ETSI TS 144 318 V10.0.0 (2011-05)

Technical Specification

**Digital cellular telecommunications system (Phase 2+);
Generic Access Network (GAN);
Mobile GAN interface layer 3 specification
(3GPP TS 44.318 version 10.0.0 Release 10)**

Reference
RTS/TSGG-0244318va00

Keywords
GSM

ETSI

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Contents

Foreword

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1 Scope

The present document describes the procedures used over the Generic Access Network (GAN) interface (i.e., the Up interface). The procedures are defined in terms of messages exchanged over the Up interface.

A building block method is used to describe the procedures.

The basic building blocks are "elementary procedures" provided by the Generic Access (GA) protocol control entities.

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

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1]   RFC 2451, November 1998: "The ESP CBC-Mode Cipher Algorithms".

[2]   3GPP TS 23.002: "Network Architecture".

[3]   3GPP TS 23.003: "Numbering, Addressing and identification".

[4]   3GPP TS 23.009: "Handover procedures".

[5]   3GPP TS 23.032: "Universal Geographical Area Description (GAD)".

[6]   3GPP TS 23.234: "3GPP system to Wireless Local Area Network (WLAN) interworking; System description".

[7]   3GPP TS 23.236: "Intra-domain connection of Radio Access Network (RAN) nodes to multiple Core Network (CN) nodes".

[8]   3GPP TS 24.008: "Mobile radio interface layer 3 specification".

[9]   3GPP TS 26.103: "Speech codec list for GSM and UMTS".

[10]   3GPP TS 33.234: "3G security; Wireless Local Area Network (WLAN) interworking security".

[11]   3GPP TS 43.020: "Security related network functions".

[12]   3GPP TS 44.018: "Mobile radio interface layer 3 specification, Radio Resource Control (RRC) protocol"

[13]   3GPP TS 44.021: "Rate adaption on the Mobile Station - Base Station System, (MS - BSS) Interface"

[14]   3GPP TS 48.004: "Base Station System - Mobile-services Switching Centre (BSS - MSC) interface; Layer 1 specification".

[15]   3GPP TS 48.006: "Signalling transport mechanism specification for the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".

[16]   3GPP TS 48.008: "Mobile-services Switching Centre - Base Station System (MSC - BSS) interface; Layer 3 specification".

[17]   3GPP TS 48.014: "General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN) interface; Gb interface Layer 1".

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[45]   3GPP TS 44.060, "Radio Link Control/Medium Access Control (RLC/MAC) protocol".

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[55]   3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA) Radio Resource Control (RRC); Protocol specification".

3   Definitions, symbols and abbreviations

3.1   Definitions

For the purposes of the present document, the terms and definitions in 3GPP TS 43.318 and the following apply.

Access Point ID: The AP-ID is the physical identity (e.g. MAC address) of the generic IP access network point through which the MS is accessing GAN service. This identifier is provided by the MS (obtained via broadcast from the AP) to the GANC via the Up interface, when it requests GAN service. The AP-ID may be used by the GANC to support location services. The AP-ID may also be used by the service provider to restrict GAN service access via only authorized APs.

Blind Transmission: refers to the decision made by the SGSN to start the transmission of downlink N-PDUs or by the target BSS/GANC to start the transmission of downlink LLC PDUs for a given mobile station before receiving confirmation that the PS handover procedure has been successfully completed.

3.2   Symbols

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

    Wm   Reference point between a Security Gateway and a 3GPP AAA Server or 3GPP AAA proxy.

3.3   Abbreviations

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

    AAA   Authentication, Authorization and Accounting
    AKA   Authentication and Key Agreement
    AP   Access Point

BSC	Base Station Controller
BSS	Base Station Subsystem
BSSGP	Base Station System GPRS Protocol
BSSMAP	Base Station System Management Application Part
BTS	Base Transceiver Station
CBS	Cell Broadcast Service
CC	Call Control
CGI	Cell Global Identification
CM	Connection Management
CN	Core Network
CPE	Customer Premises Equipment
CS	Circuit Switched
CSD	Circuit Switched Data
CTC	Circuit Transport Channel
CTM	Cellular Text Telephone Modem
DNS	Domain Name System
DTM	Dual Transfer Mode
E-UTRAN	Evolved UTRAN
EAP	Extensible Authentication Protocol
ECGI	Evolved Cell Global Identifier
ESP	Encapsulating Security Payload
ETSI	European Telecommunications Standards Institute
FCC	US Federal Communications Commission
FEC	Forward Error Correction
FLR	Frame Loss Ratio
FQDN	Fully Qualified Domain Name
GA	Generic Access
GAN	Generic Access Network
GANC	Generic Access Network Controller
GA-RC	Generic Access Resource Control
GA-CSR	Generic Access Circuit Switched Resources
GA-PSR	Generic Access Packet Switched Resources
GA-RRC	Generic Access Radio Resource Control
GERAN	GSM EDGE Radio Access Network
GGSN	Gateway GPRS Support Node
GMM/SM	GPRS Mobility Management and Session Management
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications
GSN	GPRS Support Node
HLR	Home Location Register
HPLMN	Home PLMN
IETF	Internet Engineering Task Force
IMEISV	International Mobile Station Equipment Identity and Software Version Number
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
ISP	Internet Service Provider
LA	Location Area
LAI	Location Area Identity
LLC	Logical Link Control
MAC	Medium Access Control
MAC	Message Authentication Code
MM	Mobility Management
MS	Mobile Station
MSC	Mobile Switching Center
MSRN	Mobile Station Roaming Number
MTP1	Message Transfer Part Layer 1
MTP2	Message Transfer Part Layer 2
MTP3	Message Transfer Part Layer 3
NAS	Non-Access Stratum
NAT	Network Address Translation
NSS	Network SubSystem
PDP	Packet Data Protocol

PDU	Protocol Data Unit
PLMN	Public Land Mobile Network
PSAP	Public Safety Answering Point
PSTN	Public Switched Telephone Network
PTC	Packet Transport Channel
P-TMSI	Packet TMSI
QoS	Quality of Service
RA	Routing Area
RAC	Routing Area Code
RAI	Routing Area Identity
RAT	Radio Access Technology
RLC	Radio Link Control
RRC	Radio Resource Control
RTCP	Real Time Control Protocol
RTP	Real Time Protocol
SA	Security Association
SCCP	Signalling Connection Control Part
SGSN	Serving GPRS Support Node
SEGW	Security Gateway
SMS	Short Message Service
SNDCP	Sub-Network Dependent Convergence Protocol
TAI	Tracking Area Identity
TBF	Temporary Block Flow
TC	Transport Channel
TCP	Transmission Control Protocol
TEID	Tunnel Endpoint Identifier
TFO	Tandem Free Operation
TMSI	Temporary Mobile Subscriber Identity
TrFO	Transcoder Free Operation
TTY	Text telephone or teletypewriter
UDP	User Datagram Protocol
UMTS	Universal Mobile Telecommunication System
UTRAN	Universal Terrestrial Radio Access Networks
VLR	Visited Location Register

4 Elementary procedures for handling of secure connection

4.1 General

All traffic over the Up interface shall be sent through the IPsec tunnel that is established as a result of the authentication procedure.

4.2 Establishment of the secure connection

4.2.1 General

The MS and GANC-SEGW shall set up one IKE Secure Association (SA) and one CHILD_SA for IPsec ESP according to the profiles defined in [37]. The MS shall act as initiator, and the GANC-SEGW as responder. For MS with SIM only, the MS and GANC-SEGW shall use EAP-SIM for mutual authentication of the MS and the core network according to sub-clause 4.3. For MS with USIM, the MS and GANC-SEGW shall use EAP-AKA for mutual authentication of the MS and the core network according to sub-clause 4.4.

The MS shall use certificates for authentication of the GANC-SEGW according to sub-clause 4.2.5.

Furthermore, the MS shall:

- use Configuration Payload according to [27] to acquire/renew an internal IP address in the network protected by the GANC-SEGW

- act as initiator in the Traffic Selector (TS) negotiation. The MS shall use the following value for the traffic selector-initiator and traffic selector-responder payloads:

    TSi = (0, 0-65535, 0.0.0.0-255.255.255.255)

    TSr = (0, 0-65535, 0.0.0.0-255.255.255.255)

The GANC-SEGW shall use the following value for the traffic selector-initiator and traffic selector-responder payloads:

    TSi = (0, 0-65535, *ms_internal_address - ms_internal_address*), where ms_internal_address is the IP address in the network protected by the GANC-SEGW that is assigned to the MS

    TSr = (0, 0-65535, 0.0.0.0-255.255.255.255)

Either the MS or GANC-SEGW may initiate re-keying of the SA based on their individual lifetime policy on the SA.

4.2.2   Identities

The MS shall send its EAP-SIM or EAP-AKA identity (composed according to sub-clauses 4.3.2 and 4.4.2) as initiator identity IDi.

The MS shall include the GANC-SEGW identity that it wishes to communicate with in the Identity Responder (IDr) payload in the IKE_SA_AUTH Request (message 3) as follows:

- If the MS derived the FQDN of the Provisioning GANC-SEGW from the IMSI (as described in [3]), it shall include the derived FQDN in the Identification Data field of the IDr payload and indicate Identity Type 2 (ID_FQDN) in the ID Type field of the IDr payload;

- If the MS was provisioned with an IPv4 address of the Provisioning GANC-SEGW, or received it in the GA-RC DISCOVERY ACCEPT message or GA-RC REGISTER REDIRECT message for the Default or a Serving GANC-SEGW, it shall include that IPv4 address in the Identification Data field of the IDr payload and indicate Identity Type 1 (ID_IPV4_ADDR) in the ID Type field of the IDr payload;

- If the MS was provisioned with an IPv6 address of the Provisioning GANC-SEGW, or received it in the GA-RC DISCOVERY ACCEPT message or GA-RC REGISTER REDIRECT message for the Default or a Serving GANC-SEGW, it shall include that IPv6 address in the Identification Data field of the IDr payload and indicate Identity Type 5 (ID_IPV6_ADDR) in the ID Type field of the IDr payload;

- If the MS was provisioned with a FQDN of the Provisioning GANC-SEGW, or received it in the GA-RC DISCOVERY ACCEPT message or GA-RC REGISTER REDIRECT message for the Default or a Serving GANC-SEGW, it shall include that FQDN in the Identification Data field of the IDr payload and indicate Identity Type 2 (ID_FQDN) in the ID Type field of the IDr payload;

The GANC-SEGW shall provide the GANC-SEGW identity in the Identity Payload (IDr) as following:

    Identity Type =   2 (ID_FQDN) or 1 (ID_IPV4_ADDR) or 5 (ID_IPV6_ADDR)

    Identity Data =   GANC-SEGW FQDN or IPv4 address or IPv6 address, respectively

Identity Type shall match the Type of the SubjectAltName contained in the GANC-SEGW certificate as well as what was provisioned in the MS for Provisioning GANC-SEGW or provided in GA-RC DISCOVERY ACCEPT for Default GANC-SEGW or GA-RC REGISTER REDIRECT for Serving GANC-SEGW.

4.2.3   Crypto negotiation

The MS and GANC-SEGW negotiate the cryptographic suite to use for the SA, as per [27].

The MS shall include all the algorithms for integrity and confidentiality (defined in the profile for IPsec ESP in [37]) that it supports in the proposal. The GANC-SEGW signals back the selected algorithms that will be used for confidentiality and integrity protection, based on core network policy.

4.2.4 NAT traversal

The MS and GANC-SEGW shall use the IKEv2 mechanisms for detection of NAT, NAT traversal and keep-alive (as specified in [27]). If NAT is detected, the MS and GANC-SEGW shall use the UDP encapsulation of ESP packets mechanism (as specified in [30]).

4.2.5 Certificate Handling and Authentication

As the MS and GANC-SEGW use EAP-SIM or EAP-AKA for mutual authentication, IKEv2 mandates that this is used in conjunction with a public key signature based authentication of the GANC-SEGW to the MS.

The MS requirements for certificate authentication and handling are listed in 3GPP TS 33.234 [10].

In addition to the requirements listed in 3GPP TS 33.234 [10], the MS shall take the following actions for received GANC-SEGW certificates:

- match the SubjectAltName in the end entity certificate with the IDr payload, and with GANC-SEGW identity obtained from derivation of the Provisioning GANC-SEGW FQDN, provisioning, discovery or register redirect.

- If the MS was provisioned with an IP address of the GANC-SEGW, (or received it in the GA-RC DISCOVERY ACCEPT or GA-RC REGISTER REDIRECT message), then the certificate shall contain an IPaddress SubjectAltName that matches that address.

- If the MS was provisioned with an FQDN of the GANC-SEGW, or received it in the GA-RC DISCOVERY ACCEPT or GA-RC REGISTER REDIRECT message, then the certificate shall contain a DNSname SubjectAltName that matches that FQDN.

- If the MS derived the FQDN of the Provisioning GANC-SEGW, then the certificate shall contain a DNSname SubjectAltName that matches that FQDN.

- If a single SubjectAltName extension contains several IPaddress or DNSname components, at least one of them shall match the expected value.

4.2.6 Abnormal cases

If the MS and GANC-SEGW are not able to set up the SA for any other reason than EAP-SIM or EAP-AKA authentication failure, and the current GANC-SEGW is the SEGW associated to the Default GANC or a Serving GANC, the MS shall act as if a "Lower layer failure in the MS" has occurred and act as defined in sub-clause 6.2.4.2.

If the MS and GANC-SEGW are not able to set up the SA for any other reason than EAP-SIM or EAP-AKA authentication failure, and the current GANC-SEGW is the SEGW associated to the Provisioning GANC, the MS shall act as if a "Lower layer failure in the MS" has occurred and act as defined in sub-clause 5.6.2.

4.3 EAP-SIM authentication

4.3.1 General

After the initial IKEv2 exchanges, EAP-SIM authentication is invoked by deferring the sending of the AUTH payload, as per [27].

The GANC-SEGW shall:

- compose an EAP Response/Identity message containing the IDi of the MS and send this message to the AAA server. This will trigger the EAP-SIM authentication procedure.

- communicate with the local AAA server over the Wm interface, and relay traffic between the local AAA server and MS.

After the MS has received the EAP Success message (i.e. EAP-SIM authentication procedure was successful), the MS and GANC-SEGW complete the setup of the SA.

4.3.2 EAP-SIM Identity

The MS sends its identity as part of the initial IKE exchanges, and this also serves as identify for the EAP-SIM exchange. The identity is composed compliant with the Network Access Identifier (NAI) format specified in [42] and [3].

4.3.3 EAP-SIM Fast Re-authentication

The MS may use the re-authentication identity that was provided during the previous EAP-SIM authentication procedure to authenticate using EAP-SIM fast re-authentication instead of the full authentication procedure. The MS shall use the realm part provided by the EAP-SIM server as part of the fast re-authentication identity, as specified in [23].

The MS may attempt to use the fast re-authentication procedure when it has an unused re-authentication identity available. The MS shall not use one re-authentication identity more than once. The fast re-authentication procedure shall not be used for the first authentication after the MS has powered up, in that case it shall use the full authentication procedure.

4.3.4 Abnormal cases

If the EAP-SIM authentication procedure fails, and the current GANC-SEGW is the SEGW associated to the Default GANC or a Serving GANC fails, the MS shall act as if it had received GA-RC REGISTER REJECT with the Reject Cause value 'IMSI not allowed' as defined in sub-clause 6.2.3.3.

If the EAP-SIM authentication procedure fails, and the current GANC-SEGW is the SEGW associated to the Provisioning GANC, the MS shall act as if it had received GA-RC DISCOVERY REJECT with the Reject Cause value 'IMSI not allowed' as defined in sub-clause 5.5.2.

4.4 EAP-AKA authentication

4.4.1 General

After the initial IKEv2 exchanges, EAP-AKA authentication is invoked by deferring the sending of the AUTH payload, as per [27].

The GANC-SEGW shall:

- compose an EAP Response/Identity message containing the IDi of the MS and send this message to the AAA server. This will trigger the EAP-AKA authentication procedure.

- communicate with the local AAA server over the Wm interface, and relay traffic between the local AAA server and MS.-

After the MS has received the EAP Success message (i.e. EAP-AKA authentication procedure was successful), the MS and GANC-SEGW complete the setup of the SA.

4.4.2 EAP-AKA Identity

The MS sends its identity as part of the initial IKE exchanges, and this also serves as identify for the EAP-AKA exchange. The identity is composed compliant with the Network Access Identifier (NAI) format specified in [42] and [3].

4.4.3 EAP-AKA Fast Re-authentication

The MS may use the re-authentication identity that was provided during the previous EAP-AKA authentication procedure to authenticate using EAP-AKA fast re-authentication instead of the full authentication procedure. The MS shall use the realm part provided by the EAP-AKA server as part of the fast re-authentication identity, as specified in [41].

The MS may attempt to use the fast re-authentication procedure when it has an unused re-authentication identity available. The MS shall not use one re-authentication identity more than once. The fast re-authentication procedure shall not be used for the first authentication after the MS has powered up, in that case it shall use the full authentication procedure.

4.4.4 Abnormal cases

If the EAP-AKA authentication procedure fails, and the current GANC-SEGW is the SEGW associated to the Default GANC or a Serving GANC fails, the MS shall act as if it had received GA-RC REGISTER REJECT with the Reject Cause value 'IMSI not allowed' as defined in sub-clause 6.2.3.3.

If the EAP-AKA authentication procedure fails, and the current GANC-SEGW is the SEGW associated to the Provisioning GANC, the MS shall act as if it had received GA-RC DISCOVERY REJECT with the Reject Cause value 'IMSI not allowed' as defined in sub-clause 5.5.2.

4.5 Release of the secure connection

The SA is closed according the procedures defined in [27].

5 GA-RC elementary procedures for GANC Discovery

5.1 Purpose of the Discovery Procedure

The purpose of the Discovery procedure is to allow the network to allocate a Default GANC to a MS. This allocation consists of the IP address or FQDN of the Default GANC-SEGW, and the IP address or FQDN and TCP port of the Default GANC to be used for the Registration procedure. As long as the Default GANC is available in the network the MS shall not perform Discovery procedure again. The Discovery procedure is performed using the IPsec tunnel that is established between the MS and the Provisioning GANC-SEGW as defined in sub-clause 4.2.

5.2 Discovery procedure

The Discovery procedure is performed between the MS and the Provisioning GANC. The Discovery procedure is initiated by the MS in order to receive information about the Default GANC to be used for future instances of the Registration Procedure.
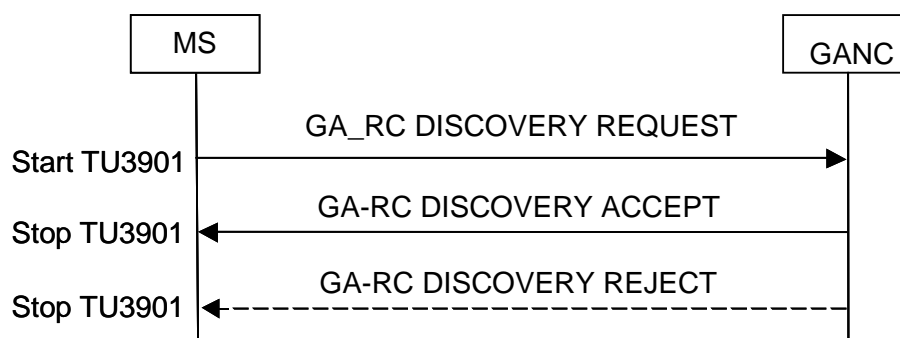
Figure 5.2: Discovery procedure

5.3 Discovery Request initiation by the MS

This procedure shall be triggered after the MS has gained IP connectivity (i.e. an IP address is allocated to the MS in the "transport IP" layer) and the MS has either no stored information about a Default GANC or if the previous Registration procedure towards the Default GANC was unsuccessful.

The MS may initially be provisioned with information (i.e. an IP address or a FQDN) about the Provisioning GANC and the corresponding Provisioning SEGW related to that GANC. The provisioning of this information in the MS is out of the scope of this document. This information can be in the format of either a FQDN or an IP-address or any combination of these.

The MS shall:

- If the MS holds an IP address of the Provisioning SEGW, the MS establishes the secure connection towards the Provisioning SEGW according to sub-clause 4.2;

- If the MS holds a FQDN of the Provisioning SEGW, the MS performs a public DNS query to retrieve the IP-address of the Provisioning SEGW and establish the secure connection towards the Provisioning SEGW according to sub-clause 4.2. The MS shall not store the IP address retrieved from DNS for subsequent procedures (apart from DNS resolver caching);

- In case the MS is not provisioned with information about the Provisioning SEGW, derive a FQDN of the Provisioning SEGW from the IMSI (as described in [3]);

  The MS performs a public DNS Query to retrieve the IP-address of the Provisioning SEGW and establish the secure connection towards the Provisioning SEGW according to sub-clause 4.2. The MS shall not store the IP address retrieved from DNS for subsequent procedures (apart from DNS resolver caching);

- Following successful establishment of secure connection to the Provisioning SEGW:

  - If the MS holds an IP address of the Provisioning GANC, the MS shall establish a TCP connection to the Provisioning GANC using the well-known TCP port for Discovery as defined in sub-clause 12.2.1

  - If the MS holds a FQDN of the Provisioning GANC, the MS shall perform a DNS query "inside the secure connection" to retrieve the IP-address of the Provisioning GANC. The MS shall establish a TCP connection to the Provisioning GANC using this IP address and a TCP port defined for Discovery (see sub-clause 12.2.1). The MS shall not store the IP address retrieved from DNS for subsequent procedures (apart from DNS resolver caching).

  - In cases where the MS is not provisioned with information about the Provisioning GANC, the MS derives a FQDN of the Provisioning GANC from the IMSI (as described in [3]).

    A DNS query is performed "inside the secure connection" to retrieve the IP-address of the Provisioning GANC. The MS shall not store the IP address retrieved from DNS for subsequent procedures (apart from DNS resolver caching).A TCP connection is then established inside the IPsec tunnel, to the Provisioning GANC using the TCP port defined for Discovery procedure (see sub-clause 12.2.1).

  - In all cases the MS shall establish only a single TCP connection to the GANC over the IPsec tunnel.

- After successful establishment of a secure connection to the SEGW and a TCP connection to the GANC the MS shall proceed as follows:

  - If the Discovery Procedure is due to the MS failing to register with a GANC, the MS includes the following information elements in the GA-RC DISCOVERY REQUEST message: Register Reject Cause IE, Redirection Counter IE and Default GANC IE,

  - Send a GA-RC DISCOVERY REQUEST message to the Provisioning GANC on the established TCP connection.

  - When GA-RC layer has submitted the GA-RC DISCOVERY REQUEST message to the TCP layer, it shall start timer TU3901.

5.4   Discovery Request processing by the network

When receiving the GA-RC DISCOVERY REQUEST message the Provisioning GANC may either accept or reject the Discovery request from the MS.

5.4.1   Discovery accepted

If the Provisioning GANC accepts the Discovery request from the MS, it shall send the GA-RC DISCOVERY ACCEPT message to the MS. When the GA-RC layer in the Provisioning GANC has submitted the GA-RC DISCOVERY ACCEPT message to the TCP layer, it may initiate release of its half of the bidirectional TCP connection.

The Provisioning GANC may use the Redirect Counter IE, Register Reject Cause Value IE and Default GANC IE received in the GA-RC DISCOVERY REQUEST message to assign a different Default GANC for the MS.

5.4.2   Discovery rejected

If the Provisioning GANC rejects the Discovery request from the MS, it shall send the GA-RC DISCOVERY REJECT message to the MS. When the GA-RC layer in the Provisioning GANC has submitted the GA-RC DISCOVERY REJECT message to the TCP layer and the value of the Discovery Reject Cause IE included in the message was not 'Network Congestion', it may initiate release of its half of the bidirectional TCP connection.

The Provisioning GANC may use the Redirect Counter IE, Register Reject Cause Value IE and Default GANC IE received in the GA-RC DISCOVERY REQUEST message to detect a problem and reject the MS.

5.5   Discovery response processing by the MS

5.5.1   Discovery accepted

When the MS receives GA-RC DISCOVERY ACCEPT message, it shall:

- stop the timer TU3901.

- set the timer value for TU3903 to the default value,

- store the information about Default GANC in persistent storage:

    - The Default GANC information consists of the Default GANC, SEGW associated with the Default GANC and optionally a TCP port to be used with that Default GANC. If a specific TCP Port is not received in the message, the defined port for Registration is used (see sub-clause 12.2.1)

- release the TCP connection towards the Provisioning GANC

- the secure connection to the Provisioning SEGW can be reused as follows;

    - If the MS is provisioned with an IP address of the Provisioning GANC-SEGW and it matches the received Default GANC-SEGW IP address IE, the MS shall reuse the existing secure connection.

    - If the MS is provisioned with a FQDN of the Provisioning GANC-SEGW or derived a FQDN for the Provisioning GANC-SEGW and it matches the received Default GANC-SEGW FQDN IE, the MS shall reuse the existing secure connection.

- otherwise the MS shall release the existing secure connection towards the SEGW of the Provisioning GANC as defined in sub-clause 4.5

- initiate the registration procedure towards the Default GANC as defined in sub-clause 6.2.

5.5.2   Discovery rejected

When the MS receives GA-RC DISCOVERY REJECT message it shall:

- stop the timer TU3901,

- set the timer value for TU3903 to the default value,

- If the value of the Reject Cause IE indicates 'Network Congestion' , the MS shall:

    - Maintain the secure connection to the GANC-SEGW and the TCP connection to the GANC.

- Create a random value between zero and the received value in TU3902 Timer IE, and

- Add this value to the received value in TU3902 Timer IE, this becomes the new value for TU3902.

- Start timer TU3902 according to the new calculated value.

- If the value of the Reject Cause IE indicates 'IMSI not allowed' or "Unspecified", then the MS shall:

- Release the TCP connection established to the Provisioning GANC, if still established.

- Release the secure connection towards the SEGW associated with the Provisioning GANC as defined in sub-clause 4.5.

- Not initiate a new Discovery procedure until the next power-on.

5.6 Abnormal cases

5.6.1 TU3901 expiry

If timer TU3901 has expired in the MS, the MS shall:

- release the TCP connection towards the Provisioning GANC,

- release the secure connection towards SEGW of the Provisioning GANC as defined in sub-clause 4.5,

- double the current value for timer TU3903 but not exceeding the maximum value defined for this timer as defined in sub-clause 12.1.1 and

- start timer TU3903 and wait for it to expire.

5.6.2 Lower layer failure in the MS

Lower layer failure in the MS can be for example related to DNS, IPsec or TCP. If any lower layer failure happens in the MS, the MS shall:

- release the TCP connection towards the Provisioning GANC, if established,

- release the secure connection towards SEGW of the Provisioning GANC, if established, as defined in sub-clause 4.5,

- double the current timer value for TU3903 but not exceeding the maximum value defined in sub-clause 12.1.1,

- stop timer TU3901 if running and

- start timer TU3903 and wait for it to expire.

5.6.3 TU3902 expiry

If timer TU3902 has expired in the MS, the MS shall:

- if the TCP connection to the Provisioning GANC is still established:

- send a GA-RC DISCOVERY REQUEST message and

- start timer TU3901

- otherwise, restart the Discovery procedure as defined in sub-clause 5.3.

5.6.4 TU3903 expiry

If timer TU3903 has expired in the MS, the MS shall restart the Discovery procedure as defined in sub-clause 5.3.

6 GA-RC elementary procedures for Registration

6.1 Purpose of GAN Registration

The Registration procedure is performed between the MS and the GANC (Default or Serving GANC). The purpose of this procedure is to allow the MS to register for GAN services on the most suitable GANC for the network. The MS as part of the Registration procedure provides the GANC with information relating to the current connectivity of the MS. The GANC, as part of a successful Registration, indicates the GAN mode (i.e., GAN A/Gb mode or GAN Iu mode) that the MS shall operate in while registered with the GANC and provides the MS with the "System Information" message content that is applicable in GAN mode. The Registration procedure is performed using the IPsec tunnel that is established between the MS and the Default or the Serving GANC-SEGW as defined in sub-clause 4.2.

6.2 Registration procedure
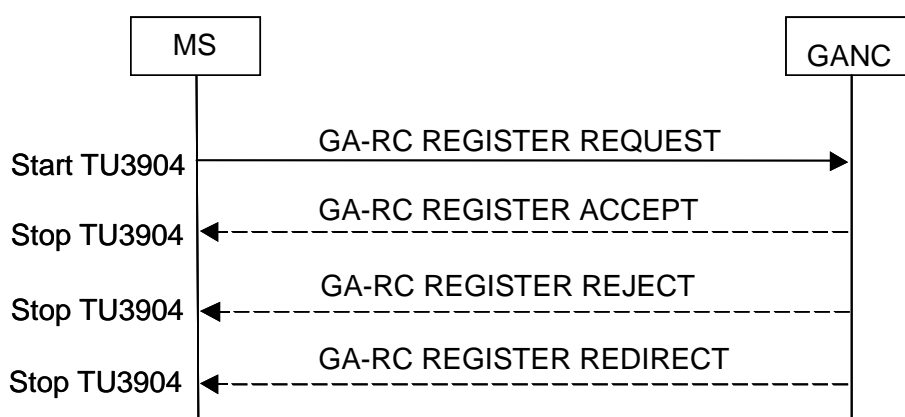
Figure 6.2.1: Registration procedure

6.2.1 Registration initiation by the MS

This procedure shall be triggered by the MS under the following conditions:

- the MS has gained IP connectivity (i.e. an IP address is allocated to the MS in the "transport IP" layer); and

- the MS has stored information about a Default GANC.

The Registration procedure is initiated towards the Default GANC after a successful Discovery procedure or after a failed Registration towards a Serving GANC, where no GAN PLMN list was provided to the MS from the Default GANC. The Registration procedure is also initiated towards the Default GANC when no more PLMNs can be selected from the GAN PLMN List received from the Default GANC.

As part of the Registration procedure, the MS may receive a list of PLMN identities when trying to register towards the Default GANC. This list of PLMN identities is passed to the GANC selection process. Following PLMN selection by the GANC selection process, and if registered to a Serving GANC, the MS shall first deregister from the current Serving GANC as defined in sub-clause 6.4.1, and then attempt the registration procedure towards the Serving GANC-SEGW and GANC associated with the selected PLMN.

This procedure is also triggered towards the Default GANC, if the MS at any time wishes to perform manual PLMN selection or "User reselection" irrespective of whether the MS is in manual or automatic PLMN selection mode. If the MS is already successfully registered to a Serving GANC, and a manual PLMN selection or "User reselection" is initiated, the MS shall first deregister from the current Serving GANC as defined in sub-clause 6.4.1 and then initiate registration towards the Default GANC and include an indication that a list of PLMN identities is requested for manual PLMN selection or user reselection. After receiving the requested PLMN list from the Default GANC the MS shall then re-register on the last registered Serving GANC.

GANC information required to initiate the Registration procedure consists of a GANC-SEGW address, a GANC address and a GANC TCP port number. The MS shall initiate the Registration procedure towards a Serving GANC if the corresponding GANC information is available in the stored Serving GANC table. If successful, the stored Serving GANC table in the MS may be updated to contain address information of the successfully registered Serving GANC and the corresponding GSM-CGI, UTRAN cell identity or E-UTRAN cell identity, if available, or AP-ID, if no GSM CGI, UTRAN cell identity or E-UTRAN cell identity is available (see sub-clause 6.2.3.1). UTRAN cell identity consists of the Location Area Identity (LAI) and Cell Identity (defined in [40]). E-UTRAN cell identity consists of the Tracking Area Identity (TAI) and Cell Identity (defined in [55]). The Default GANC is in control of whether or not the MS is allowed to store GANC information in the stored Serving GANC table.

If the MS is in GERAN, UTRAN or E-UTRAN coverage, it shall check if it has stored Serving GANC information for the current GSM CGI in case of GERAN coverage, UTRAN cell identity in case of UTRAN Coverage, or E-UTRAN cell identity in case of E-UTRAN coverage, or if the MS is not in GERAN/UTRAN/E-UTRAN coverage, it shall check if it has stored Serving GANC information for the current AP-ID:

- if found, the MS shall initiate the GAN Registration procedure towards the stored Serving GANC

- if not found, the MS shall initiate the GAN Registration procedure towards the Default GANC

The Location Black List contains information about forbidden Locations acquired while attempting GAN registration and is only valid if the MS is in GERAN or UTRAN coverage. It can contain Location information on 3 different levels: Country (i.e. MCC), PLMN (i.e. MCC and MNC) and Location Area (i.e. MCC, MNC and LAC). If the MS is in a location identified by an entry in the Location Black List, the MS shall not initiate the GAN Registration procedure. The Location Black List shall be deleted upon power cycle.

The AP Black List contains information about denied APs. If the MS is being provided IP connectivity by an AP that is on the AP Black List, the MS shall not initiate discovery or GAN registration, until the relevant AP has been removed from the AP Black List. The AP Black List shall be deleted upon power cycle.

To initiate the GAN registration procedure the MS shall:

- If the MS has stored an IP address of the GANC-SEGW, and the MS does not already have an established secure connection to this GANC-SEGW, the MS establishes a secure connection towards the GANC-SEGW according to sub-clause 4.2;

- If the MS has stored a FQDN of the GANC-SEGW, the MS performs a public DNS query to retrieve the IP-address of the GANC-SEGW, if the MS does not already have an established secure connection to this GANC-SEGW, the MS establishes the secure connection towards the GANC-SEGW according to sub-clause 4.2. The MS shall not store the IP address retrieved from DNS for subsequent procedures (apart from DNS resolver caching).

Following successful establishment of secure tunnel:

- If the MS holds an IP address of the GANC, the MS establishes a TCP connection to the GANC at the stored TCP port to be used for Registration with this GANC. If no TCP port has been stored for this GANC, the default TCP port (see sub-clause 12.2.1) shall be used;

- If the MS holds a FQDN of the GANC, the MS performs a DNS query "inside the secure tunnel" to retrieve the IP-address of the GANC. The MS establishes a TCP connection to the GANC at the stored TCP port to be used for Registration with this GANC. If no TCP port has been stored for this GANC, the default TCP port (see sub-clause 12.2.1) shall be used. The MS shall not store the retrieved IP address for subsequent procedures (apart from DNS resolver caching);

- The MS shall only establish a single TCP connection to the GANC over the IPsec tunnel.

After successful establishment of a secure connection to the SEGW and a TCP connection to the GANC, the MS sends a GA-RC REGISTER REQUEST message to the GANC on the TCP connection, including the following information elements:

- The Geographical Location IE, if available;

- AP Location IE, if available;

- Required GAN Services IE, if required;

- If a GAN PLMN list was received during the last registration attempt with the Default GANC and the GANC selection process is finished unsuccessfully (i.e. the MS was not successfully registered to a Serving GANC and to the associated PLMN in the GAN PLMN List IE), then the MS includes the received GAN PLMN List information in the GAN PLMN List IE in the GA-RC REGISTER REQUEST message;

- Else if the MS failed to register during the last registration it attempted with a GANC (Default or Serving), then Register reject Cause IE, Redirection Counter IE and address information (i.e. IP Address or the Fully Qualified Domain/Host Name IE) of the last GANC and last GANC-SEGW;

- Else if the MS was redirected during the last registration it attempted with a GANC (Default or Serving):

  - Redirection Counter IE and address information (i.e. IP address or FQDN) of the last GANC and last GANC-SEGW

When GA-RC layer has submitted the GA-RC REGISTER REQUEST message to the TCP layer, it shall start a timer TU3904

6.2.2 Registration processing by the network

6.2.2.1 General

When receiving the GA-RC REGISTER REQUEST message the GANC may either accept or reject the Registration request from the MS. The GANC may also redirect the MS to another GANC or provide a list of PLMN identities that may provide GAN service to the MS.

The GANC should verify that the binding (IMSI, inner IP address) as received in the GA-RC REGISTER REQUEST is the same as the one that the MS used during authentication to the GANC-SEGW.

6.2.2.2 Registration accepted

If the GANC accepts the Registration request from the MS, it shall send the GA-RC REGISTER ACCEPT message to the MS and store information relating to the GAN service requirements of the mobile station.

If the Default GANC indicator is included in the GA-RC REGISTER REQUEST message received from the MS, then the GANC shall include the Serving GANC Table indicator to indicate to the MS whether or not the MS is allowed to store the GANC information in the stored Serving GANC table.

The GANC shall include the IE "GAN Mode Indicator" if the IE "GAN Classmark" received by the GANC in the GA-RC REGISTER REQUEST message included the GAN Mode Support Indicator field with value other than Unspecified. The IE "GAN Mode Indicator" indicates the GAN mode (i.e., GAN A/Gb mode or GAN Iu mode) that the MS shall operate in while registered with the GANC.

6.2.2.3 Registration redirected

If the GANC decides to redirect the MS to another GANC, the network shall send the GA-RC REGISTER REDIRECT message to the MS and act as follows:

- If the MS attempts to register with the Default GANC as indicated by the presence of the Registration Indicators IE in the GA-RC REGISTER REQUEST message and the MS is not in manual PLMN selection mode, user reselection was not triggered and the MS is being redirected to a Serving GANC in the HPLMN, the GANC shall not include the GAN PLMN List information element.

- If the MS attempts to register with the Default GANC as indicated by the presence of the Registration Indicators IE in the GA-RC REGISTER REQUEST message, and the MS is not in manual PLMN selection mode, user reselection was not triggered and based on the current MS location and operator policies, the MS needs to perform a GANC selection, the GANC shall include the GAN PLMN List information element.

- If the MS attempts to register with the Default GANC as indicated by the presence of the Registration Indicators IE in the GA-RC REGISTER REQUEST message and that the MS is in manual PLMN selection mode or user reselection was triggered and requests a list of PLMNs, the GANC shall include the GAN PLMN List information element.

- If the MS attempts to register with a Serving GANC as indicated by the absence of the Registration Indicators IE in the GA-RC REGISTER REQUEST message, the GANC shall not include the GAN PLMN List information.

When the GA-RC layer in the network has submitted the GA-RC REGISTER REDIRECT message to the TCP layer, it may initiate release of its half of the bidirectional TCP connection.

The GANC can send this message at any time, but it shall not be sent to an MS in GA-CSR-DEDICATED or GA-PSR-ACTIVE state.

The GANC may use the Redirect Counter IE, Register Failure Cause IE, Register Reject Cause Value IE and Last GANC IE to detect a problem and redirect the MS to a different Serving GANC.

If the Default GANC indicator is included in the GA-RC REGISTER REQUEST message received from the MS, then the GANC may include the Serving GANC Table indicator to indicate to the MS whether or not the MS is allowed to store the GANC information in the stored Serving GANC table.

6.2.2.4 Registration rejected

If the GANC decides to reject the registration from the MS, it shall send the GA-RC REGISTER REJECT message to the MS. When the GA-RC layer in the network has submitted the GA-RC REGISTER REJECT message to the TCP layer and the value of the Register Reject Cause IE included in the message was not 'Network Congestion', it may initiate release of its half of the bidirectional TCP connection.

The GANC may use the Redirect Counter IE, Register Failure Cause IE, Register Reject Cause Value IE and Last GANC IE to detect a problem and reject the MS.

6.2.3 Registration response processing by the MS

6.2.3.1 Registration accepted

When the MS receives GA-RC REGISTER ACCEPT message, it shall:

- stop the timer TU3904,

- reset the Redirection Counter,

- retrieve the GAN Mode Indicator IE (if included) and:

  - if no GAN Mode Indicator IE is included or if the GAN Mode Indicator IE is included and indicates that the MS shall operate in GAN A/Gb mode, and the MS supports GAN A/Gb mode, then the MS shall operate in GAN A/Gb mode while registered with the GANC.

  - if the GAN Mode Indicator IE is included and indicates that the MS shall operate in GAN Iu mode, and the MS supports GAN Iu mode, then the MS shall operate in GAN Iu mode while registered with the GANC.

- if GAN A/Gb mode is selected, then retrieve the GAN System Information parameters and:

  - send the contents of GAN Cell Description IE (if received) to the GSM RR layer or UTRAN RRC to be used for Measurement Reports in GSM RR dedicated mode or GSM RR packet transfer mode or UTRAN RRC connected mode

  - store the received GAN System Information and when GA-RC becomes the serving layer send the following information to the upper layers either immediately or upon entering the GA-CSR-IDLE state if the MS is currently in GA-CSR-DEDICATED state:

    - from GAN Control Channel Description IE
      - Network Mode of Operation,
      - GPRS availability Indicator,
      - Dual Transfer Mode Indicator,
      - IMSI Detach/Attach indicator,
      - MSC Release Indicator,
      - SGSN Release Indicator,
      - T3212 timer value,

- Routing Area Code,
- Emergency Call Mode Preference and
- Emergency Call indicator.

- GAN Location Area Identity.

- Store the Early Classmark Sending Indicator from GAN Control Channel Description IE.

- Store the Call Re-establishment bit from GAN Control Channel Description IE.

- if GAN Iu mode is selected, then retrieve the GAN System Information parameters and:

- send the contents of GAN Iu Mode Cell Description IE (if received) to the GSM RR layer or UTRAN RRC to be used for Measurement Reports in GSM RR dedicated mode or GSM RR packet transfer mode or UTRAN RRC connected mode

- store the received GAN System Information and when GA-RC becomes the serving layer send the following information to the upper layers either immediately or upon entering the GA-RRC-IDLE state if the MS is currently in GA-RRC-CONNECTED state:

- from GAN Control Channel Description IE
- Network Mode of Operation,
- IMSI Detach/Attach indicator,
- MSC Release Indicator,
- SGSN Release Indicator,
- T3212 timer value,
- Routing Area Code,
- Emergency Call Mode Preference and
- Emergency Call indicator.

- GAN Location Area Identity.

- Store the Call Re-establishment bit from GAN Control Channel Description IE.

- Start Keep alive mechanism as defined in sub-clause 6.5 using the received TU3906 Timer IE.

- Use the received TU3910 Timer value as follows:

- When the MS roves out (i.e. leaves GAN mode and enters GERAN/UTRAN mode), it shall start timer TU3910 and shall not rove in (i.e. leave GERAN/UTRAN mode and enter GAN mode) until this timer has expired, unless the MS has detected loss of GERAN or UTRAN coverage.

- If timer TU3910 is running and MS is in GA-RC-REGISTERED state and;

- MS receives GA-RC REGISTER UPDATE DOWNLINK message, the MS shall restart the timer TU3910 using the new value if included in the message.

- If the GA-RC REGISTER ACCEPT was received from the Default GANC, the MS shall store the received Serving GANC table indicator and shall consider the Default GANC to be the Serving GANC.

- If the stored Serving GANC Table indicator is set to "store", update the stored Serving GANC table as follows (the SEGW and GANC address information type, i.e. FQDN or IP address, stored depends on the address type held by the MS when initiating registration i.e. if the MS held an IP address, then that IP-address shall be stored and if the MS held an FQDN, then that FQDN shall be stored):

- If the MS is in GERAN/UTRAN/E-UTRAN coverage and this was indicated in the GA-RC REGISTER REQUEST by including a current GSM CGI, UTRAN cell identity (i.e., LAI and Cell Identity which is defined in [40]), or E-UTRAN cell identity (i.e., TAI and Cell Identity which is defined in [55]):

- if the stored Serving GANC table does not contain the GSM CGI, UTRAN cell identity, or E-UTRAN cell identity, add the GSM CGI, UTRAN cell identity or E-UTRAN cell identity to the table with the information about the Serving GANC: SEGW FQDN or IP-address, GANC FQDN or IP-address and the TCP port to be used (if received in the message, otherwise the TCP port for Registration as defined in sub-clause 12.2.1).

- if the stored Serving GANC table contains the GSM CGI, UTRAN cell identity or E-UTRAN cell identity, update the information about the Serving GANC for this GSM CGI, UTRAN cell identity or E-UTRAN cell identity: SEGW FQDN or IP-address, GANC FQDN or IP-address and the TCP port to be used, as described above.

- If the MS is not in GERAN/UTRAN/E-UTRAN coverage and this was indicated in the GA-RC REGISTER REQUEST:

  - if the stored Serving GANC table does not contain the AP-ID, add the AP-ID with the information about the Serving GANC: SEGW FQDN or IP-address, GANC FQDN or IP-address and the TCP port to be used (if received in the message, otherwise the TCP port for Registration as defined in sub-clause 12.2.1).

  - if the stored Serving GANC table contains the AP-ID, update the information about the Serving GANC for this AP-ID: SEGW FQDN or IP-address, GANC FQDN or IP-address and the TCP port to be used, as described above.

- If the stored Serving GANC Table indicator is set to "Do not store", the MS should not store the new registered serving GANC information in the stored Serving GANC table but should still maintain the related serving GANC information, if existing in the stored Serving GANC table.

6.2.3.2 Registration redirected

When the MS receives GA-RC REGISTER REDIRECT message, it shall:

- stop the timer TU3904,

- Increment the Redirection counter,

- release the TCP connection towards the GANC,

- if timer TU3910 is running and MS is in GA-RC-REGISTERED state the MS shall stop the timer TU3910,

- if the GA-RC REGISTER REDIRECT was received from the Default GANC, the MS shall;

  - store the received Serving GANC table indicator;

  - if the GA-RC REGISTER REDIRECT contains the GAN PLMN List information element;

  - store the information received in the GAN PLMN List information element ,

  - pass the received list of PLMN identities to the GANC selection process;

  - release the secure connection towards SEGW of the Default GANC as defined in sub-clause 4.5; and;

  - following PLMN selection by the GANC selection process, initiate the registration procedure towards the GANC associated with the selected PLMN as defined in sub-clause 6.2. Each GANC selected in this manner shall be considered as a Serving GANC by the MS;

- if the returned SEGW is the same as the one used for the connection towards the previous GANC,

  - if the GA-RC-REGISTER REDIRECT was received from the Default GANC, then:

    - if the stored Default GANC-SEGW address information is in an IP address format and the received GA-RC REGISTER REDIRECT message contains the Serving GANC-SEGW IP address IE, and these two IP addresses match, the MS shall reuse the secure connection;

    - or if the stored Default GANC-SEGW address information is a FQDN and the received GA-RC REGISTER REDIRECT message contains the Serving GANC-SEGW FQDN IE, and these identifiers match, the MS shall reuse the secure connection.

  - if the GA-RC-REGISTER REDIRECT was received from a Serving GANC, then:

    - if the MS held a Serving GANC-SEGW IP address for the current Serving GANC (either in the Serving GANC store or received in a previous GA-RC REGISTER REDIRECT) and the received GA-RC REGISTER REDIRECT contains the Serving GANC-SEGW IP address IE, and these two IP addresses match, the MS shall reuse the secure connection, or

- if the MS held a Serving GANC-SEGW FQDN identifier (either in the Serving GANC store or received in a previous GA-RC REGISTER REDIRECT) and the received GA-RC REGISTER REDIRECT contains the Serving GANC-SEGW FQDN IE, and these identifiers match, the MS shall reuse the secure connection

- otherwise release the secure connection towards SEGW of the previous GANC as defined in sub-clause 4.5

- initiate the registration procedure towards the returned GANC as defined in sub-clause 6.2.

6.2.3.3   Registration rejected

When the MS receives GA-RC REGISTER REJECT message it shall:

- stop the timer TU3904,

- if the MS is in the process of GANC selection;

    - ignore the received Register Reject Cause Information Element; and;

    - proceed as defined in sub-clause 6.2.4.5.

- else extract the Register Reject Cause information element and act as following depending on the value of the Reject Cause IE:

    - 'Network Congestion'
      - create a random value between zero and the received value in IE 'TU3907 Timer' and
      - add this value to the received value in IE 'TU3907 Timer', and use this as the new value for TU3907
      - start timer TU3907 according to the new calculated value and wait for it to expire.

    - 'AP not allowed'
      - release the TCP connection established to the GANC, if still established,
      - release the secure connection towards the SEGW associated with the GANC, as defined in sub-clause 4.5
      - store the AP-ID in the AP Black List and not initiate a new Register Request from this AP, until the AP-ID is removed from the AP Black List i.e. as a result of power-cycle.

    - 'Location not allowed'
      - release the TCP connection established to the GANC, if still established,
      - release the secure connection towards the SEGW associated with the GANC, as defined in sub-clause 4.5
      - update the Location Black List according to the received information elements Location Black List indicator and Location Area Identification (i.e. the same as that included in the GA-RC REGISTER REQUEST message) and not initiate a new Register Request from the locations indicated by the updated Location Black List, until they are removed from the Location Black List i.e. as a result of power-cycle.

    - 'IMSI not allowed'
      - release the TCP connection established to the GANC, if still established.
      - release the secure connection towards the SEGW associated with the GANC, as defined in sub-clause 4.5
      - not initiate a new GAN Registration procedure until the next power-on.

    - 'Invalid GANC' or 'Unspecified'
      - release the TCP connection established to the GANC, if still established.
      - release the secure connection towards the SEGW associated with the GANC, as defined in sub-clause 4.5
      - act as defined in sub-clause 6.2.4.5

    - 'Geo Location not known'
      - release the TCP connection established to the GANC, if still established.
      - release the secure connection towards the SEGW associated with the GANC, as defined in sub-clause 4.5
      - not retry registration from this AP until the location is provided or until the next power-on.

The MS shall also:

- Update the stored Serving GANC table as follows if the received Reject cause was not 'Network Congestion' or 'Geo Location not known':

    - If the MS is in GERAN/UTRAN/E-UTRAN coverage it shall remove information related to the current GSM CGI, UTRAN cell identity or E-UTRAN cell identity, if it exists in the table.

- If the MS is not in GERAN/UTRAN/E-UTRAN coverage it shall remove information related to the AP-ID, if exists in the table.

6.2.4 Abnormal cases

6.2.4.1 TU3904 expiry

If timer TU3904 expires in the MS, the MS shall:

- release the TCP connection towards the GANC,

- release the secure connection towards SEGW of the GANC as defined in sub-clause 4.5,

- If GAN registration is unsuccessful after a number of attempts defined by the MS parameter "Up Register Max Retries" (defined in sub-clause 12.2.3), the MS shall act as defined in sub-clause 6.2.4.5.

- Otherwise, if GAN Registration can be re-attempted according to the MS parameter "Up Register Max Retries", start timer TU3905 and wait for it to expire.

6.2.4.2 Lower layer failure in the MS

Lower layer failure in the MS can be for example related to DNS, IPsec or TCP. If any lower layer failure happens in the MS, the MS shall:

- release the TCP connection towards the current GANC, if established,

- Stop timer TU3904 if running,

- release the secure connection towards SEGW of the current GANC, if established, as defined in sub-clause 4.5, and

- If registration is still unsuccessful after a number of attempts defined by the MS parameter "Up Connect Attempt Count" (defined in sub-clause 12.2.3), the MS shall act as defined in sub-clause 6.2.4.5.

- otherwise, stop timer TU3907 if running and

- start timer TU3905 and wait for it to expire.

6.2.4.3 TU3905 expiry

If timer TU3905 has expired in the MS, the MS shall restart the Registration procedure as defined in sub-clause 6.2.1.

6.2.4.4 TU3907 expiry

If timer TU3907 expires in the MS, the MS shall:

- If GAN registration is unsuccessful after a number of attempts defined by the MS parameter "Up Register Max Retries" (defined in sub-clause 12.2.3), the MS shall act as if a "Lower layer failure in the MS" has occurred as defined in sub-clause 6.2.4.2

- else, if the TCP connection to the GANC is still established,

  - send a GA-RC REGISTER REQUEST that includes information elements as described in sub-clause 6.2.1 and

  - start timer TU3904

- else, restart the GAN Registration procedure towards the GANC as defined in sub-clause 6.2.1

6.2.4.5 Registration Failure

The MS shall;

- If the GANC selection is ongoing:

    - act on upper layer indications as follows;

    - If no more PLMNs/GANCs are available for GANC selection or the GANC selection is finished unsuccessfully;

        - stop all ongoing registration procedures;

        - release the TCP connection towards the current GANC, if established,

        - release the secure connection towards SEGW of the current GANC, if established, as defined in sub-clause 4.5

        - initiate registration towards the Default GANC as defined in sub-clause 6.2.1;

    - else if the GANC selection process indicates new PLMN/GANC selection:

        - initiate registration procedure towards the GANC associated with the selected PLMN as defined in sub-clause 6.2.

- else if the MS attempted the registration towards the Default GANC

    - delete the stored information about the Default GANC,

    - delete the contents of the stored Serving GANC table

    - Increment Redirection Counter

    - initiate Discovery Procedure as defined in sub-clause 5.3

- else if the MS attempted the registration towards current GANC is a Serving GANC

    - Update the stored Serving GANC table as defined in the end of sub-clause 6.2.3.3 (i.e. delete information about this Serving GANC in the table) and

    - Increment Redirection Counter

    - initiate Registration Procedure towards the Default GANC as defined in sub-clause 6.2.1

6.2.4.6 GAN mode selection related failures

If no GAN Mode Indicator IE is included in the GA-RC REGISTER ACCEPT message or if the GAN Mode Indicator IE is included and indicates that the MS shall operate in GAN A/Gb mode, but the MS does not support GAN A/Gb mode, then the MS shall immediately initiate GAN deregistration per sub-clause 6.4.1 and then proceed according to the registration reject procedures defined for the case of 'Invalid GANC' in sub-clause 6.2.3.3.

If the GAN Mode Indicator IE is included in the GA-RC REGISTER ACCEPT message and indicates that the MS shall operate in GAN Iu mode, but the MS does not support GAN Iu mode, then the MS shall immediately initiate GAN deregistration per sub-clause 6.4.1 and then proceed according to the registration reject procedures defined for the case of 'Invalid GANC' in sub-clause 6.2.3.3.

6.3 Registration Update procedure

After the MS has successfully registered to a GANC, the MS shall update the GANC as a result of the conditions described in sub-clause 6.3.1: This update is performed using the Registration Update procedure.

The GANC may also use the Registration Update procedure towards the MS.
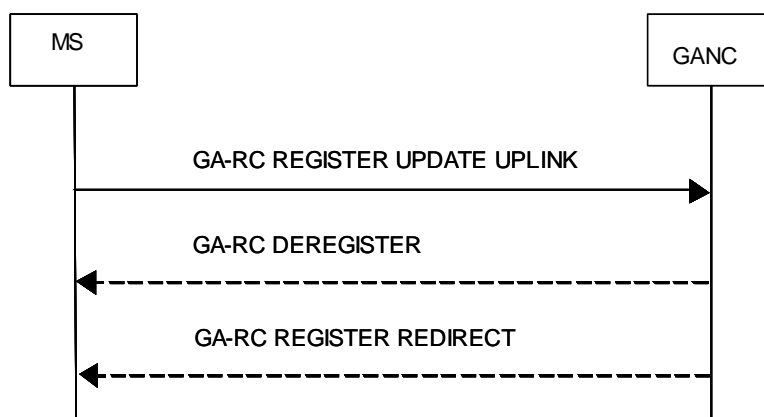
Figure 6.3.1: Registration Update procedure initiated by the MS
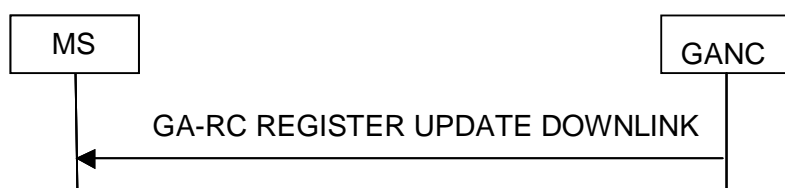
Figure 6.3.2: Registration Update procedure initiated by the network

6.3.1 Register Update initiation by the MS

MS initiates this procedure when it has registered successfully to GANC and any of the following occurs:

- The MS acquires GERAN/UTRAN/E-UTRAN coverage for the first time after reporting no coverage during its last GAN registration.

- An MS registered for GAN Iu mode establishes a new UTRAN serving cell as a result of Intra-RAT handover while in GERAN/UTRAN/E-UTRAN mode and the UARFCN of the new UTRAN serving cell is different from the UARFCN indicated during its last GAN Registration or GAN Registration Update.

- An MS registered for GAN Iu mode establishes a new serving cell as a result of Inter-RAT handover to UTRAN while in GERAN/UTRAN/E-UTRAN mode.

- An MS registered for GAN Iu mode enters connected mode in a UTRAN cell while in GERAN/UTRAN/E-UTRAN mode and the UARFCN of the serving UTRAN cell is different from the UARFCN indicated during its last GAN Registration/GAN Registration Update or a UARFCN was not provided during its last GAN Registration/GAN Registration Update.

- An MS operating in GERAN/UTRAN/E-UTRAN preferred mode and registered for GAN Iu mode enters dedicated/Packet Transfer mode in a GERAN cell while in GERAN/UTRAN/E-UTRAN mode and the GERAN serving cell is different from the one indicated during its last GAN Registration/GAN Registration Update.

- An MS operating in GERAN/UTRAN/E-UTRAN preferred mode and registered for GAN A/Gb mode establishes a new GERAN serving cell as a result of Intra-RAT/inter-RAT handover while in GERAN/UTRAN/E-UTRAN mode.

- An MS operating in GERAN/UTRAN/E-UTRAN preferred mode and registered for GAN A/Gb mode establishes a new UTRAN serving cell as a result of intra-RAT/inter-RAT handover while in GERAN/UTRAN/E-UTRAN mode.

- An MS operating in GERAN/UTRAN/E-UTRAN preferred mode and registered for GAN A/Gb mode enters dedicated/Packet Transfer mode in a GERAN cell, or enters connected mode in a UTRAN cell or enters connected mode in a E-UTRAN cell while in GERAN/UTRAN/E-UTRAN mode and the GERAN/UTRAN/E-UTRAN serving cell is different from the one indicated during its last GAN Registration/GAN Registration Update.

- Changes to the generic IP access network point of attachment (i.e. a new radio link is established).

- When the mobile station requires a change to the list of GAN services previously requested within the Required GAN Services IE of a GAN Registration.

The MS shall:

- send a GA-RC REGISTER UPDATE UPLINK message to the GANC on the established TCP connection and include the changed information in the message.

6.3.2   Register Update processing by the network

When receiving the GA-RC REGISTER UPDATE UPLINK message, the network may either accept or reject the Registration Update. The network may also redirect the MS to another GANC.

6.3.2.1   Register Update Accepted

If the network accepts the Registration Update, no message is returned to the MS.

6.3.2.2   Register Update Rejected

If the network rejects the Registration Update, it shall send the GA-RC DEREGISTER message to the MS. This message shall contain the Register Reject Cause information element.

6.3.2.3   Register Update results in redirection

If the network decides to redirect the MS to another GANC, it shall send the GA-RC REGISTER REDIRECT message to the MS. This message shall contain valid information about another GANC, so that the MS is able to initiate the Registration procedure towards that GANC.

The GANC can send the GA-RC REGISTER REDIRECT message at any time, but it shall not be sent to an MS in GA-CSR-DEDICATED or GA-PSR-ACTIVE state.

6.3.3   Register Update Response handling in the MS

6.3.3.1   Register Update Rejected

When the MS receives the GA-RC DEREGISTER message, it shall act as defined in sub-clause 6.4.4 "Reception of GA-RC DEREGISTER by MS".

6.3.3.2   Register Update results in redirection

When the MS receives GA-RC REGISTER REDIRECT message, it shall act as defined in sub-clause 6.2.3.2 "Registration redirected".

6.3.4   Register Update initiation by the network

The network may at any time send the GA-RC REGISTER UPDATE DOWNLINK message to a MS that is registered. This could happen e.g. because of change in the GANC System Information. The network may include all information in this message (i.e. not necessarily only the changed information).

6.3.5   Register Update handling in the MS

When the MS receives GA-RC REGISTER UPDATE DOWNLINK message, it shall process the received information elements as defined in sub-clause 6.2.3.1.

6.4 MS deregistration

The MS should attempt to perform deregistration procedure before leaving the AP. Optionally, the network could also initiate deregistration of a MS.
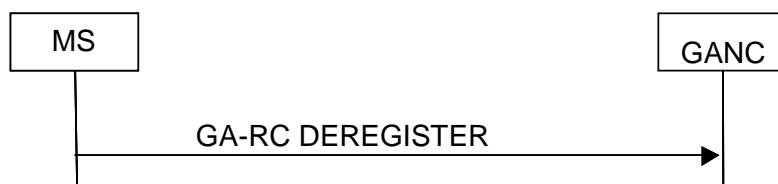
Figure 6.4.1: Deregistration procedure initiated by the MS

Figure 6.4.2: Deregistration procedure initiated by the network

6.4.1 Deregistration initiated by the MS

When the MS is leaving or about to leave the GAN coverage and the MS has successfully registered with a GANC, it should:

- send the GA-RC DEREGISTER message (with Register Reject Cause = Unspecified) using the currently established TCP-connection,

- release the TCP connection towards the GANC,

- release the secure connection towards the SEGW, as defined in sub-clause 4.5 and

- release all resources related to GAN

6.4.2 Reception of GA-RC DEREGISTER by GANC

When the network receives the GA-RC DEREGISTER message, it shall release all resources associated with the MS.

6.4.3 Deregistration initiated by the network

The GANC may at any time initiate the deregistration of a successfully registered MS by sending the GA-RC DEREGISTER message to the MS. When the GA-RC layer in the network has submitted the GA-RC DEREGISTER message to the TCP layer, it may initiate release of its half of the bidirectional TCP connection.

6.4.4 Reception of GA-RC DEREGISTER by MS

When the MS receives the GA-RC DEREGISTER message, it shall:

- if the MS is in the process of PLMN selection;

  - ignore the received Register Reject Cause Information Element, and

  - proceed as defined in sub-clause 6.2.4.5.

- else extract the Reject Cause information element and act as following depending on the value of the Reject Cause IE:

- 'Network Congestion'

    - release all local GAN resources (e.g. MS is in active call over GAN)

    - release the TCP connection towards the current GANC and

    - release the secure connection towards the GANC-SEGW, as defined in sub-clause 4.5

    - create a random value between zero and the received value in IE "TU3907 Timer" and

    - add this value to the received value in IE "TU3907 Timer", and use this as the new value for TU3907

    - start timer TU3907 according to the new calculated value

- 'AP not allowed'

    - release the TCP connection established to the GANC, if still established,

    - release the secure connection towards the SEGW associated with the GANC, as defined in sub-clause 4.5,

    - store the AP-ID in the AP Black List of and not initiate a new Register Request from this AP, until the AP-ID is removed from the AP black list i.e. as a result of power-cycle.

- 'Location not allowed'

    - release the TCP connection established to the GANC, if still established,

    - release the secure connection towards the SEGW associated with the GANC, as defined in sub-clause 4.5,

    - update the Location Black List according to the received information elements Location Black List indicator and Location Area Identification and not initiate a new Register Request from that Location, until the Location is removed from the Location Black List i.e. as a result of power-cycle.

- 'IMSI not allowed'

    - release the TCP connection established to the GANC, if still established.

    - release the secure connection towards the SEGW associated with the GANC as defined in sub-clause 4.5,

    - not initiate a new Registration procedure until the next power-on.

- 'Unspecified'

    - release the TCP connection established to the GANC, if still established.

    - release the secure connection towards the SEGW associated with the GANC as defined in sub-clause 4.5,

    - act as if a "Lower layer failure in the MS" has occurred as defined in sub-clause 6.2.4.2

- 'Invalid GANC'

    - release the TCP connection established to the GANC, if still established.

    - release the secure connection towards the SEGW associated with the GANC as defined in sub-clause 4.5,

    - act as defined in sub-clause 6.2.4.5 "Registration Failure"

- 'Geo Location not known'

    - release the TCP connection established to the GANC, if still established.

    - release the secure connection towards the SEGW associated with the GANC as defined in sub-clause 4.5,

    - not retry registration from this AP until the location is provided or until the next power-on.

The MS shall also,

- Update the stored Serving GANC table as following if the received Reject cause was not 'Network Congestion' or 'Geo Location not known'

- If the MS is in GERAN/UTRAN/E-UTRAN coverage

  - Remove information related to the current GSM CGI, UTRAN cell identity or E-UTRAN cell identity, if exists in the table

- If the MS is not in GERAN/UTRAN/E-UTRAN coverage

  - Remove information related to the AP-ID, if exists in the table.

6.5 Keep alive mechanism and TU3906 handling

When the MS receives the GA-RC REGISTER ACCEPT message, it shall initiate the GA-RC Keep Alive -mechanism by starting timer TU3906 using the TU3906 Timer value received in that message.

When timer TU3906 expires in the MS, the MS shall send the GA-RC KEEP ALIVE -message to the GANC and start timer TU3906.

If the MS releases the TCP connection (e.g. because of receiving GA-RC REGISTER REDIRECT, GA-RC REGISTER REJECT and GA-RC DEREGISTER message), then it shall stop timer TU3906.
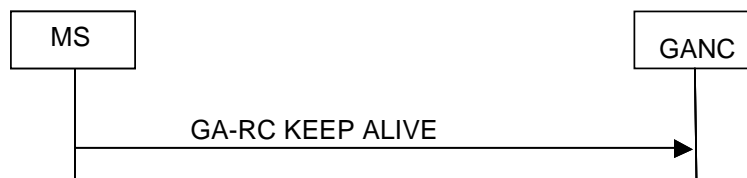
Figure 6.5.1: Keep Alive procedure

If the MS detects, that it is not able to send the GA-RC KEEP ALIVE message to the network due to lower layer failure, it shall act according to sub-clause 9.5.

6.6 MS Initiated Synchronization after TCP connection reestablishment

When MS receives TCP RST after TCP connection failure, it shall try to re-establish the signalling connection using GA-RC Synchronization procedure. The following message flow depicts the messages associated with this procedure:

Figure 6.6.1 MS initiated synchronization procedure

6.6.1 Initiation of the Synchronization Procedure by the MS

When MS receives TCP RST indicating a TCP connection failure, it shall attempt to re-establish TCP connection once. After successfully re-establishing TCP connection, the MS shall send GA-RC SYNCHRONIZATION INFORMATION to the GANC to synchronize the state information. If TCP connection re-establishment is unsuccessful, the MS shall release the related local GA-CSR and GA-PSR resources (if the MS is operating in GAN A/Gb mode) or GA-RRC resources (if the MS is operating in GAN Iu mode), and continue as per section 9.5 as if a TCP failure other than TCP RST has occurred.

6.6.2 Processing of the Synchronization Information message by the GANC

Upon receiving the GA-RC SYNCHRONIZATION INFORMATION message from the MS, the GANC updates the MS state information as specified in the request.

Moreover, the GANC should verify that the binding (IMSI, inner IP address) as received in the GA-RC SYNCHRONIZATION INFORMATION is the same as the one that the MS used as identity for authentication to the GANC-SEGW.

6.7 Transmission of Cell Broadcast Information

If the GANC has previously received the indication that the mobile station requires to receives the CBS, the GANC may pass the GA-RC CELL BROADCAST INFO message to a mobile station including one or more pages of Cell Broadcast messages.

Figure 6.7.1: Transmission of Cell Broadcast Information by the network

7 GA-CSR elementary procedures

7.1 GA-CSR Connection establishment

The GA-CSR connection is a logical connection between the MS and the GANC. It is established when the upper layers in the MS request GA-CSR to enter dedicated mode. The MS initiates GA-CSR connection establishment by sending the GA-CSR REQUEST message to the network. When a successful response is received from the network, GA-CSR replies to the upper layer that it has entered dedicated mode. The upper layers have then the possibility to request transmission of messages to the network. These messages are sent to the network using GA-CSR UPLINK DIRECT TRANSFER messages as defined in sub-clause 7.2.1.

Note that in the case of a network-initiated CS session, the GA-CSR connection is implicitly established when the MS responds to the GA-CSR PAGING REQUEST message from the GANC with the GA-CSR PAGING RESPONSE message (see sub-clause 7.3).

Also, in the case of CS handover from GERAN or UTRAN to GAN A/Gb mode, the GA-CSR connection is implicitly established when the MS sends the GA-CSR HANDOVER ACCESS message to the GANC (see sub-clause 7.7).

Two service access points are defined which are discriminated by their Service Access Point Identifiers (SAPI):

SAPI 0:   supports the transfer of signalling information including user-user information;

SAPI 3:   supports the transfer of user short messages.
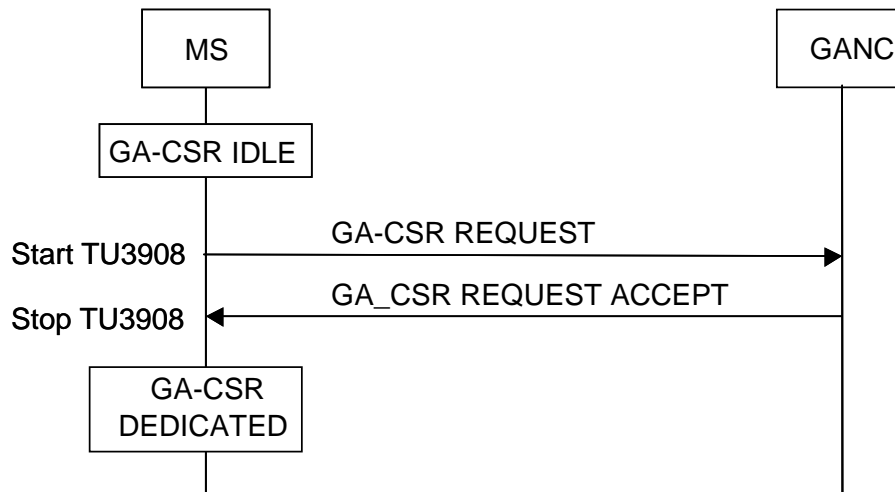
Figure 7.1.1 Initiation of GA-CSR connection, successful case
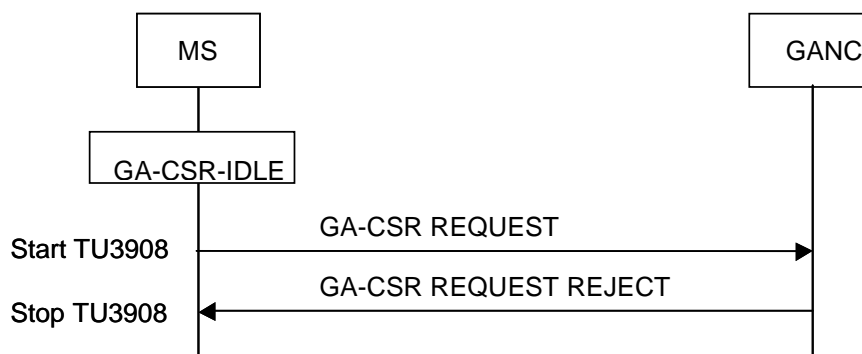
Figure 7.1.2 Initiation of GA-CSR connection, failure case

7.1.1 Initiation of GA-CSR connection establishment by the MS

The MS initiates the establishment of the GA-CSR connection when the upper layers request the GA-CSR to enter dedicated state.

Before initiation of GA-CSR connection establishment request, the MS shall check for access permission based on Access Control Class bits returned within GA-RC REGISTER ACCEPT message as defined in [12].

If it is allowed for the MS to access the network, it shall send a GA-CSR REQUEST message to the GANC on the established TCP connection and include the Establishment Cause IE and start timer TU3908

7.1.2 Reception of GA-CSR REQUEST by GANC

When GANC receives GA-CSR REQUEST message, the GANC may either accept or reject the GA-CSR connection establishment request.

7.1.2.1 GA-CSR connection establishment request accepted

If the GANC accepts the GA-CSR connection establishment request, it shall send the GA-CSR REQUEST ACCEPT message to the MS.

7.1.2.2 GA-CSR connection establishment request rejected

If the GANC rejects the GA-CSR connection establishment request, it shall send the GA-CSR REQUEST REJECT message to the MS.

7.1.3 GA-CSR connection establishment response handling in the MS

7.1.3.1 GA-CSR connection establishment request accepted

When the MS receives the GA-CSR REQUEST ACCEPT message, it shall:

- if timer TU3908 is active:

    - stop timer TU3908,

    - move into GA-CSR-DEDICATED state,

    - indicate to upper layers that GA-CSR has entered dedicated state and

    - send the initial GA-CSR UPLINK DIRECT TRANSFER message to the network

- if timer TU3908 is not active:

    - ignore the GA-CSR REQUEST ACCEPT message and

    - continue with any ongoing procedure as if the GA-CSR REQUEST ACCEPT message was not received

7.1.3.2 GA-CSR connection establishment request rejected

When the MS receives the GA-CSR REQUEST REJECT message, it shall:

- if timer TU3908 is active:

    - stop timer TU3908,

    - remain in GA-CSR-IDLE state and

    - indicate to upper layers that GA-CSR was not able to enter dedicated state

- if timer TU3908 is not active:

    - ignore the GA-CSR REQUEST REJECT message and

    - continue with any ongoing procedure as if the GA-CSR REQUEST REJECT message was not received

7.1.4 Failure cases

7.1.4.1 Timer TU3908 expiry

If timer TU3908 expires in the MS, the MS shall remain in GA-CSR-IDLE state and indicate to upper layers that GA-CSR was not able to enter dedicated state

7.2 Upper layer message transmission

The GA-CSR UPLINK DIRECT TRANSFER message is used for the transfer of upper layer messages from the MS to the GANC while the GA-CSR DOWNLINK DIRECT TRANSFER message is used for the transfer of upper layer messages from the GANC to the MS. The first GA-CSR UPLINK DIRECT TRANSFER message received by the GANC triggers the establishment of the signalling connection to the CN for that MS.

7.2.1 Upper layer message forwarding by the MS
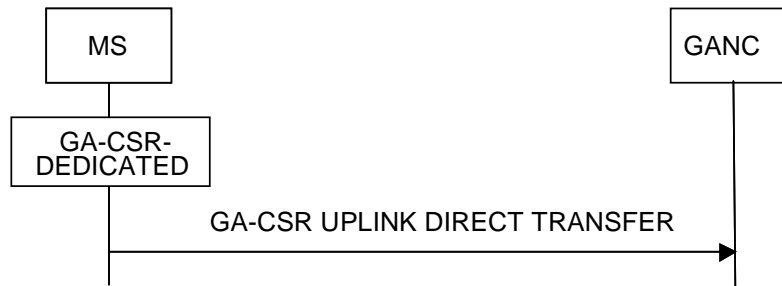
Figure 7.2.1.1 Uplink Direct Transfer, normal flow

The MS shall initiate the Uplink Direct Transfer procedure in GA-CSR-DEDICATED state when the upper layers request a transfer of a non-access stratum message.

The MS shall include the contents of the received upper layer message in the IE "L3 Message" and set the SAPI used in the IE "SAPI ID".

7.2.2 Reception of GA-CSR UPLINK DIRECT TRANSFER by GANC

When the GANC receives GA-CSR UPLINK DIRECT TRANSFER message from an MS in GA-CSR-DEDICATED state for which there is no signalling connection to the core network (i.e. this is the first GA-CSR UPLINK DIRECT TRANSFER after GA-CSR Connection establishment) the GANC should trigger the normal A-interface procedures towards the Core network to establish a signalling connection. GANC should transfer the contents of the IE "L3 Message" to the CN. The GANC should transfer the contents of the IE "SAPI ID" to the CN.

7.2.3 Upper layer message forwarding by the GANC

Figure 7.2.3.1 Downlink Direct Transfer, normal flow

The Downlink Direct Transfer procedure is initiated by the GANC, when the GANC receives a request from the upper layers to transfer a non-access stratum message, after the establishment of the GA-CSR connection to the MS.

On receiving a request from the upper layers the GANC should include the contents of the upper layer message in the IE "L3 Message".

7.2.4 Reception of GA-CSR DOWNLINK DIRECT TRANSFER by the MS

When the MS receives the GA-CSR DOWNLINK DIRECT TRANSFER message it shall forward the contents of the message to the upper layers.

7.2.4.1 Invalid GA-CSR DOWNLINK DIRECT TRANSFER

If the MS receives a GA-CSR DOWNLINK DIRECT TRANSFER message and MS is not in GA-CSR-DEDICATED state, the MS shall:

- ignore the contents of the GA-CSR DOWNLINK DIRECT TRANSFER message;

- transmit a GA-CSR STATUS message as follows:

    - set the IE "RR Cause" to "Message type not compatible with protocol state"

    - include the received message contents in the IE "PDU in error"

- continue with any ongoing procedure and act as if the GA-CSR DOWNLINK DIRECT TRANSFER message was not received.

7.3 Paging for CS domain
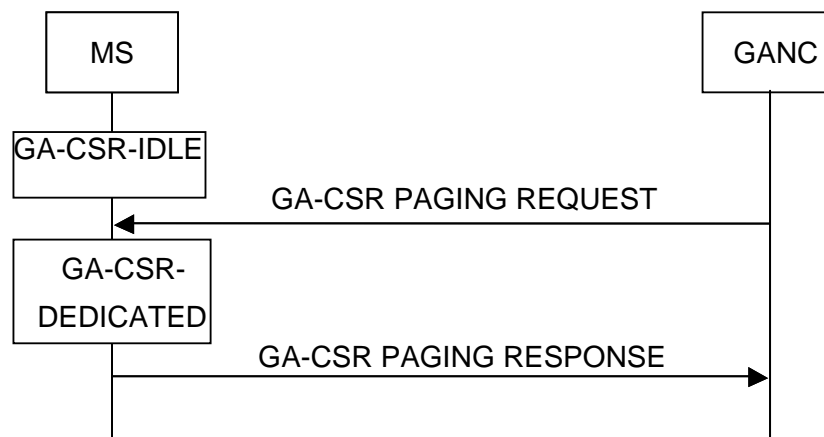
Figure 7.3.1 Paging, normal flow

7.3.1 Initiation of Paging

The GANC initiates this procedure when it receives a PAGING REQUEST message over the A-interface or a Paging CS message over the Gb-interface. The MS to be paged is identified by the identity received in the request from the CN. If the request includes the TMSI then the GANC should include the TMSI as the mobile identity else it should include the IMSI received in the request.

7.3.2 Reception of GA-CSR PAGING REQUEST by the MS

If the mobile identity in the GA-CSR PAGING REQUEST message matches any of the valid identities of the MS and the MS is in GA-CSR-IDLE state, the MS shall:

- if timer TU3908 is not active and access to the network is allowed;

    - send a GA-CSR PAGING RESPONSE message to the GANC and

    - enter GA-CSR-DEDICATED state.

- if timer TU3908 is active;

- discard the received GA-CSR PAGING REQUEST message.

7.3.3 Reception of GA-CSR PAGING RESPONSE by the GANC

On receiving the GA-CSR PAGING RESPONSE message the GANC should establish the signalling connection to the MSC and forward the contents of the GA-CSR PAGING RESPONSE message to the MSC.

7.3.4 Abnormal Cases

If the MS receives a GA-CSR PAGING REQUEST message and MS is in GA-CSR-DEDICATED state or GA-RC-REGISTERED state, the MS shall:

- ignore the GA-CSR PAGING REQUEST message

- continue with any ongoing procedure as if the GA-CSR PAGING REQUEST was not received.

If the MS receives a GA-CSR PAGING REQUEST and the mobile identity included in the message does not match any of the valid identities assigned to the MS, the MS shall:

- ignore the GA-CSR PAGING REQUEST message

- continue with any ongoing procedure as if the GA-CSR PAGING REQUEST message was not received.

7.4 Traffic Channel assignment
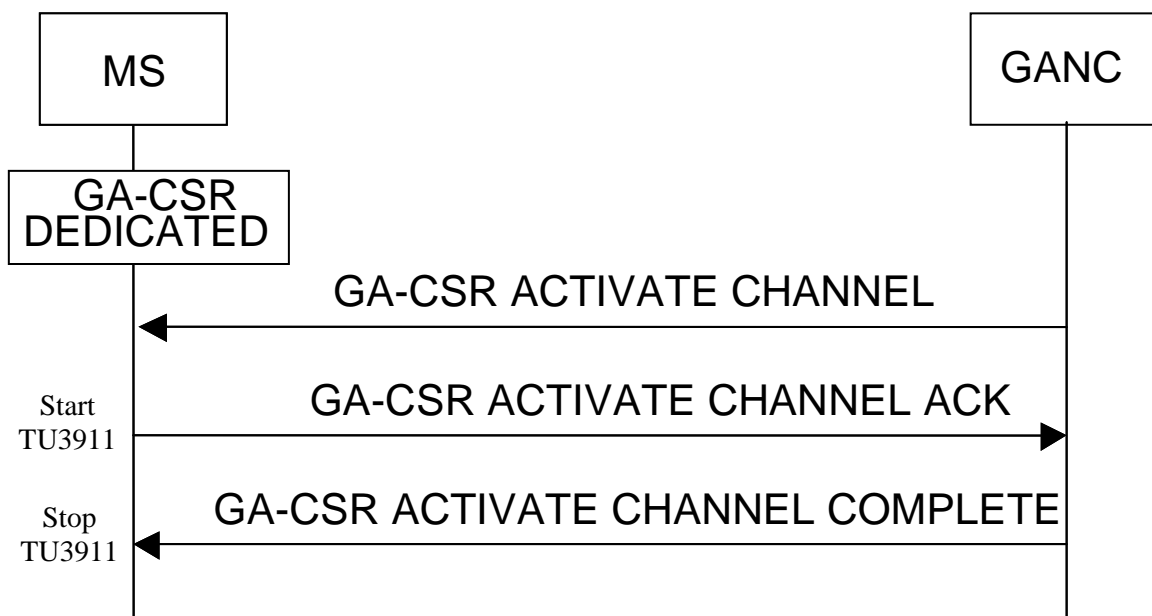
Figure 7.4.1 Channel Activation, successful case

7.4.1 Initiation of Channel Assignment

The GANC configures a traffic channel by transmitting the GA-CSR ACTIVATE CHANNEL message on receiving an Assignment Request from the MSC. The GA-CSR ACTIVATE CHANNEL message can be sent to the MS only in GA-CSR-DEDICATED state. The Channel Assignment procedure is always activated by the network.

7.4.2 Reception of GA-CSR ACTIVATE CHANNEL by MS

The MS shall act on the received GA-CSR ACTIVATE CHANNEL message when in GA-CSR-DEDICATED state as follows:

- Code and decode the CS payload samples according to the IE "Channel Mode";

- If the IE "Bandwidth-efficient Mode Indicator" is received, use the RFC 4867 [48] bandwidth-efficient payload format to code and decode the CS payload samples; otherwise, use the RFC 4867 [48] octet-aligned payload format.

- Use the value indicated by the IE "Sample Size" as the minimum sampling size for the coding and decoding of the CS payload samples, if the MS is not able to use the indicated value. If AMR is used with FEC by sending

redundant frames, the sample size is defined as the size of the new speech sample in each RTP packet, not including any redundant speech sample.

- Configure the uplink CS payload stream to be transmitted to the UDP port identified by the IE "UDP Port";

- Configure the uplink CS payload stream to be transmitted to the IP address identified by the IE "IP address";

- If received, use the configuration included in the IE 'Multi-rate Configuration' for the CS payload stream;

- If received, use the configuration included in the IE "RTP Redundancy Configuration" for the CS payload stream. The redundancy policy is defined for each of the AMR modes to use. The level of redundancy can span from no redundancy to double redundancy. In the same active codec set, a lower codec mode shall not be associated with a lower redundancy level then a higher codec mode. For example, the highest mode in the set is used with no redundancy, the next lower with single redundancy and rest of the modes with double redundancy;

- If received, use the Payload Type included in the IE 'Payload Type' for the PT field in the RTP header for the CS downlink and uplink payload streams;

On successful configuration of the channel, the MS shall:

- Start timer TU3911.

- Transmit a GA-CSR ACTIVATE CHANNEL ACK message and include the UDP port number in the IE 'UDP Port" for the downlink CS payload stream to be used by the GANC.

- Include the selected RTP sample size, to be used uplink and downlink, in the IE Sample Size.

- if the IE 'RTCP UDP Port' was received in the GA-CSR ACTIVATE CHANNEL message and the MS is capable of supporting RTCP, activate the uplink RTCP stream and include the IE 'RTCP UDP Port' for the downlink RTCP stream to be used by the GANC.

7.4.3 Reception of GA-CSR ACTIVATE CHANNEL ACK by GANC

If the call uses a TDM-based A-interface: The GANC shall configure itself for transmission of RTP packets to the MS to the indicated UDP port and RTCP packets to the MS, if the IE 'RTCP UDP Port' is included by the MS, and transmit a GA-CSR ACTIVATE CHANNEL COMPLETE message to the MS.

If the call uses a TDM-based A-interface: To enable downlink quality measurements in the MS, the GANC shall send at least one RTP frame each 480 ms. During periods of discontinuous transmission (DTX), each RTP frame transmitted by the GANC shall bear a format in the AMR payload Table of Contents that either (a) omits all NO_DATA indications and contains only the next AMR speech or SID frame that is available, or (b) includes a single NO_DATA frame should no AMR speech or SID frame become available for 480 ms. The RTP timestamp shall indicate the time of that speech or SID or NO_DATA frame. See Section A.1.2 of Annex A for examples of the RFC 4867 [48] octet-aligned payload format.

If the call uses a IP-based A-interface: The GANC sends a GA-CSR ACTIVATE CHANNEL COMPLETE message to the UE.

7.4.4 Reception of GA-CSR ACTIVATE CHANNEL COMPLETE by MS

The RTP channel is available for use by upper layers. To enable uplink quality measurements in the GANC, the MS shall send at least one RTP frame each 480 ms. During periods of discontinuous transmission (DTX), each RTP frame transmitted by the MS shall bear a format in the AMR payload Table of Contents that either (a) omits all NO_DATA indications and contains only the next AMR speech or SID frame that is available, or (b) includes a single NO_DATA frame should no AMR speech or SID frame become available for 480 ms. The RTP timestamp shall indicate the time of that speech or SID or NO_DATA frame. See Section A.1.2 of Annex A for examples of the RFC 4867 [48] octet-aligned payload format.

 Stop timer TU3911.

7.4.5 Failure to establish channel by MS

If the MS fails to establish the channel indicated in the GA-CSR ACTIVATE CHANNEL message or timer TU3911 expires the MS shall:

- transmit a GA-CSR ACTIVATE CHANNEL FAILURE message;

- act as if the GA-CSR ACTIVATE CHANNEL message was not received.

7.5 Release of GA-CSR

7.5.1 Initiation of GA-CSR connection release by MS

If the MS needs to release the GA-CSR connection and signalling connection to the core network, it shall send the GA-CSR CLEAR REQUEST message to the GANC and start timer TU3909. The MS shall include the 'RR Cause' IE.

Figure 7.5.1.1 Initiation of GA-CSR connection release by MS

7.5.2 Reception of GA-CSR CLEAR REQUEST by GANC

The GANC will request core network to initiate the procedure to release of dedicated resources.

7.5.3 Initiation of GA-CSR connection release by GANC
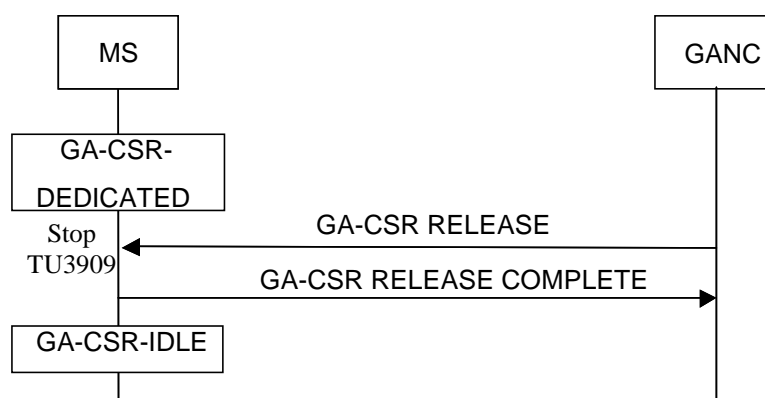
Figure 7.5.3.1 Initiation of GA-CSR connection release by network

The GANC initiates this procedure to command the MS to release the GA-CSR and any traffic channel resources and instruct the MS to leave GA-CSR-DEDICATED state.

The GA-CSR RELEASE message will include an RR cause indication as follows:

    #0:   normal release, e.g. at the end of a call.

#1: unspecified abnormal release.

#65: if e.g. a handover procedure is stopped because the call has been cleared.

7.5.4 Reception of GA-CSR RELEASE by MS

When the MS receives the GA-CSR RELEASE message, it shall:

- transmit a GA-CSR RELEASE COMPLETE message to the GANC and release all GA-CSR and any traffic channel resources,

- stop timer TU3909 (if running), and

- enter GA-CSR-IDLE state.

A mobile station not supporting "GPRS" shall consider the IE "GPRS Resumption" as unknown in the GA-CSR RELEASE message and perform the GA-CSR Release procedure as normal.

For a MS supporting the "GPRS" option:

- if the GA-CSR RELEASE message includes the IE "GPRS Resumption":

  - if the GPRS Resumption information element indicates that the network has resumed GPRS services, the GA-CSR sub-layer of the mobile station shall indicate a GA-CSR GPRS resumption complete to the MM sub-layer.

  - if the GPRS Resumption information element indicates that the network has not successfully resumed GPRS services, the GA-CSR sub-layer of the mobile station shall indicate a GPRS resumption failure to the MM sub-layer.

- if the mobile station has performed the GPRS suspension procedure (sub-clause 8.10) and the GPRS Resumption information element is not included in the message, the GA-CSR sub-layer of the mobile station shall indicate a GPRS resumption failure to the MM sub-layer.

- if the mobile station has not performed the GPRS suspension procedure and the GPRS Resumption information element is not included in the message, the mobile station shall perform the channel release procedure as normal

7.5.5 Failure cases

7.5.5.1 Timer TU3909 expiry

If timer TU3909 expires in the MS, the MS shall release all GA-CSR and any traffic channel resources and enter GA-CSR-IDLE state.

7.6 Classmark Indication

7.6.1 Initiation of classmark interrogation by GANC
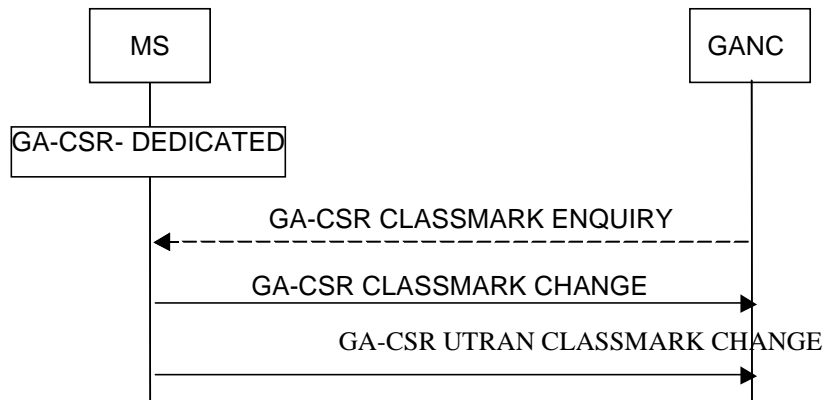
Figure 7.6.1.1 Classmark change

The GANC initiates the classmark interrogation procedure by transmitting the GA-CSR CLASSMARK ENQUIRY message to the MS when it desires more information about the MS's capabilities. The GA-CSR CLASSMARK ENQUIRY message can be sent to a MS only in GA-CSR-DEDICATED state.

7.6.2 Transmission of classmark information by MS

On receipt of the GA-CSR CLASSMARK ENQUIRY message or in case of "early classmark sending" procedure based on the system information indication received in GA-RC REGISTER ACCEPT message, the mobile station sends a GA-CSR CLASSMARK CHANGE message to the GANC.

The MS shall include the IE "Mobile Classmark 2" in the GA-CSR CLASSMARK CHANGE message. It may also contain a IE "Mobile Classmark 3" depending on the MS capabilities.

In addition a MS supporting UTRAN sends a GA-CSR UTRAN CLASSMARK CHANGE message.

The Classmark Enquiry Mask information element in the GA-CSR CLASSMARK ENQUIRY message indicates the type of request. If the Classmark Enquiry Mask information element is not included in the GA-CSR CLASSMARK ENQUIRY message, this indicates a request for GA-CSR CLASSMARK CHANGE message.

In the "early classmark sending" case the GA-CSR UTRAN CLASSMARK CHANGE message shall not be sent by the MS if prohibited by the 3G Early Classmark Sending Restriction received as system information in GA-RC REGISTER ACCEPT message.

The GA-CSR UTRAN CLASSMARK CHANGE and GA-CSR CLASSMARK CHANGE message shall only be sent by a MS in GA-CSR-DEDICATED state

When an GA-CSR CLASSMARK CHANGE message and an GA-CSR UTRAN CLASSMARK CHANGE message are to be sent, the GA-CSR CLASSMARK CHANGE message shall be sent first.

7.7 CS handover to GAN A/Gb mode
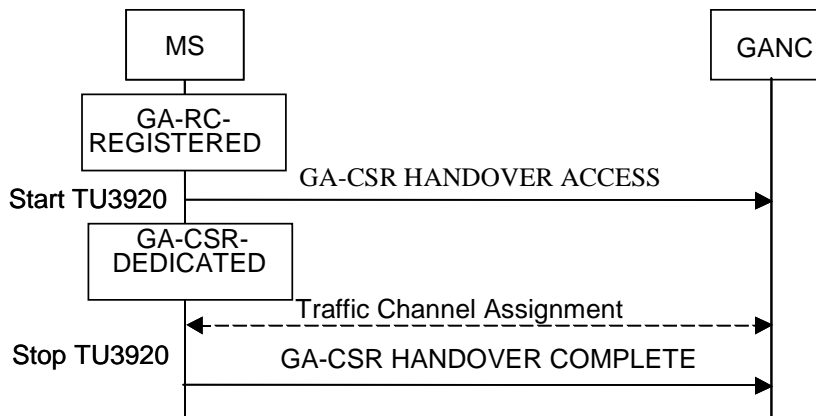
Figure 7.7.1: CS handover to GAN A/Gb mode, successful case 7.7.1 Initiation

The procedure is initiated when the source radio access technology (e.g. GERAN) orders the MS to make CS handover to GAN A/Gb mode.

The procedure is applicable in GA-RC-REGISTERED state provided the conditions described in Annex C.1: "(Source-RAT) Measurement Report for Handover and Cell Change Order to GAN A/Gb mode" are met.

The handover order in the source radio access technology mode is sent via the (RR) HANDOVER COMMAND message. If the ARFCN and BSIC parameters included in the Cell Description IE in the (RR) HANDOVER COMMAND message (specified in [12]) match those of the GAN cell, the MS shall:

- send a GA-CSR HANDOVER ACCESS message to the network including the complete (RR) HANDOVER COMMAND message in the *Handover To GAN Command* IE and enter GA-CSR-DEDICATED state;

- NOTE: sending the complete (RR) HANDOVER COMMAND message in the *Handover To GAN Command* IE instead of the *Handover Reference* IE allows for more than 256 concurrent handover requests

- if non-signalling mode is indicated in *Channel Mode* IE, the MS shall:

  - start timer TU3920;

- otherwise, the MS shall:

  - immediately send a GA-CSR HANDOVER COMPLETE message to the network;

  - switch to GAN A/Gb mode; i.e. attach the GA-CSR entity to the RR-SAP.

7.7.2 Reception of GA-CSR HANDOVER ACCESS by the GANC

If non-signalling mode is indicated in the *Channel Mode* IE, the GANC shall initiate traffic channel assignment as specified in sub-clause 7.4.

7.7.3 Successful completion of the CS handover to GAN A/Gb mode

If the traffic channel assignment was successfully completed within timer TU3920, the MS shall:

- stop timer TU3920;

- send a GA-CSR HANDOVER COMPLETE message to the network;

- switch to GAN A/Gb mode; i.e. attach the GA-CSR entity to the RR-SAP.

In addition the MS shall send upper layer messages for which LAPDm has not yet received acknowledgement from the network to the network using the GA-CSR entity.

7.7.4 Reception of GA-CSR HANDOVER COMPLETE by the GANC

The GANC should indicate handover detection and completion to CN.

7.7.5 MS fails to complete requested handover

If the traffic channel assignment procedure fails or the timer TU3920 expires before traffic channel assignment is completed, the MS shall:

- terminate the procedure including release of the associated GA-CSR resources;

- resume the connection in the source radio access technology used before the handover;

- indicate the failure to the source radio access technology.

7.8 CS handover from GAN A/Gb mode
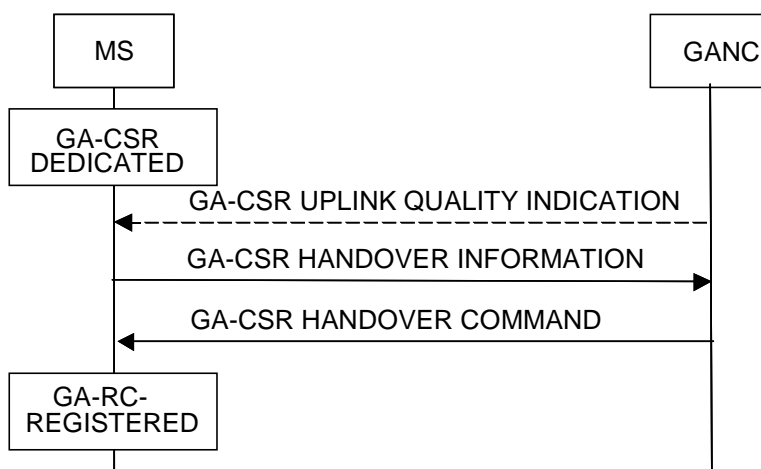
Figure 7.8.1: Handover from GAN, successful case
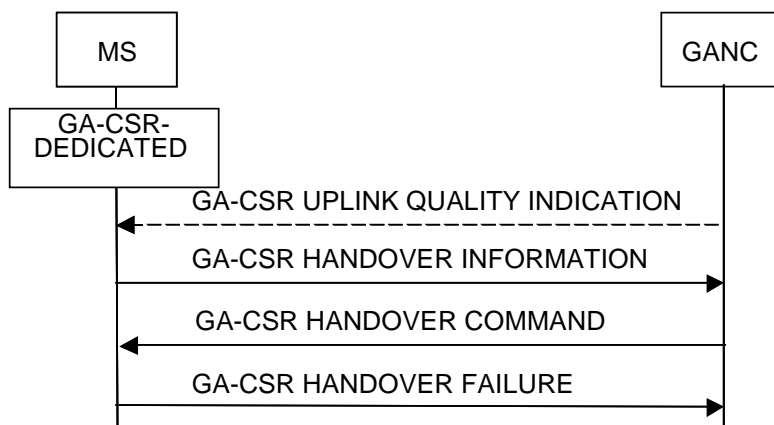
Figure 7.8.2: Handover from GAN, failure case

7.8.1 Initiation

The purpose of this procedure is to transfer, upon request from the MS (and under the control of the GAN), a connection between MS and GAN to another radio access technology (e.g. GERAN).

The procedure is applicable in GA-CSR-DEDICATED state.

The procedure may be initiated by the MS based on:

- local measurements of GAN coverage signal quality;

- reception of a GA-CSR UPLINK QUALITY INDICATION message indicating poor uplink quality in the *UL Quality Indication* IE; If the UL Quality Indication IE indicates "Network problem" a handover out to GERAN or UTRAN should be attempted. In case the UL Quality Indication information element shows "Radio problem" or "Undetermined problem" a search for a new access point should be done before the handover out is initiated;

- reception of RTCP packets indicating poor uplink quality;

- excessive loss or delay in the received RTP packets

When the MS decides to trigger the handover from GAN A/Gb mode, it shall:

- send a GA-CSR HANDOVER INFORMATION message to the network including a list of candidate/ target cell identifiers ranked in order of preference which is the most recent list available from the other radio access technology (e.g. GSM RR) and including the received signal strength for each identified GERAN or UTRAN cell. The MS may include GERAN cells, UTRAN cells or both, as permitted by the Handover Reporting Control IE (see sub-clause 11.2.113). If no Handover Reporting Control IE was included in the most recently received GA-RC REGISTER ACCEPT message, there is no restriction on the cells that may be listed.

7.8.2 Reception of GA-CSR HANDOVER INFORMATION by the GANC

The GANC should signal the need for handover to the CN.

If the CN grants the handover request, GANC should send a GA-CSR HANDOVER COMMAND message to the MS.

The GA-CSR HANDOVER COMMAND message should only indicate a target cell which was reported by the MS in the GA-CSR HANDOVER INFORMATION message.

7.8.3 Reception of GA-CSR HANDOVER COMMAND by the MS

The MS shall:

- suspend all NAS layer signalling transmissions;

- start the connection establishment to the target radio access technology (e.g. GERAN) by using the contents of the *Handover From GAN Command* IE. This message carries information about the candidate/ target cell identifier and radio parameters relevant for the target radio access technology;

A MS that is simultaneously operating in GPRS and CS modes over GAN shall follow the procedure as outlined in 3GPP TS 43.055 when it switches to target cell.

NOTE: The requirements concerning the establishment of the radio connection towards the target radio access technology (e.g. GERAN) and the signalling procedure are outside of the scope of this specification.

7.8.4 Successful completion of the CS handover from GAN A/Gb mode

Upon successfully completing the CS handover from GAN A/Gb mode, the GANC should:

- release all radio resources associated with the GAN connection.

Upon successfully completing the CS handover, the MS shall:

- switch to target radio access technology (e.g. GERAN) mode i.e. detach the GA-RR entity from the RR-SAP;

- enter GA-RC-REGISTERED state.

NOTE: The release of the GAN radio resources is initiated from the target RAT. The MS may deregister from the GANC (as defined in sub-clause 6.4) after successfully completing the handover. If the MS chooses to deregister from the GANC, it may do so either immediately after successfully completing the handover or after sending the GA-CSR RELEASE COMPLETE message to the GANC in response to the GA-CSR RELEASE message from the GANC.

7.8.5 MS fails to complete requested handover

If the MS does not succeed in establishing a connection to the target radio access technology, the MS shall:

- revert back to the GAN configuration;

- return a GA-CSR HANDOVER FAILURE message and resume normal operation as if the GA-CSR HANDOVER COMMAND message has not been received. The cause shall be set as specified in 3GPP TS 44.018.

7.8.6 Reception of GA-CSR HANDOVER FAILURE by the GANC

The GANC may initiate the release of resources in the target radio access technology.

7.8.7 Abnormal Cases

If the GA-CSR HANDOVER COMMAND message instructs the MS:

- to perform a non-supported scenario, or

- to use a non-supported configuration,

the MS shall return a GA-CSR HANDOVER FAILURE message with cause as defined in 3GPP TS 44.018 and resume normal operation as if the GA-CSR HANDOVER COMMAND message has not been received.

7.9 Ciphering configuration procedure

The ciphering configuration procedure is used by the network to set the ciphering mode, i.e. whether or not the transmission is ciphered, and if so which algorithm to use. This information is not used when the GA-CSR-layer is the serving entity in the MS, but shall be stored in the MS for possible future use after a handover from GAN during the same upper layer transaction (i.e. RR-layer becomes the serving entity during this upper layer transaction).

This procedure applies only for a MS in GA-CSR-DEDICATED state.

The procedure shall only be used to change from "not ciphered" mode to "ciphered" mode, or vice-versa, or to pass a GA-CSR CIPHERING MODE COMMAND message to the mobile station while remaining in the "not ciphered" mode. The ciphering mode setting procedure is always triggered by the network.
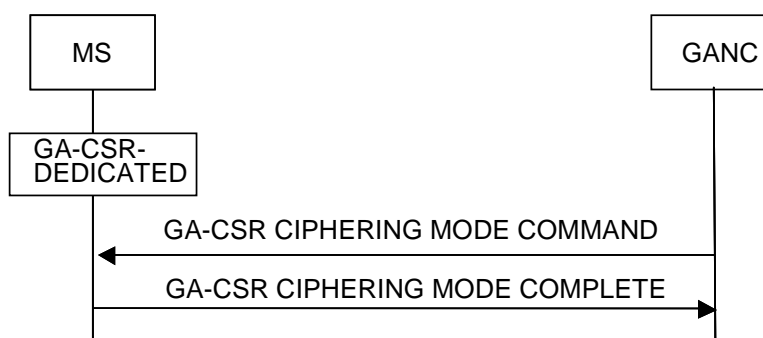
Figure 7.9.1 Ciphering configuration

7.9.1 Ciphering configuration initiation

The network initiates the ciphering mode setting procedure by sending a GA-CSR CIPHERING MODE COMMAND message to the mobile station, indicating whether ciphering shall be used or not, and if yes which algorithm to use.

Additionally, the network may, by the use of the cipher response information element, request the mobile station to include its IMEISV in the GA-CSR CIPHERING MODE COMPLETE message.

7.9.2 Ciphering configuration completion

Whenever the mobile station receives a valid GA-CSR CIPHERING MODE COMMAND message, it shall, if a SIM is present and considered valid and the ciphering key sequence number stored on the SIM indicates that a ciphering key is available, save information about the ciphering key to use if the MS is later performing Handover from GAN. A valid GA-CSR CIPHERING MODE COMMAND message is defined to be one of the following:

- one that indicates "start ciphering" and is received by the mobile station in the "not ciphered" mode;

- one that indicates "no ciphering" and is received by the MS in the "not ciphered" mode; or

- one that indicates "no ciphering" and is received by the mobile station in the "ciphered" mode.

Other GA-CSR CIPHERING MODE COMMAND messages shall be regarded as erroneous, and a GA-CSR STATUS message with cause "Protocol error unspecified" shall be returned, and no further action taken.

The MS shall also calculate a MAC (Message Authentication Code). The MAC shall be calculated over the following data:

$$RAND \mid IMSI$$

using "HMAC-SHA1-96" algorithm, as specified in [24] with Kc as authentication key.

In the formulas above, the "|" character denotes concatenation. RAND is the 16-octet random number received from the GANC in the GA-CSR CIPHERING MODE COMMAND message. IMSI is the MS IMSI, in the same format as defined for the Mobile Identity IE as defined in [8] i.e. as a variable-length sequence of digits in BCD format (e.g. the IMSI "123456789098765" is encoded as the following octets (in hexadecimal): "21 43 65 87 09 89 67 F5"). Network byte order is used.

The Kc key is the Kc that has been derived during the last authentication. The length of the MAC is 12 octets.

When the appropriate action on the GA-CSR CIPHERING MODE COMMAND message has been taken, the mobile station sends back a GA-CSR CIPHERING MODE COMPLETE message. If the "cipher response" field of the cipher response information element in the GA-CSR CIPHERING MODE COMMAND message specified "IMEISV must be included" the mobile station shall include its IMEISV in the GA-CSR CIPHERING MODE COMPLETE message.

7.10 Channel mode modify procedure

In dedicated mode, the GANC can request a modification of the channel mode, multi-rate configuration, RTP redundancy configuration, sample size, GANC IP address, GANC RTP UDP port and GANC RTCP UDP port used for an active traffic channel.

The channel mode modify procedure allows the network to request the mobile station to modify configuration used for an active channel. The channel mode covers the coding, decoding and transcoding mode as well as the redundancy policy used on the active channel.

This procedure is always initiated by the network.
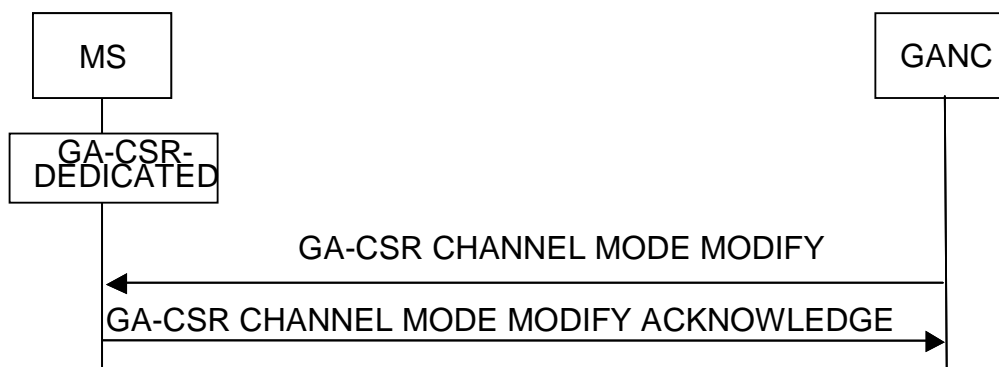
Figure 7.10.1 Channel mode modify

7.10.1 Normal channel mode modify procedure

7.10.1.1 Initiation of the channel mode modify procedure

The network initiates the procedure by sending a GA-CSR CHANNEL MODE MODIFY message to the mobile station.

7.10.1.2 Completion of channel mode modify procedure

When the MS has received the GA-CSR CHANNEL MODE MODIFY message, the mobile station modifies the configuration, sets the mode and/or the RTP redundancy configuration for the active channel and then replies by a GA-CSR CHANNEL MODE MODIFY ACKNOWLEDGE message indicating the ordered channel mode.

This applies whether the mode and/or redundancy policy commanded by the GA-CSR CHANNEL MODE MODIFY message is different from the one used by the mobile station or whether it is already in use.

When the MS has sent the GA-CSR CHANNEL MODE MODIFY ACKNOWLEDGE message, it shall start transmit RTP packets with the new size. Until RTP packets with the new sample size have been received, the MS should handle the reception of RTP packets with the old sample size. The MS shall also use changed configurations for all other parameters (channel mode, multi-rate configuration, RTP redundancy configuration, etc.) in uplink RTP frames immediately after sending GA-CSR CHANNEL MODE MODIFY ACKNOWLEDGE message. In the downlink direction, MS shall be able to receive RTP packets with the old parameters, until the first RTP packet using the new parameters is received.

The GANC shall only start using the new configuration in downlink RTP frames as of receiving GA-CSR CHANNEL MODE MODIFY ACKNOWLEDGE message. In the uplink direction, the GANC shall be able to receive RTP packets with the old parameters, until the first RTP packet using the new parameters is received.

7.10.1.3 Abnormal cases

If the GA-CSR CHANNEL MODE MODIFY message includes IE "RTP Redundancy Configuration" and MS has indicated that it does not support RTP Redundancy through the GAN Classmark, it shall ignore the IE "RTP Redundancy Configuration".

If the mobile station does not support the indicated channel mode or sample size modifications, it shall retain the old mode and return the used configuration in the GA-CSR CHANNEL MODE MODIFY ACKNOWLEDGE message.

8 GA-PSR elementary procedures

8.1 GA-PSR Transport Channel (GA-PSR TC) Overview

The GA-PSR Transport Channel is defined as a UDP based point to point GA-PSR connection between the MS and the GANC utilized for GPRS user data transfer. The life-time of the GA-PSR TC is controlled by the TU4001 timer. The duration of the TU4001 timer is provided to the MS as one of the GAN system parameters in the GA-RC REGISTER ACCEPT message. In the same way as other GAN system parameters, the GANC can update the TU4001 timer using the standard mechanism for GAN system parameters update. The MS shall store the TU4001 timer for future use and updates the value when requested.

8.2 MS Initiated GA-PSR Transport Channel (GA-PSR TC) Activation

The MS initiated GA-PSR TC activation is triggered by the uplink GPRS user data request when the GA-PSR is in the GA-PSR-STANDBY state. The following message flow depicts the messages and timers involved in this procedure:
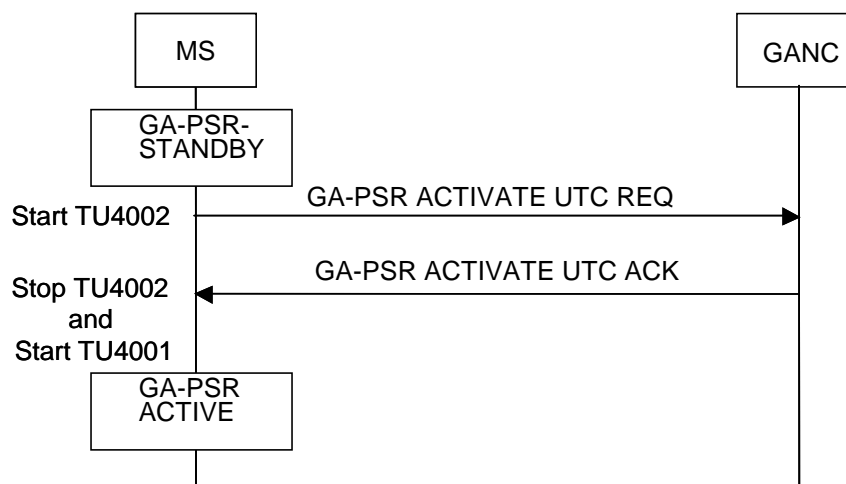
Figure 8.2.1: MS initiated GA-PSR TC Activation

8.2.1 Initiation of the GA-PSR TC Activation by the MS

Upon receiving the uplink user data transfer request from the LLC for LLC SAPI 3, 5, 9 or 11 and while the MS GA-PSR is in the GA-PSR-STANDBY state, the MS shall,

- send a GA-PSR-ACTIVATE-UTC-REQ message,

- start timer TU4002,

- set the uplink packet sequence number to 0,

- set the expected downlink packet sequence number to 0 and

8.2.2 Processing of the GA-PSR TC Activation Request by the GANC

Upon receiving the GA-PSR-ACTIVATE-UTC-REQ message from the MS, if the GANC accepts this request, it:

- allocates the IP address and the UDP port number to be used by the MS for GPRS user data transport,

- sends the GA-PSR-ACTIVATE-UTC-ACK message to the MS with the cause indicating successful activation,

- sets downlink packet sequence number to 0 and

- sets the expected uplink packet sequence number to 0.

8.2.3 Processing of the GA-PSR TC Activation Acknowledgment by the MS

Upon receiving the GA-PSR-ACTIVATE-UTC-ACK message while the MS initiated GA-PSR TC activation is in progress, the MS shall stop timer TU4002, create and store the corresponding GA-PSR TC information and the MS GA-PSR shall transition into GA-PSR-ACTIVE state. The MS GA-PSR shall start TU4001 timer and forward any outstanding uplink user data packets. The TU4001 timer is restarted whenever any user data packet is sent to or received from the GANC.

8.2.4 Abnormal Cases

8.2.4.1 GA-PSR TC Activation Collision

If the GANC receives a GA-PSR-ACTIVATE-UTC-REQ message from the MS while the network initiated GA-PSR TC activation procedure is in progress, the GANC aborts the network initiated activation procedure and responds to the

MS with the GA-PSR-ACTIVATE-UTC-ACK message including the cause indicating successful activation. The message includes GANC IP address and GANC UDP port to be used for the uplink GPRS user data transport.

If the MS receives a GA-PSR-ACTIVATE-UTC-REQ message from the GANC while the MS initiated GA-PSR TC activation procedure is in progress, the MS shall silently discard the request and wait for the acknowledgment related to the MS initiated activation already in progress.

8.2.4.2 Timer TU4002 Expires during GA-PSR TC Activation

If timer TU4002 expires in the MS, the MS shall remain in GA-PSR-STANDBY state and declare the procedure as failed to the upper layers.

8.2.4.3 GANC Receives Duplicate GA-PSR TC Activation Request

If the GANC receives a GA-PSR TC activation message from the MS with an active GA-PSR TC, it responds with the GA-PSR-ACTIVATE-UTC-ACK message to the MS and the cause indicates successful activation. The message includes GANC IP address and GANC UDP port allocated to the existing GA-PSR TC. In parallel, if the MS provided new UDP port number, the GANC updates the GA-PSR TC attributes accordingly.

After sending the GA-PSR-ACTIVATE-UTC-ACK message, the GANC

- sets the downlink packet sequence number to 0 and

- sets the expected uplink packet sequence number to 0

8.2.4.4 GANC Rejects GA-PSR TC Activation

If the GANC decides to reject GA-PSR TC activation, it shall send a GA-PSR-ACTIVATE-UTC-ACK message to the MS with the failure cause code and shall not include GANC IP address and UDP port number. The following rejection cause values are supported:

- "No available resources" indicates that the GANC failed to allocate required resources.

- "GANC failure" indicates internal GANC failure.

- "Not authorized for data service" indicates that the MS is not authorized to use data services via GAN.

Upon receiving the GA-PSR-ACTIVATE-UTC-ACK message indicating failure, the MS shall declare the procedure as failed to the upper layers.

8.2.4.5 MS Aborts GA-PSR TC Activation due to Lower Layer Failure

If a lower layer failure is detected while waiting for GA-PSR-ACTIVATE-UTC-ACK message, the MS shall declare the procedure as failed and send the corresponding indication to upper layers. Further, the MS shall act according to sub-clause 9.5.

8.3 Network Initiated GA-PSR Transport Channel (GA-PSR TC) Activation

The GANC initiated GA-PSR TC activation is triggered by the downlink GPRS user data request when the corresponding GA-PSR TC does not exist or as a result of PS handover from a GERAN/UTRAN cell to a GAN cell if PS handover is supported by the GANC. The following message flow depicts the messages and timers associated with this procedure:
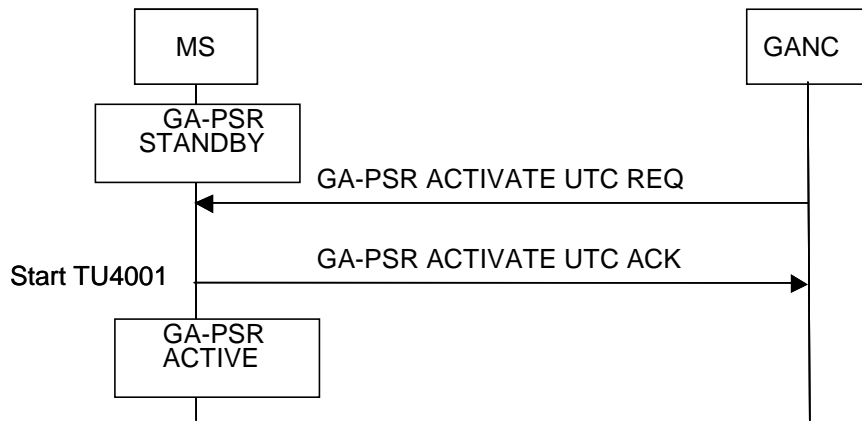
Figure 8.3.1: Network initiated GA-PSR TC Activation

8.3.1 Initiation of the GA-PSR TC Activation by the GANC

Upon receiving the downlink user data transfer request associated with LLC SAPI 3, 5, 9 or 11 and if there is no GA-PSR TC associated with the specific MS or upon receiving a PS Handover Request message from the SGSN and if PS handover is supported, the GANC allocates the IP address and the UDP port number to be used by the MS for GPRS user data transport and sends a GA-PSR-ACTIVATE-UTC-REQ message to the MS. The GANC also:

- sets the downlink packet sequence number to 0 and

- sets the expected uplink packet sequence number to 0

8.3.2 Processing of the GA-PSR TC Activation Request by the MS

Upon receiving the GA-PSR-ACTIVATE-UTC-REQ message from the GANC, the MS shall verify the following:

- the GA-PSR is in GA-PSR-STANDBY state

- the GA-PSR TC does not exist

- the GPRS service is not suspended

Assuming successful verification, the MS shall allocate UDP port number for the MS GPRS user data transport and store the associated information. In parallel, the MS GA-PSR shall transition to GA-PSR-ACTIVE state and start TU4001 timer. Subsequently, the MS shall send the GA-PSR-ACTIVATE-UTC-ACK message to the GANC with the cause indicating successful activation. The message includes the MS UDP port to be used for the downlink GPRS user data transport.

After the MS has sent the GA-PSR-ACTIVATE-UTC-ACK message, it shall:

- set the uplink packet sequence number to 0 and

- set the expected downlink packet sequence number to 0

8.3.3 Processing of the GA-PSR TC Activation Acknowledgment by the GANC

Upon receiving the GA-PSR-ACTIVATE-UTC-ACK message while the GANC initiated GA-PSR TC activation is in progress as a result of a downlink user data transfer request, the GANC forwards any outstanding downlink user data packets.

Upon receiving the GA-PSR-ACTIVATE-UTC-ACK message while the GANC initiated GA-PSR TC activation is in progress as a result of receiving a PS Handover Request message from the SGSN, the GANC sends a PS Handover Request Ack message to the SGSN and may start blind transmission of downlink user data.

Both uplink and downlink packet sequence number for user data are set to 0 after successful GA-PSR TC activation.

8.3.4 Abnormal Cases

8.3.4.1 GA-PSR TC Activation Collision

If the MS receives a GA-PSR-ACTIVATE-UTC-REQ message from the GANC while the MS initiated GA-PSR TC activation procedure is in progress, the MS shall silently discard the request and wait for the acknowledgment related to the MS initiated activation already in progress.

8.3.4.2 MS Rejects GA-PSR TC Activation when the GPRS Service is suspended

If the MS determines that the GPRS service is suspended when the GA-PSR-ACTIVATE-UTC-REQ is received, it shall send a GA-PSR-ACTIVATE-UTC-ACK message to the GANC with the failure cause code set to "GPRS Suspended".

Upon receiving the GA-PSR-ACTIVATE-UTC-ACK message indicating that the GPRS service is suspended, the GANC aborts the activation procedure.

8.3.4.3 MS Receives GA-PSR TC Activation Request while GA-PSR TC active

If the MS receives a GA-PSR TC activation message from the GANC while the GA-PSR TC is active, it shall send the GA-PSR-ACTIVATE-UTC-ACK message to the GANC. The message shall include MS UDP port allocated to the existing GA-PSR TC. In parallel, if the GANC provided new IP Address and UDP port number, the MS shall update the GA-PSR TC attributes accordingly.

After sending the GA-PSR-ACTIVATE-UTC-ACK message, the MS shall:

- set uplink packet sequence number to 0 and

- set the expected downlink packet sequence number to 0

8.4 MS Initiated Deactivation of GA-PSR Transport Channel

When the TU4001expires, the MS GA-PSR initiates deactivation of the GA-PSR TC by sending the request to the GANC as per following message flow:
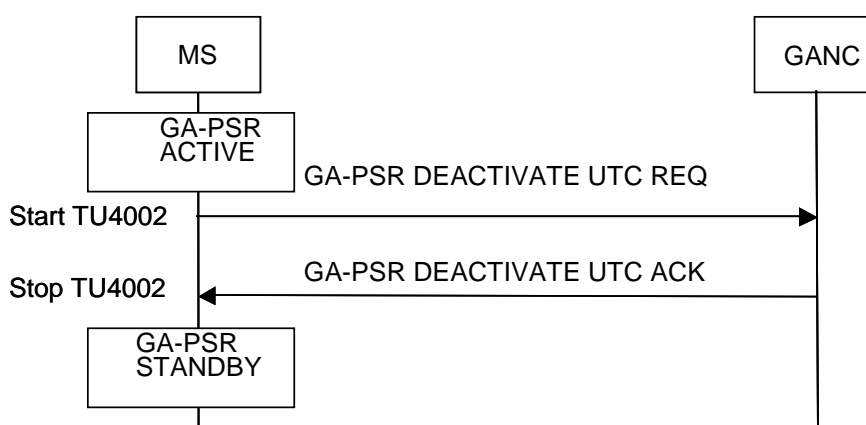
Figure 8.4.1: MS initiated GA-PSR TC Deactivation

8.4.1 GA-PSR TC Deactivation Initiation by the MS

When the TU4001 timer expires and if there are no outstanding uplink GPRS user data messages to be transferred, the MS GA-PSR shall send the GA-PSR-DEACTIVATE-UTC-REQ message to the GANC to request the deactivation of the transport channel. In parallel, the MS shall start TU4002 timer to wait for the confirmation.

8.4.2 Processing of GA-PSR TC Deactivation Request by the GANC

Upon receipt of a GA-PSR-DEACTIVATE-UTC-REQ message from the MS, the GANC releases the GA-PSR TC and sends the GA-PSR-DEACTIVATE-UTC-ACK message to the MS indicating successful deactivation; i.e. the cause IE is set to "success".

8.4.3 Processing of GA-PSR TC Deactivation Acknowledgment by the MS

Upon receipt of a GA-PSR-DEACTIVATE-UTC-ACK message from the GANC, the MS GA-PSR shall stop TU4002 timer, and release the GA-PSR TC. In parallel, the MS GA-PSR shall transition to GA-PSR-STANDBY state.

8.4.4 Abnormal Cases

8.4.4.1 Timer TU4002 Expires during GA-PSR TC Deactivation

If timer TU4002 expires in the MS, the MS shall transit to GA-PSR-STANDBY state and declare the procedure as failed to the upper layers.

8.4.4.2 GANC Rejects GA-PSR TC Deactivation

The following scenarios cover the cases when the GANC rejects GA-PSR TC Deactivation:

- If the corresponding GA-PSR TC does not exist on the network side, the GANC responds with a GA-PSR-DEACTIVATE-UTC-ACK message indicating successful deactivation.

- If there is outstanding downlink GPRS user data for the specified MS, the GANC forwards the data packets instead and ignores the deactivation request.

8.4.4.3 Uplink User Data Transfer is initiated while GA-PSR TC Deactivation is in Progress

If the MS LLC initiates the uplink user data transfer after the MS GA-PSR has sent the deactivation request to the GANC, the MS GA-PSR shall complete the deactivation procedure first and than initiate a new GA-PSR TC activation procedure to enable data transfer.

8.4.4.4 Downlink User Data Transfer is received while the GA-PSR TC Deactivation is in Progress

If the MS receives any downlink user data packets while waiting for the GA-PSR-DEACTIVATE-UTC-ACK message response, it shall abort the deactivation procedure (i.e. stop timer TU4002) and restart TU4001 timer.

8.4.4.5 Unexpected GA-PSR-DEACTIVATE-UTC-ACK response

If the MS receives an unexpected GA-PSR-DEACTIVATE-UTC-ACK message response while the GA-PSR is in GA-PSR-ACTIVE state, the MS GA-PSR shall stop TU4001 timer, and release the GA-PSR TC. In parallel, the MS GA-PSR shall transition to GA-PSR-STANDBY state.

If the MS receives an unexpected GA-PSR-DEACTIVATE-UTC-ACK message response while the GA-PSR is in GA-PSR-STANDBY state, the message is silently discarded.

8.4.4.6 Unexpected GA-PSR-ACTIVATE-UTC-REQ

If the MS receives an unexpected GA-PSR-ACTIVATE-UTC-REQ message while waiting for GA-PSR-DEACTIVATE-UTC-ACK message response, the MS ignores the request and continues waiting for deactivation response.

8.4.4.7 MS Aborts GA-PSR TC Deactivation due to Lower Layer Failure

If a lower layer failure is detected while waiting for GA-PSR-DEACTIVATE-UTC-ACK message, the MS shall declare the procedure as failed and send the corresponding indication to upper layers. Further, the MS shall act according to sub-clause 9.5.

8.5 GANC Initiated Deactivation of GA-PSR Transport Channel

The GANC may initiate the deactivation of the GA-PSR TC by sending the request to the MS as per following message flow:
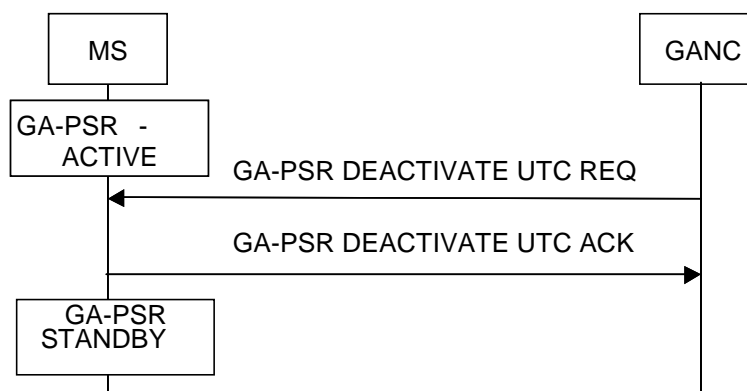
Figure 8.5.1: Network initiated GA-PSR TC Deactivation

8.5.1 GA-PSR TC Deactivation Initiation by the GANC

When the GANC decides to deactivate GA-PSR TC channel, it shall send GA-PSR-DEACTIVATE-UTC-REQ message to the MS to request the deactivation.

8.5.2 Processing of GA-PSR TC Deactivation Request by the MS

Upon receipt of a GA-PSR-DEACTIVATE-UTC-REQ message from the GANC, the MS shall release the GA-PSR TC and send the GA-PSR-DEACTIVATE-UTC-ACK message to the GANC indicating successful deactivation; i.e. the cause IE is set to "success". In parallel, the MS GA-PSR shall transition to GA-PSR-STANDBY state.

8.5.3 Processing of GA-PSR TC Deactivation Acknowledgment by the GANC

Upon receipt of a GA-PSR-DEACTIVATE-UTC-ACK message from the MS, the GANC shall release the GA-PSR TC.

8.5.4 Abnormal Cases

8.5.4.1 MS Rejects GA-PSR TC Deactivation

The following scenarios cover the cases when the MS rejects GA-PSR TC Deactivation:

- If the corresponding GA-PSR TC does not exist on the MS side, the MS shall respond with a GA-PSR-DEACTIVATE-UTC-ACK message indicating successful deactivation.

- If there is outstanding uplink GPRS user data, the MS forwards the data packets instead and ignores the deactivation request.

8.5.4.2 Uplink User Data Transfer is received while GA-PSR TC Deactivation is in Progress

If the MS LLC initiates the uplink user data transfer after the MS has received a deactivation request from the GANC, the MS shall complete the deactivation procedure first and than initiate a new GA-PSR TC activation procedure to enable data transfer.

If the MS LLC initiates the uplink user data transfer before the MS has received a deactivation request from the GANC, the MS shall treat that as normal uplink user data transfer as defined in sub-clause 8.7.1.

8.5.4.3 Downlink User Data Transfer is initiated while the GA-PSR TC Deactivation is in Progress

If the GANC receives any downlink user data packets while waiting for the GA-PSR-DEACTIVATE-UTC-ACK response, it shall complete the deactivation procedure first and than initiate a new GA-PSR TC activation procedure to enable data transfer.

8.6 Implicit Deactivation of GA-PSR Transport Channel

If the GAN deregistration is performed for a mobile station with an active GA-PSR TC, the GANC automatically releases the associated GA-PSR TC. The MS shall release the GA-PSR TC upon GAN deregistration.

This includes the scenarios where an implicit GAN deregistration is performed by either the MS or GANC due to lower layer failures.

8.7 GA-PSR GPRS User Data Transport

While the corresponding GA-PSR TC is available, both mobile station and GANC can initiate GPRS user data transfer automatically using GA-PSR UNITDATA service as illustrated in the following figure:
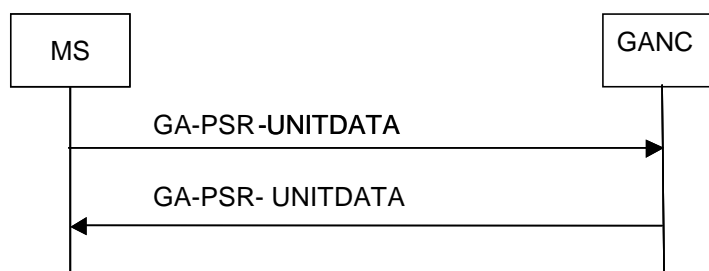
Figure 8.7.1: GA-PSR GPRS User Data transport

The GPRS user data packets are tunnelled using UDP transport as specified for GA-PSR Transport Channel. Each packet is assigned a sequence number in the range of 0 to 65535 sequentially. The sequence number is set to 0 after reaching the maximum - 65535.

8.7.1 MS Initiates Uplink GPRS User Data Transfer

Assuming that the GA-PSR TC has been already activated as specified in sub-clauses 8.2 or 8.3, the MS GA-PSR is able to immediately forward any uplink GPRS user data packets to the GANC. Upon the request from the LLC to transfer an uplink LLC PDU with GPRS user data identified with LLC SAPI 3, 5, 9 or 11, the MS GA-PSR shall restart TU4001 timer and encapsulate the complete LLC PDU within a GA-PSR UNITDATA message.

Subsequently, the MS shall send the GA-PSR UNITDATA message to the GANC using the existing GA-PSR TC; i.e. using the corresponding GANC IP address and UDP port number.

The MS shall increment the uplink packet sequence number for each GA-PSR-UNITDATA message sent to the GANC.

8.7.2 Processing of the Uplink GPRS User Data Message by the GANC

Upon receiving the uplink user data message from the MS, the GANC extracts the received LLC PDU and available message parameters, relays the PDU to the SGSN via the Gb interface using the BSSGP uplink unitdata procedure as per standard GPRS.

The GANC increments the expected uplink packet sequence number for each GA-PSR-UNITDATA message received from the MS.

8.7.3 GANC Initiates Downlink GPRS User Data Transfer

Assuming that the GA-PSR TC has been already activated as specified in sub-clause 8.2 or 8.3, the GANC is able to immediately forward any downlink GPRS user data packets to the MS. Upon receiving a downlink packet for the MS, the GANC sends the GA-PSR UNITDATA message to the MS using the existing GA-PSR TC; i.e. using the corresponding MS IP address and UDP port number.

The GANC increments the downlink packet sequence number for each GA-PSR-UNITDATA message sent to the MS.

8.7.4 Processing of the Downlink GPRS User Data Message by the MS

Upon receiving the downlink user data message from the GANC, the MS GA-PSR shall restart TU4001 timer, extract the received LLC PDU and TLLI and forward the PDU to the LLC layer via the GRR SAP as per standard GPRS.

The MS shall increment the expected downlink packet sequence number for each GA-PSR-UNITDATA message received from the GANC.

8.7.5 Abnormal Cases

8.7.5.1 GANC Receives an Uplink User Data Message while the GA-PSR TC Activation Procedure is in progress

Upon receiving an uplink message while the GA-PSR TC activation procedure is in progress (TU4002 timer is still running), the GANC will process the request as if the GA-PSR TC was active.

8.7.5.2 GANC Receives an Uplink User Data Message and the GA-PSR TC is not active

Upon receiving an uplink message that is associated with a GA-PSR TC that does not exist, the GANC will process the message as defined in sub-clause 8.7.2. The GANC may disregard the uplink packet sequence number in this case. Further, the GANC initiates GA-PSR TC activation procedure as defined in sub-clause 8.3.

8.7.5.3 Handling of out-of-sequence packets

Packets received out-of-sequence should be dropped.

8.7.5.4 MS Receives a Downlink User Data Message while the GA-PSR TC Activation Procedure is in progress

Upon receiving a downlink message while the GA-PSR TC activation procedure is in progress (TU4002 timer is still running), the MS GA-PSR shall process the request as if the transport channel was active. The MS shall not initiate uplink GPRS user data transfer until the GA-PSR TC activation procedure is successfully completed (as specified in the subclause 8.2). The MS shall use the IP address and UDP port number received in the GA-PSR ACTIVATE UTC ACK message for sending uplink GPRS user data packets to the GANC on that transport channel.

8.7.5.5 Uplink User Data Transfer Failed due to Lower Layer Failure

If a lower layer failure is detected while attempting to send an uplink user data packet, the MS shall declare the procedure as failed and send the corresponding indication to upper layers.

8.8 GA-PSR GPRS Signalling and SMS Messages Transport

While the MS is registered for GAN services, the corresponding TCP session for signalling transport is always available and, assuming that the MS GA-CSR and GA-PSR are attached to GSM/GPRS SAPs, both mobile station and GANC can initiate GPRS signalling message transfer using GA-PSR DATA service as illustrated in the following figure. The GA-PSR-DATA transport mechanism is utilized for all GPRS GMM/SM signalling and SMS messages.
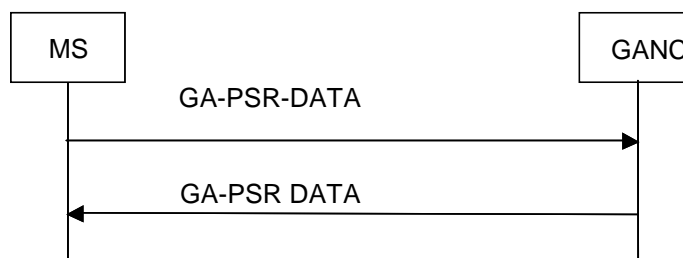
Figure 8.8.1: GA-PSR GPRS Signalling and SMS Messages transport

8.8.1 MS Initiates Uplink GPRS Signalling/SMS Message Transfer

Upon the request form the LLC to transfer an uplink LLC PDU carrying GPRS signalling message (identified with LLC SAPI 1) or GPRS SMS message (LLC SAPI 7), the MS GA-PSR shall encapsulate the complete LLC PDU within a GA-PSR DATA message and send the message to the GANC using the existing signalling TCP session.

8.8.2 Processing of the Uplink GA-PSR DATA Message by the GANC

Upon receiving the uplink GA-PSR DATA message from the MS, the GANC extracts the received LLC PDU and available message parameters and, relays the PDU to the SGSN via the Gb interface using the BSSGP uplink unitdata procedure as per standard GPRS.

8.8.3 GANC Initiates Downlink GA-PSR DATA Transfer

Upon receiving a downlink LLC PDU with GPRS signalling (identified with LLC SAPI 1) or SMS message (LLC SAPI 7), the GANC encapsulates the complete LLC PDU within a GA-PSR DATA message and sends the message to the MS using the existing signalling TCP session.

8.8.4 Processing of the Downlink GA-PSR DATA Message by the MS

Upon receiving the GA-PSR-DATA message that includes the downlink GPRS signalling or SMS LLC PDU from the GANC, the MS shall extract the received LLC PDU and TLLI and forward the PDU to the LLC layer via the GRR SAP as per standard GPRS.

8.8.5 Abnormal Cases

8.8.5.1 Downlink or Uplink User Data Transfer Failed due to Lower Layer Failure

If a lower layer failure is detected while attempting to send an uplink GPRS signalling or SMS message, the MS GA-PSR shall act according to sub-clause 9.5.

8.9 Packet paging for packet service

The following figure depicts interactions involved in the packet paging procedure via GAN.
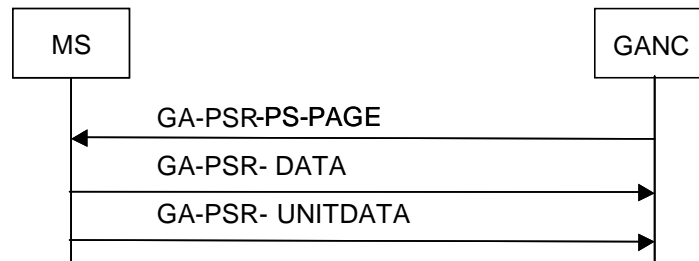
Figure 8.9.1: Packet Paging

8.9.1 PS Paging Request Processing by the GANC

Upon receiving a Paging PS request from the SGSN for GAN registered MS, the GANC sends the GA-PSR-PS-PAGE message to the MS via the signalling TCP session.

8.9.2 PS Paging Request Processed by the MS

Upon receiving a GA-PSR-PS-PAGE message from the GANC, the MS GA-PSR shall forward the indication to the GMM layer using the GMMRR SAP as per standard GPRS. Subsequently, the MS shall send an uplink LLC PDU as a page response per standard GPRS. The MS may either send GA-PSR-DATA or GA-PSR-UNITDATA message as described in sub-clauses 8.7 and 8.8.

8.9.3 Processing of the PS Paging Response by the GANC

Since the MS responds to a PS Paging with any LLC PDU encapsulated within the standard GA-PSR-DATA or GA-PSR-UNITDATA message, the GANC will process the message as any other GPRS signalling/SMS or user data message. The processing of uplink GPRS data messages is described in sub-clause 8.7 and for the uplink GPRS signalling messages in sub-clause 8.8.

8.10 GPRS Suspend Procedure

The following figure depicts interaction involved in the GPRS Suspend procedure.
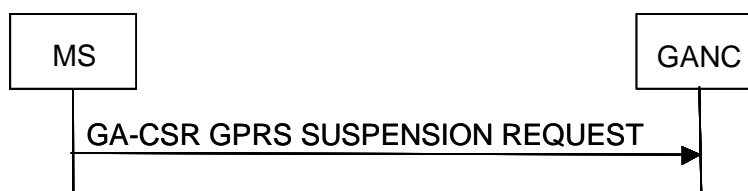
Figure 8.10.1 GPRS Suspend

8.10.1 GPRS Suspension Initiation by the MS

While transitioning to dedicated mode and if unable to support simultaneous CS and PS services, the MS shall request the suspension of the downlink GPRS data transfer by sending a GA- CSR GPRS SUSPENSION REQUEST message to the GANC

8.10.2 GPRS Suspend Request Processing by the GANC

Upon receiving a GA- CSR GPRS SUSPENSION REQUEST message from the MS, the GANC completes the GPRS suspend procedure via the Gb interface as defined in [19].

8.11 MS Initiated Downlink Flow Control

The MS initiated downlink flow control procedure is based on standard GPRS downlink flow control mechanism enhanced for GAN service. The MS implements the flow control algorithm to monitor and calculate the data rate that could be supported based on the current conditions. When the flow control condition is detected (e.g. the utilization of the buffers reaches a high watermark level), the MS re-calculates the estimated data rate that could be supported and sends the flow control request to the GANC to adjust the data rate accordingly. The following message flow depicts the messages and timers associated with this procedure:

```
        ┌──────┐                              ┌──────┐
        │  MS  │                              │ GANC │
        └──────┘                              └──────┘
                      GA-PSR-DFC-REQ
Start TU4003 │─────────────────────────────────────▶│
             │                                       │
```
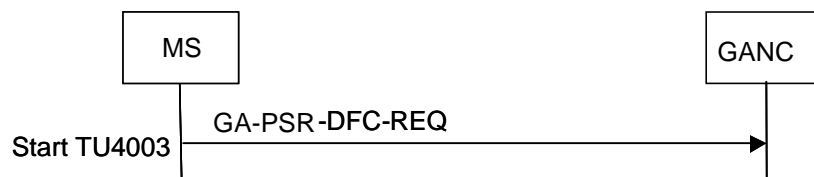
Figure 8.11.1: MS initiated Downlink Flow Control

Initially, before detecting a flow control condition, the flow control condition does not exist in the MS. In this state, the MS GA-PSR monitors the average downlink data rate and the utilization of resources (e.g. downlink buffers), and when utilization exceeds a certain threshold, a downlink flow control condition is detected.

When the downlink flow control condition is detected, the MS sends the GA-PSR-DFC-REQ message to the GANC and starts the TU4003 timer. Whenever the timer expires, the MS checks the downlink flow control condition, and if it continues to exist, the MS restarts the timer, and sends another GA-PSR-DFC-REQ message to the GANC. The MS remains in this state while the flow control condition persists. As soon as the flow control condition is resolved, the MS deactivates the TU4003 timer and transitions to the default state in which no downlink flow control condition exists.

In case TU4003 is running and the CS traffic channel is activated or released or in case of GA-CSR state transition, MS may request the GANC flow control parameters to adjust existing flow control by sending GA-PSR-DFC-REQ message to the GANC and if so it shall restart the timer TU4003.

8.11.1 Initiation of the Downlink Flow Control by the MS

Upon detecting the downlink flow control condition, the MS shall initiate a downlink flow control procedure by sending a GA-PSR-DFC-REQ message to the GANC via the existing GA-PSR TC. The message includes new estimated data rate that can be supported. At the same time the MS shall start timer TU4003 to continue monitoring the flow control condition. The timer TU4003 is specified in sub-clause 12.

8.11.2 Processing of the Downlink Flow Control Request by the GANC

Upon receiving the GA-PSR-DFC-REQ message from the MS, the GANC initiates downlink flow control procedure over the Gb interface as per standard GPRS.

8.11.3 Processing of the TU4003 Timer Expiry by the MS

When the TU4003 timer expires, the MS shall re-evaluate the flow control condition and perform the following based on the outcome of the evaluation:

- If the flow control condition still exists (e.g. downlink buffer utilization is still above the low watermark level), the MS shall calculate a new data rate that can be supported and forward the corresponding GA-PSR-DFC-REQ message to the GANC via the existing GA-PSR TC. Simultaneously, the MS shall start timer TU4003 to continue monitoring the downlink data transfer.

- If the flow condition has been resolved (e.g. buffer utilization is below the low mark level), the MS shall not restart the TU4003 timer and shall stop sending flow control requests to the GANC.

8.12 Uplink Flow Control

The uplink flow control procedure is used to dynamically manage sharing of the available Gb interface bandwidth. The following message flow depicts the messages and timers associated with this procedure:
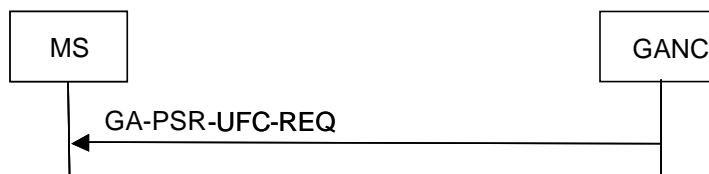
Figure 8.12.1: Uplink Flow Control

Upon receiving the request, the MS GA-PSR adjusts the uplink data rate as per request.

8.12.1 Initiation of the Uplink Flow Control by the GANC

Upon detecting the uplink flow control condition, the GANC initiates an uplink flow control procedure by sending a GA-PSR-UFC-REQ message to the MS via the existing GA-PSR TC. The request is PFC based if the packet flow management procedures are supported.

The GANC shall never request the uplink data rate that is lower than the guaranteed uplink bit rate specified for that PFC. The guaranteed bit rate can be ignored by the GANC if the Traffic Class is Interactive class or Background class.

8.12.2 Processing of the Uplink Flow Control Request by the MS

Upon receiving the GA-PSR-UFC-REQUEST message from the GANC, the MS adjusts the uplink data rate accordingly.

8.12.3 Resetting of the Uplink Flow Control Condition by the GANC

After the uplink flow control condition is resolved and the current conditions allow the uplink data rate to be reset to normal level, the GANC initiates an uplink flow control condition reset by sending a GA-PSR-UFC-REQUEST message to the MS via the existing GA-PSR TC. This message includes the reset indicator.

8.12.4 Abnormal Cases

8.12.4.1 GA-PSR TC Deactivation is in Progress

If the MS receives a GA-PSR-UFC-REQUEST message while the GA-PSR TC deactivation is in progress, the MS shall ignore the flow control request.

8.13 PS handover to GAN A/Gb mode

8.13.1 Initiation

If PS handover to GAN A/Gb mode is supported by both the MS and the source BSS/RNC it may be used to prevent an MS from performing an autonomous rove-in to GAN A/Gb mode in favour of using PS handover to perform a cell change. PS handover from a GERAN cell to a GAN A/Gb mode cell may be triggered as described in 3GPP TS 44.060 [45]. PS handover from a UTRAN cell to a GAN A/Gb mode cell may be triggered as described in 3GPP TS 25.331 [40].

The procedure for PS handover to a GAN A/Gb mode cell results in the target GANC allocating the MS a GA-PSR Transport Channel in response to receiving a **PS Handover Request** message from the SGSN (see sub-clause 8.3 and 3GPP TS 43.129 [49]). When the source BSS/RNC is informed about the successful allocation of the GA-PSR Transport Channel it responds by sending the MS a **PS Handover Command** message (source BSS) or a **Handover from UTRAN Command** message (source RNC).

If the target GANC supports blind transmission it may begin transmitting downlink data on the allocated GA-PSR Transport Channel prior to determining that PS handover to the GAN A/Gb mode cell has been successfully completed. Otherwise, it may discard downlink data that becomes available prior to detecting the successful completion of the PS handover to the GAN A/Gb mode cell. An MS that supports blind transmission enables the reception of downlink data upon being allocated a GA-PSR Transport Channel (i.e. prior to switching to GAN A/Gb mode).

8.13.2   Successful completion of the PS handover to GAN A/Gb mode

From the MS perspective the procedure for PS handover to a GAN A/Gb mode cell is started upon reception of the **PS HANDOVER COMMAND** message or the **HANDOVER FROM UTRAN COMMAND** message and completed upon sending a **GA-PSR HANDOVER COMPLETE** message to the GANC.

From the source BSS/RNC perspective the procedure for PS handover to a GAN A/Gb mode cell is started upon deciding to perform PS handover of an MS to a GAN A/Gb mode cell and completed upon being told by the SGSN to release all ongoing radio resources.

From the target GANC perspective the procedure for PS handover to a GAN A/Gb mode cell is started upon receiving a **PS HANDOVER REQUEST** message and completed upon receiving a **GA-PSR HANDOVER COMPLETE** message from the MS. Upon receiving this message the GANC shall indicate PS handover completion to the SGSN.

8.13.3   Abnormal Cases

Upon receiving a **PS HANDOVER COMMAND** message or a **HANDOVER FROM UTRAN COMMAND** message in the source cell the MS may experience the following abnormal conditions:

-    If connectivity has been lost on the GA-PSR Transport Channel before the MS has transmitted a GA-PSR HANDOVER COMPLETE message it shall abort the PS handover to GAN A/Gb mode. The MS shall remain in the source cell and provide a failure notification as described in 3GPP TS 44.060 [45] for a GERAN cell or in 3GPP TS 25.331 [40] for a UTRAN cell.

8.14   PS handover from GAN A/Gb mode

8.14.1   Initiation

If PS handover from GAN A/Gb mode is supported by both the MS and the GANC it may be used to prevent an MS from performing an autonomous rove-out from GAN A/Gb mode in favour of using PS handover to perform a cell change.
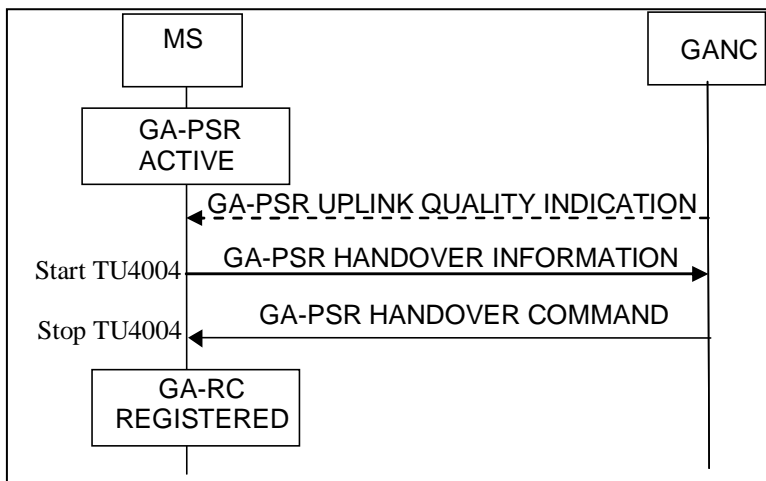
Figure 8.14.1: PS handover from GAN A/Gb mode, successful case
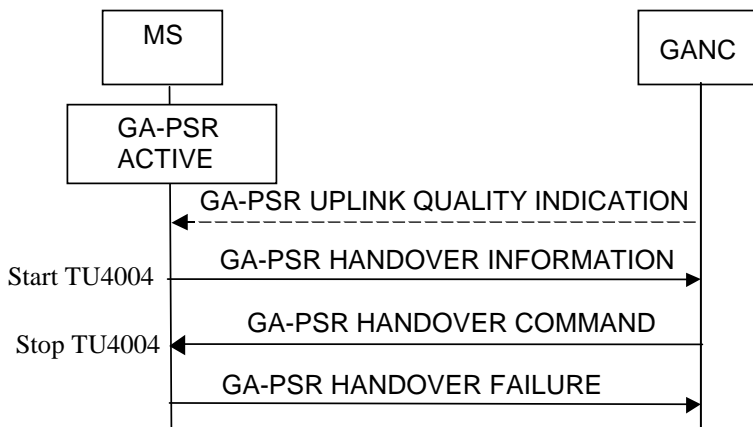
Figure 8.14.2: PS handover from GAN A/Gb mode, failure case

The MS and the GANC inform each other of whether or not they support PS handover during GAN registration. If supported, PS handover may be triggered by the MS based on:

- local measurements of GAN coverage signal quality;

- user initiated change of operational mode to GERAN/UTRAN preferred or GERAN/UTRAN only;

- reception of a **GA-PSR UPLINK QUALITY INDICATION** message from the GANC indicating one of the following in the UL Quality Indication IE:

  - Radio problem (unacceptable uplink performance).

  - Network problem.

  - Unknown problem.

Upon experiencing any of these trigger conditions an MS may at any point trigger the PS handover procedure in the source GANC by sending a **GA-PSR HANDOVER INFORMATION** message.

A **GA-PSR HANDOVER INFORMATION** message sent by an MS shall include a list of candidate GERAN/UTRAN cells ranked in order of preference based on the most recent lists available from the candidate radio access technologies and including the received signal strength for each identified GERAN or UTRAN cell. The list of candidate cells may include only GERAN cells, only UTRAN cells or both, as permitted by the Handover Reporting Control IE (see sub-clause 11.2.113). If no Handover Reporting Control IE was included in the most recently received GA-RC REGISTER ACCEPT message, there is no restriction on the cells that may be listed. Upon sending this message the MS shall start timer TU4004.

8.14.2 Reception of GA-PSR HANDOVER INFORMATION by the GANC

Upon reception of a **GA-PSR HANDOVER INFORMATION** message the source GANC triggers PS handover to a GERAN/UTRAN target cell by sending a **PS Handover Required** message to the SGSN. This results in the allocation of radio resources/RABs in the target cell (see 3GPP TS 43.129 [49]). When the source GANC is informed by the SGSN about the successful allocation of radio resources/RABs in the target cell it responds by sending the MS a **GA-PSR HANDOVER COMMAND** message. While the PS handover procedure is ongoing but prior to sending the MS a **GA-PSR HANDOVER COMMAND** message, the GANC may send the MS one or more instances of the **GA-PSR HANDOVER CONTINUE** message to prevent timer TU4004 from expiring in the MS.

8.14.3 Reception of GA-PSR HANDOVER CONTINUE by the MS

Upon reception of a **GA-PSR HANDOVER CONTINUE** message from the GANC the MS shall proceed as follows:

- If timer TU4004 is running it shall be restarted.

- If timer TU4004 is not running the MS shall discard the **GA-PSR HANDOVER CONTINUE** message.

8.14.4 Reception of GA-PSR HANDOVER COMMAND by the MS

The **GA-PSR HANDOVER COMMAND** message should only indicate a target cell which was reported by the MS in the **GA-PSR HANDOVER INFORMATION** message.

- For the case of PS handover to a GERAN cell, the GA-PSR Handover Command message shall include the set of PSI or SI messages required for mobile station to operate in the new cell within the *PS Handover to GERAN PSI* IE or *PS Handover to GERAN SI* IE (see A/Gb mode to A/Gb mode PS handover described in 3GPP TS 44.060 [45]).

- For the case of PS handover to a GERAN cell the MS shall ignore the value of the Page Mode, Global TFI and Container ID information elements included in the PS HANDOVER COMMAND message carried within the GA-PSR Handover Command message.

- For the case of PS Handover to a GERAN cell, the PS Handover Command message created by the target BSS shall always indicate the PS Handover type as being non-synchronized (see 3GPP TS 44.060 [45]).

Upon reception of a **GA-PSR HANDOVER COMMAND** message from the GANC the MS shall:

- stop timer TU4004.

- suspend all NAS layer signalling transmissions;

- start the connection establishment to the target BSS/RNC by using the contents of the *PS Handover to GERAN Command* IE or *PS Handover to UTRAN Command* IE (included in the **GA-PSR HANDOVER COMMAND** message) which contains either a **PS Handover Command** message (see 3GPP TS 44.060 [45]) created by the target BSS (for PS handover to a GERAN cell) or a **Handover to UTRAN Command** message (see 3GPP TS 25.331 [40]) created by the target RNC (for PS handover to a UTRAN cell). These encapsulated messages carry information about the target cell identifier and radio parameters relevant for the target radio access technology.

8.14.5 Successful completion of the PS Handover from GAN A/Gb mode

From the MS perspective the procedure for PS handover from a GAN A/Gb mode cell is started upon reception of the **GA-PSR HANDOVER COMMAND** message from the GANC and completed using procedures applicable to the target radio access technology (see Note 1). Upon successfully completing the PS handover from a GAN A/Gb mode cell the MS shall:

- switch to GERAN/UTRAN mode (i.e. switch the serving RR to GSM RR or UTRAN RRC).

- enter GA-RC-REGISTERED state.

- either deregister from GAN A/Gb mode as defined in sub-clause 6.4 or remain in the GA-RC-REGISTERED state but consider the GA-PSR Transport Channel previously used in the GAN A/Gb mode cell as implicitly released.

From the source GANC perspective the procedure for PS handover from a GAN A/Gb mode cell is started upon receiving a **GA-PSR HANDOVER INFORMATION** message from the MS and deciding to perform PS handover to a GERAN/UTRAN cell. It is completed upon being told by the SGSN to delete the packet flow contexts corresponding to that MS (see Note 2).

From the target BSS/RNC perspective the procedure for PS handover from a GAN A/Gb mode cell is started upon receiving a **PS Handover Request** message (target BSS) or a **Relocation Request** message (target RNC) from the SGSN and completed upon receiving confirmation from the MS that it has arrived in the target cell (see Note 1).

NOTE 1: The requirements concerning the establishment of the radio connection towards the target radio access technology and the corresponding signalling procedures are outside of the scope of this specification.

NOTE 2: The target RAT informs the source RAT (e.g. by sending a **Forward Relocation Complete** message) that PS handover was successful so that the local release of the GA-PSR Transport Channel can be triggered.

8.14.6 Abnormal Cases

If timer TU4004 expires the MS shall either rove-out to GERAN/UTRAN mode or remain in GANA/Gb mode if the conditions that caused the MS to initiate PS handover have been resolved. In the latter case, the MS may subsequently re-initiate PS handover based on the triggering events described in clause 8.14.1.

If the MS is unable to act on the **GA-PSR HANDOVER COMMAND** message it shall discard it, send the source GANC a **GA-PSR HANDOVER FAILURE** message and resume normal operation as if the **GA-PSR HANDOVER COMMAND** message had not been received. The GA-PSR cause value in the **GA-PSR HANDOVER FAILURE** message shall be set to "PS handover failure - incorrect handover command".

If the MS is able to act on the **GA-PSR HANDOVER COMMAND** message but is unable to establish the radio connection towards the target radio access technology it shall return to the old cell, send the source GANC a **GA-PSR HANDOVER FAILURE** message and resume normal operation as if the **GA-PSR HANDOVER COMMAND** message had not been received. The GA-PSR cause value in the **GA-PSR HANDOVER FAILURE** message shall be set to "PS handover failure - target RAT access failure".

For the case of PS handover to a GERAN cell, if the **GA-PSR HANDOVER COMMAND** message does not contain the minimum set of PSI or SI messages required for mobile station to operate in the new cell (see A/Gb mode to A/Gb mode PS handover described in 3GPP TS 44.060 [45]), the MS shall send the source GANC a **GA-PSR HANDOVER FAILURE** message and resume normal operation as if the GA-PSR HANDOVER COMMAND message had not been received. The GA-PSR cause value in the **GA-PSR HANDOVER FAILURE** message shall be set to "PS handover failure - missing SI/PSI information".

For the case of PS handover to a GERAN cell, if the PS HANDOVER COMMAND message carried within the **GA-PSR HANDOVER COMMAND** message does not provide resources for at least one uplink TBF in the new cell, the MS shall send the source GANC a **GA-PSR HANDOVER FAILURE** message and resume normal operation as if the GA-PSR HANDOVER COMMAND message had not been received. The GA-PSR cause value in the **GA-PSR HANDOVER FAILURE** message shall be set to "PS handover failure - no uplink TBF allocation".

8.14.7 Reception of GA-PSR HANDOVER FAILURE by the GANC

Upon reception of a **GA-PSR HANDOVER FAILURE** message from an MS the GANC shall initiate the release of resources in the target radio access technology.

8a GA-RRC elementary procedures

8a.1 GA-RRC connection establishment

The GAN Iu mode GA-RRC CS and PS connections are logical connections between the MS and the GANC. As described in 3GPP TS 43.318, the GA-RRC sub-layer in the MS contains two entities, the CS domain GA-RRC sublayer entity and the PS domain GA-RRC sublayer entity. These entities operate independently and in parallel; e.g., two GA-RRC connections are established in the case of simultaneous CS and PS services, one GA-RRC connection for each domain. Each GA-RRC sub-layer entity in the MS can be in one of two states, GA-RRC-IDLE or GA-RRC-CONNECTED. Figures showing state changes (e.g., from GA-RRC-IDLE to GA-RRC-CONNECTED) in this sub-clause refer to changes for a single GA-RRC sub-layer entity, either CS or PS.

A GA-RRC connection is established when the upper layers in the MS request the establishment of a signalling connection for either CS or PS domain and the GA-RRC sub-layer entity in the MS is in the GA-RRC-IDLE state for that domain; i.e., no GA-RRC connection exists. When a successful response is received from the network, GA-RRC replies to the upper layer that the GA-RRC sub-layer entity in the MS has entered the RRC connected mode (i.e., the GA-RRC-CONNECTED state). The upper layers then have the possibility to request transmission of NAS messages to the network (as described in sub-clause 8a.2).

Note that in the case of a network-initiated CS or PS session, the GA-RRC connection is implicitly established when the MS responds to the GA-RRC PAGING REQUEST message from the GANC with the GA-RRC INITIAL DIRECT TRANSFER message containing the paging response (see sub-clause 8a.3).

Also, in the case of handover from GERAN or UTRAN to GAN Iu mode, the GA-RRC connection is implicitly established when the MS sends the GA-RRC RELOCATION ACK message to the GANC (normal case) or the GA-RRC RELOCATION ACCESS message to the GANC (exception case), as described in sub-clause 8a.10.
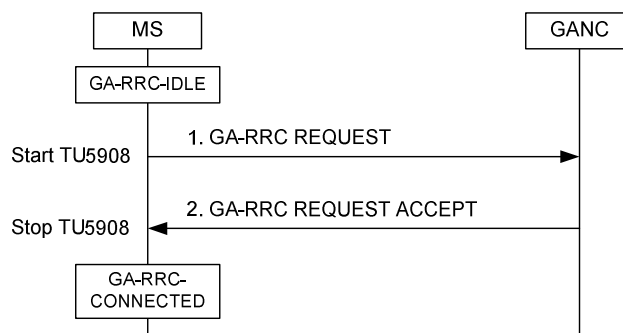
Figure 8a.1.1 MS initiation of GA-RRC connection, successful case
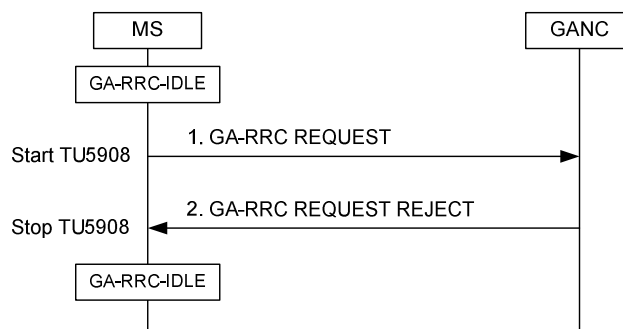
Figure 8a.1.2 MS initiation of GA-RRC connection, failure case

8a.1.1 Initiation of GA-RRC connection establishment by the MS

The MS initiates the establishment of the GA-RRC connection when the upper layers in the MS request the establishment of a signalling connection for either CS or PS domain and the GA-RRC sub-layer entity in the MS is in GA-RRC-IDLE state for that domain.

Before initiation of the GA-RRC connection establishment request, the MS shall check for access permission based on Access Control Class bits returned within GA-RC REGISTER ACCEPT message as defined in [12].

If it is allowed for the MS to access the network, the MS shall send a GA-RRC REQUEST message to the GANC on the established TCP connection, including the IE "CN Domain Identity" and the IE "Establishment Cause", and start timer TU5908 for the domain (i.e., the MS may have up to two instances of the TU5908 timer running at the same time, one for each domain).

8a.1.2 Reception of GA-RRC REQUEST by GANC

When the GANC receives the GA-RRC REQUEST message, the GANC may either accept or reject the GA-RRC connection establishment request.

8a.1.2.1 GA-RRC connection establishment request accepted

If the GANC accepts the GA-RRC connection establishment request, it shall send the GA-RRC REQUEST ACCEPT message to the MS including the IE "CN Domain Identity".

8a.1.2.2 GA-RRC connection establishment request rejected

If the GANC rejects the GA-RRC connection establishment request, it shall send the GA-RRC REQUEST REJECT message to the MS including the IE "CN Domain Identity".

8a.1.3 GA-RRC connection establishment response handling in the MS

8a.1.3.1 GA-RRC connection establishment request accepted

When the MS receives the GA-RRC REQUEST ACCEPT message, it shall:

- if timer TU5908 is active for the domain indicated by the IE "CN Domain Identity":

    - stop timer TU5908 for that domain,

    - move into the GA-RRC-CONNECTED state for that domain,

    - indicate to upper layers that GA-RRC has entered the connected state for that domain, and

    - send the GA-RRC INITIAL DIRECT TRANSFER message to the network;

- if timer TU5908 is not active for the domain indicated by the IE "CN Domain Identity":

    - ignore the GA-RRC REQUEST ACCEPT message, and

    - continue with the procedure as if the GA-RRC REQUEST ACCEPT message was not received.

8a.1.3.2 GA-RRC connection establishment request rejected

When the MS receives the GA-RRC REQUEST REJECT message, it shall:

- if timer TU5908 is active for the domain indicated by the IE "CN Domain Identity":

    - stop timer TU5908 for that domain,

    - remain in the GA-RRC-IDLE state for that domain, and

    - indicate to upper layers that GA-RRC was not able to enter the connected state for that domain;

- if timer TU5908 is not active for the domain indicated by the IE "CN Domain Identity":

    - ignore the GA-RRC REQUEST REJECT message, and

    - continue with the procedure as if the GA-RRC REQUEST REJECT message was not received.

8a.1.4 Failure cases

8a.1.4.1 Timer TU5908 expiry

If timer TU5908 expires in the MS, the GA-RRC sub-layer entity in the MS shall remain in the GA-RRC-IDLE state and indicate to upper layers that GA-RRC was not able to enter the connected state for the domain.

8a.2 Upper layer message transmission

The GA-RRC INITIAL DIRECT TRANSFER message is used to transfer the "initial" upper layer message for the domain (i.e., the first NAS message after GA-RRC connection establishment for the domain) from the MS to the

GANC. Receipt of the GA-RRC INITIAL DIRECT TRANSFER message by the GANC triggers the establishment of the signalling connection to the indicated CN domain for the MS. The GA-RRC UPLINK DIRECT TRANSFER message is used to transfer all subsequent upper layer messages for the signalling connection from the MS to the GANC.

The GA-RRC DOWNLINK DIRECT TRANSFER message is used to transfer upper layer messages from the GANC to the MS.

8a.2.1 Initial upper layer message forwarding by the MS

Figure 8a.2.1.1 Initial direct transfer, normal flow

The GA-RRC sub-layer entity in the MS shall initiate the initial direct transfer procedure in the GA-RRC-CONNECTED state when the upper layers request the transfer of the first non-access stratum (NAS) message associated with the signalling connection.

The MS shall include the IE "CN Domain Identity" and the contents of the received NAS message in the L3 Message IE. The MS also includes the Intra Domain NAS Node Selector (IDNNS) IE which may be used by the GANC to route the establishment of a signalling connection to a CN node within the indicated CN domain (i.e., using IuFlex).

8a.2.2 Reception of GA-RRC INITIAL DIRECT TRANSFER by GANC

When the GANC receives the GA-RRC INITIAL DIRECT TRANSFER message from a GA-RRC sub-layer entity in MS in the GA-RRC-CONNECTED state and there is no signalling connection to the indicated CN domain, the GANC shall establish an Iu signalling connection between the GANC and the indicated CN domain and transfer the initial NAS message to the CN.

8a.2.3 Subsequent upper layer message forwarding by the MS

Figure 8a.2.3.1 Uplink direct transfer, normal flow

The GA-RRC sub-layer entity in the MS shall initiate the uplink direct transfer procedure in the GA-RRC-CONNECTED state when the upper layers request the transfer of a subsequent NAS message associated with the signalling connection (i.e., after the initial NAS message).

The MS shall include the IE "CN Domain Identity" and the contents of the received NAS message in the IE "L3 Message".

8a.2.4 Reception of GA-RRC UPLINK DIRECT TRANSFER by GANC

When the GANC receives the GA-RRC UPLINK DIRECT TRANSFER message from a GA-RRC sub-layer entity in the MS in the GA-RRC-CONNECTED state, the GANC shall transfer the NAS message to the CN using the existing signalling connection.

8a.2.5 Upper layer message forwarding by the GANC

Figure 8a.2.5.1 Downlink direct transfer, normal flow

The downlink direct transfer procedure is initiated by the GANC when the GANC receives a NAS message from a CN domain (i.e., after the establishment of the GA-RRC connection to the MS for the domain).

The GANC shall include the IE "CN Domain Identity" and the contents of the received NAS message in the IE "L3 Message".

8a.2.6 Reception of GA-RRC DOWNLINK DIRECT TRANSFER by the MS

When the MS receives the GA-RRC DOWNLINK DIRECT TRANSFER message it 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 upper layers.

8a.2.6.1 Invalid GA-RRC DOWNLINK DIRECT TRANSFER

If the MS receives a GA-RRC DOWNLINK DIRECT TRANSFER message and GA-RRC sub-layer entity in the MS is not in GA-RRC-CONNECTED state for the indicated domain, the MS shall:

- ignore the contents of the GA-RRC DOWNLINK DIRECT TRANSFER message;

- transmit a GA-RRC STATUS message to the GANC as follows:

    - set the IE "GA-RRC Cause" to "Message type not compatible with protocol state"

    - include the received message contents in the IE "PDU in Error"

- continue with any ongoing procedure and act as if the GA-RRC DOWNLINK DIRECT TRANSFER message was not received.

8a.3 Paging

The GANC uses the paging procedure to transmit paging information received from the CN to the MS. The procedure also results in GA-RRC connection establishment between the MS and the GANC for the indicated domain.
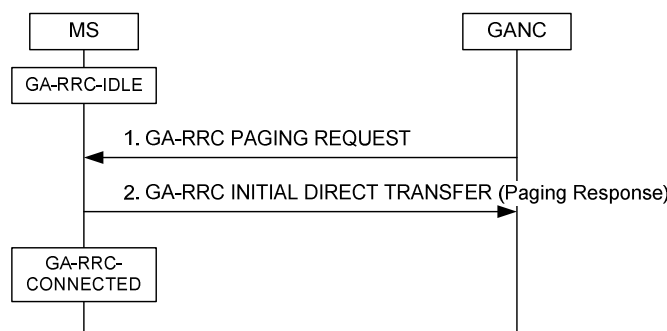
Figure 8a.3.1 Paging, normal flow

8a.3.1 Initiation of paging

The GANC sends the GA-RRC PAGING REQUEST message to the MS when the GANC receives a PAGING message over the Iu interface from a CN domain. The IMSI of the MS to be paged is identified by the IE "Permanent NAS UE Identity" received in the request from the CN. If the request also includes the (P-)TMSI then the GANC shall include the (P-)TMSI in the IE "Mobile Identity"; else the GANC shall include the IMSI in the IE "Mobile Identity". The GANC also includes the IE "CN Domain Identity" and the IE "GA-RRC Paging Cause", if a cause is received from the CN.

8a.3.2 Reception of GA-RRC PAGING REQUEST by the MS

If the mobile identity in the GA-RRC PAGING REQUEST message matches any of the valid identities of the MS and the GA-RRC sub-layer entity in the MS is in the GA-RRC-IDLE state for the indicated domain, the MS shall:

- if timer TU5908 is not active for the domain and access to the network is allowed:

    - indicate reception of paging to upper layers, and

    - forward the IE "CN Domain Identity", the IE "Mobile Identity" and the IE "Paging Cause" (if received) to the upper layers;

    - Note: The upper layers will request the establishment of a signalling connection and the transmission of the paging response in the initial NAS message. This results in the implicit establishment of the GA-RRC connection (i.e., the GA-RRC sub-layer entity in the MS enters the GA-RRC CONNECTED state) and the transmission of the paging response from the MS to the GANC in the GA-RRC INITIAL DIRECT TRANSFER message, as shown in Figure 8a.3.1.

- if timer TU5908 is active for the domain:

    - ignore the GA-RRC PAGING REQUEST message, and

    - continue with the ongoing procedure as if the GA-RRC PAGING REQUEST was not received.

8a.3.3 Abnormal Cases

If the MS receives a GA-RRC PAGING REQUEST message and the GA-RRC sublayer entity in the MS is in GA-RRC-CONNECTED state for the indicated domain or the MS is in the GA-RC-REGISTERED state but in GERAN/UTRAN/E-UTRAN mode, the MS shall:

- ignore the GA-RRC PAGING REQUEST message, and

- continue with any ongoing procedure as if the GA-RRC PAGING REQUEST was not received.

If the MS receives a GA-RRC PAGING REQUEST and the mobile identity included in the message does not match any of the valid identities assigned to the MS, the MS shall:

- ignore the GA-RRC PAGING REQUEST message, and

- continue with any ongoing procedure as if the GA-RRC PAGING REQUEST message was not received.

8a.4 Transport channel activation

There are two versions of the transport channel activation procedure, the circuit transport channel (i.e., the "RTP channel") activation procedure and the packet transport channel activation procedure. As illustrated in the following sub-clauses, these two procedures use the same messages and the same basic message flows (as illustrated in the following figure), but differ in the content of the messages.
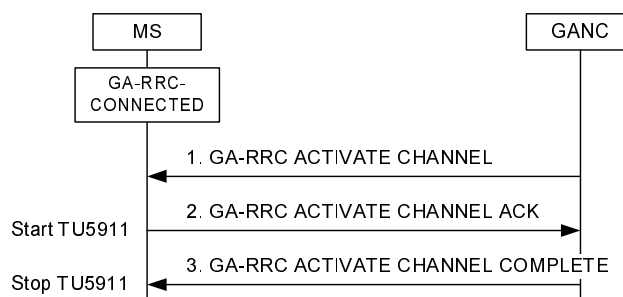
Figure 8a.4.1 Transport channel activation, normal flow

8a.4.1 Circuit transport channel activation

8a.4.1.1 Initiation of circuit transport channel activation

The following are the possible triggers for initiation of the circuit transport channel (CTC) activation procedure:

- If the MS is in the GA-RRC-CONNECTED state for the CS domain and the GANC receives the RAB Assignment Request message from the MSC;

- If the MS is in the GA-RRC-CONNECTED state for the CS domain and the GANC receives the GA-RRC RELOCATION ACCESS message from the MS during the CS handover to GAN Iu mode process (see sub-clause 8a.10.5).

One or more CTCs may be activated using a single instance of the channel activation procedure; however, it is not possible to activate both circuit and packet transport channels using a single instance of the channel activation procedure.

The GANC begins the activation of the CTC(s) by transmitting the GA-RRC ACTIVATE CHANNEL message to the MS. The message contains the IE "CN Domain Identity" (indicating CS domain) and IE "CTC Activation List" which includes the parameters necessary to describe each circuit transport channel.

8a.4.1.2 Reception of GA-RRC ACTIVATE CHANNEL (CS domain) by the MS

The MS shall act on the received GA-RRC ACTIVATE CHANNEL message indicating the CS domain as follows:

- for each CTC specified in the IE "CTC Activation List":

- store the RAB ID;

- if the IE "RAB Configuration" indicates that the CTC is for AMR or AMR-WB speech, use the format specified in Annex A.1 and Annex D to code and decode the RTP packets;

- if the IE "RAB Configuration" indicates that the CTC is for circuit switched data, use the format specified in Annex A.2 to code and decode the RTP packets;

- use the value indicated by the IE "Sample Size" as the minimum sample size for the coding and decoding of the RTP packets, if the MS is not able to use the indicated value. If the circuit transport channel is for AMR or AMR-WB speech with RTP redundancy, the sample size is defined as the size of the new speech sample in each RTP packet, not including any redundant speech samples;

- configure the uplink RTP packets to be transmitted to the UDP port and IP address identified by the IE "RTP UDP Port" and the IE "GANC IP address", respectively;

- use the Payload Type included in the IE "Payload Type" for the PT field in the RTP header for the RTP packets;

- if received, use the configuration included in the IE "Multi-rate Configuration 2" for the circuit transport channel that is for AMR or AMR-WB speech;

- if received, use the configuration included in the IE "RTP Redundancy Configuration" for the circuit transport channel that is for AMR or AMR-WB speech. The redundancy policy is defined for each of the AMR modes

specified in the IE "Multi-rate Configuration 2". The level of redundancy can span from no redundancy to double redundancy. In the same active codec set, a lower codec mode shall not be associated with a lower redundancy level then a higher codec mode. For example, the highest mode in the set is used with no redundancy, the next lower with single redundancy and rest of the modes with double redundancy.

-   if received, pass the contents of the NAS Synchronisation Indicator to upper layers.

On completing the above procedure, the MS shall:

-   start timer TU5911 for the CS domain;

-   transmit a GA-RRC ACTIVATE CHANNEL ACK message including the IE "CN Domain Identity" and the IE "CTC Activation Ack List". For each CTC specified in the IE "CTC Activation Ack List":

-   include the IE "RAB ID" for the CTC with the same value as received in the GA-RRC ACTIVATE CHANNEL message in the IE "RAB ID";

-   include the IE "GA-RRC Cause" indicating either success (i.e., value '0') or a failure cause value;

-   for each CTC that is successfully configured (i.e., GA-RRC Cause value is '0'):

-   include the allocated UDP port number in the IE "RTP UDP Port" for the downlink RTP packets to be sent from the GANC to the MS;

-   include the selected RTP sample size, to be used for uplink and downlink RTP packets, in the IE "Sample Size";

-   include the Payload Type in the IE "Payload Type";

-   if the IE "RTCP UDP Port" was received in the GA-RRC ACTIVATE CHANNEL message and the MS is capable of supporting RTCP, activate the uplink RTCP stream and include the IE "RTCP UDP Port" for the downlink RTCP packets to be sent from the GANC to the MS.

8a.4.1.3 Reception of GA-RRC ACTIVATE CHANNEL ACK (CS domain) by GANC

On reception of the GA-RRC ACTIVATE CHANNEL ACK message indicating the CS domain, the GANC shall configure itself for transmission of RTP packets to the "RTP UDP Port" indicated in the message and RTCP packets to the "RTCP UDP Port" indicated in the message (if included) for each successfully activated CTC, and transmit a GA-RRC ACTIVATE CHANNEL COMPLETE message to the MS.

To enable downlink quality measurements in the MS, the GANC shall send at least one RTP frame each 480 ms for each active CTC. During periods of discontinuous transmission (DTX), if the CTC is for AMR or AMR-WB speech, each RTP frame transmitted by the GANC shall bear a format in the AMR/AMR-WB payload Table of Contents that either (a) omits all NO_DATA indications and contains only the next AMR speech or SID frame that is available, or (b) includes a single NO_DATA frame should no AMR speech or SID frame become available for 480 ms. The RTP timestamp shall indicate the time of that speech or SID or NO_DATA frame. See Section A.1.2 of Annex A for examples.

8a.4.1.4 Reception of GA-RRC ACTIVATE CHANNEL COMPLETE (CS domain) by MS

On reception of the GA-RRC ACTIVATE CHANNEL COMPLETE message indicating the CS domain, the MS shall stop timer TU5911 for the CS domain and consider the successfully activated CTC(s) to be available for use by upper layers. To enable uplink quality measurements in the GANC, the MS shall send at least one RTP frame each 480 ms for each active CTC. During periods of discontinuous transmission (DTX), each RTP frame transmitted by the MS shall bear a format in the AMR/AMR-WB payload Table of Contents that either (a) omits all NO_DATA indications and contains only the next AMR speech or SID frame that is available, or (b) includes a single NO_DATA frame should no AMR speech or SID frame become available for 480 ms. The RTP timestamp shall indicate the time of that speech or SID or NO_DATA frame. See Section A.1.2 of Annex A for examples.

8a.4.2 Packet transport channel activation

8a.4.2.1 Initiation of packet transport channel activation

The following is the possible trigger for initiation of the packet transport channel activation procedure:

- If the MS is in the GA-RRC-CONNECTED state for the PS domain and the GANC receives the RAB Assignment Request message from the SGSN.

One or more packet transport channels may be activated using a single instance of the channel activation procedure; however, it is not possible to activate both circuit and packet transport channels using a single instance of the channel activation procedure.

The GANC begins the activation of the PTC(s) by transmitting the GA-RRC ACTIVATE CHANNEL message to the MS. The message contains the IE "CN Domain Identity" (indicating PS domain) and IE "PTC Activation List" which includes the parameters necessary to describe each packet transport channel.

8a.4.2.2 Reception of GA-RRC ACTIVATE CHANNEL (PS domain) by the MS

The MS shall act on the received GA-RRC ACTIVATE CHANNEL message indicating the PS domain as follows:

- for each PTC specified in the IE "PTC Activation List":

- store the RAB ID;

- allocate local PTC resources based on the values in the IE "RAB Configuration";

- use the TEID value included in the IE "GANC TEID" for the TEID field in the GA-RRC PDU messages to be sent to the GANC;

- use the TEID value included in the IE "MS TEID" to verify the TEID field in the GA-RRC PDU messages to be received from the GANC;

- configure the uplink GA-RRC PDU messages to be transmitted to the UDP port and IP address identified by the IE "GANC UDP Port" and the IE "GANC IP address", respectively.

On completing the above procedure, the MS shall:

- start timer TU5911 for the PS domain;

- transmit a GA-RRC ACTIVATE CHANNEL ACK message including the IE "CN Domain Identity" and the IE "PTC Activation Ack List". For each PTC specified in the IE "PTC Activation Ack List":

- include the IE "RAB ID" for the PTC with the same value as received in the GA-RRC ACTIVATE CHANNEL message in the IE "RAB ID";

- include the IE "GA-RRC Cause" indicating either success (i.e., value '0') or a failure cause value;

- for each PTC that is successfully configured (i.e., GA-RRC Cause value is '0'):

- include the allocated UDP port number in the IE "MS UDP Port" for the downlink GA-RRC PDU messages to be sent from the GANC to the MS.

8a.4.2.3 Reception of GA-RRC ACTIVATE CHANNEL ACK (PS domain) by GANC

On reception of the GA-RRC ACTIVATE CHANNEL ACK message indicating the PS domain, the GANC shall configure itself for transmission of GA-RRC PDU messages to the "MS UDP Port" indicated in the message for each successfully activated PTC, and transmit a GA-RRC ACTIVATE CHANNEL COMPLETE message to the MS.

8a.4.2.4 Reception of GA-RRC ACTIVATE CHANNEL COMPLETE (PS domain) by MS

On reception of the GA-RRC ACTIVATE CHANNEL COMPLETE message indicating the PS domain, the MS shall stop timer TU5911 for the PS domain, and start timer TU4001 for each of the successfully activated PTC(s) which are now available for use by upper layers.

8a.5 GA-RRC connection release

8a.5.1 GA-RRC connection release request by MS

If the MS needs to release the GA-RRC connection and signalling connection to a particular CN domain, it shall send the GA-RRC RELEASE REQUEST message to the GANC and start timer TU5909 for the domain. The MS shall include the IE "CN Domain Identity" and the IE "GA-RRC Cause". The GA-RRC Cause value shall be one of the following:

#40: UE generated signalling connection release

#115: unspecified failure
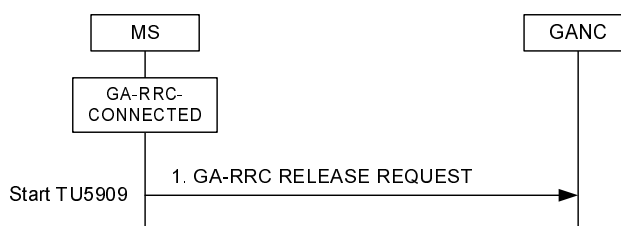
Figure 8a.5.1.1 GA-RRC connection release request by MS

8a.5.2 Reception of GA-RRC RELEASE REQUEST by GANC

When the GANC receives the GA-RRC RELEASE REQUEST message, it shall request the selected CN domain to release the Iu connection for the MS, including all active RABs for that domain. The GANC selects the CN domain based on the value of the received IE "CN Domain Identity".

8a.5.3 Initiation of GA-RRC connection release by GANC

The GANC initiates the GA-RRC connection release procedure to command the MS to release the GA-RRC connection and any user plane resources for a particular domain and instruct the GA-RRC sub-layer entity of the MS to leave the GA-RRC-CONNECTED state and return to the GA-RRC-IDLE state for the domain. The GANC normally initiates this procedure when it receives the Iu Release Command from the CN; however, the GANC may also initiate this procedure under certain failure conditions.
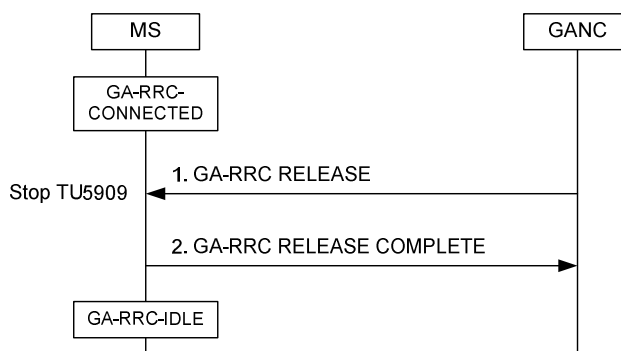
Figure 8a.5.3.1 GA-RRC connection release, normal flow

The GANC initiates the GA-RRC connection release procedure by sending the GA-RRC RELEASE message to the MS.

The GA-RRC RELEASE message includes the IE "GA-RRC Cause". The GA-RRC Cause value should be one of the following:

- #83: normal release; e.g., at the end of a call

- #115: unspecified failure

Other values, if received, should be treated as "unspecified failure".

8a.5.4 Reception of GA-RRC RELEASE by MS

When the GA-RRC sublayer entity in the MS receives the GA-RRC RELEASE message, it shall:

- send a GA-RRC RELEASE COMPLETE message to the GANC,

- release the GA-RRC connection and any user plane resources for the indicated domain,

- stop timer TU5002 for the domain (if running) (see sub-clause 8a.8),

- stop timer TU5909 for the domain (if running), and

- enter the GA-RRC-IDLE state for the domain.

8a.5.5 Failure cases

8a.5.5.1 Timer TU5909 expiry

If timer TU5909 expires in the MS, the GA-RRC sublayer entity in the MS shall release the GA-RRC connection and any user plane resources and enter the GA-RRC-IDLE state for the domain associated with the TU5909 timer.

8a.6 Security mode control

The security mode control procedure is used by the network to set the security mode; i.e., the settings for integrity protection and encryption, including the algorithms to use. This information is not used when GA-RRC is the serving entity in the MS, but shall be stored in the MS for possible future use after a handover from GAN Iu mode to UTRAN during the same upper layer transaction (i.e., the UTRAN RRC layer becomes the serving entity during this upper layer transaction).

The security mode control procedure also proves that the MS identity that is authenticated to the GANC is the same as the MS identity authenticated to the core network.

The security mode control procedure applies only for a MS in the GA-RRC-CONNECTED state for either the CS domain or the PS domain.

The security mode control procedure is always triggered by the network.
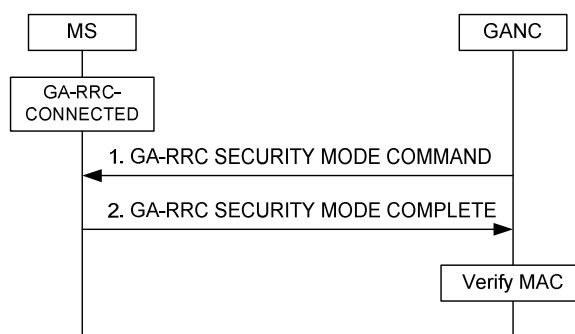
Figure 8a.6.1 Security mode control, normal flow

8a.6.1 Security mode control initiation

The GANC initiates the security mode control procedure by sending a GA-RRC SECURITY MODE COMMAND message to the MS. This message includes the IE "Selected Integrity Protection Algorithm", the IE "Selected Encryption Algorithm" (optional), and the IE "Random Number". The GANC selects the algorithms based on the permitted algorithms received from the CN and the MS security capabilities indicated in the IE "3G Security Capability" received from the MS in the GA-RC REGISTER REQUEST message.

8a.6.2 Security mode control completion

Whenever the MS receives a valid GA-RRC SECURITY MODE COMMAND message, it shall, if a (U)SIM is present and considered valid and the key set identifier (KSI) stored on the (U)SIM indicates that an integrity key and cipher key are available for the domain indicated in the IE "CN Domain Identity", store the selected integrity protection algorithm and (if received) the selected encryption algorithm for possible future use after a handover from GAN Iu mode to UTRAN during the same upper layer transaction. If handover from GAN Iu mode to UTRAN occurs, encryption is enabled if the IE 'Selected Encryption Algorithm' is present in the message and disabled otherwise.

The MS shall also calculate a MAC (Message Authentication Code). The MAC shall be calculated over the following data:

$$RAND \mid IMSI$$

using "HMAC-SHA1-96" algorithm, as specified in [24] with the integrity key (IK) for the domain indicated in the IE "CN Domain Identity" used as the authentication key.

In the formulas above, the "|" character denotes concatenation. RAND is the 16-octet random number received from the GANC in the GA-RRC SECURITY MODE COMMAND message. IMSI is the MS IMSI, in the same format as defined for the Mobile Identity IE as defined in [8]; i.e. as a variable-length sequence of digits in BCD format (e.g. the IMSI "123456789098765" is encoded as the following octets (in hexadecimal): "21 43 65 87 09 89 67 F5"). Network byte order is used.

The IK key is the IK that has been derived during the last authentication for the domain indicated in the IE "CN Domain Identity". The length of the MAC is 12 octets.

When the appropriate action on the GA-RRC SECURITY MODE COMMAND message has been taken, the MS sends a GA-RRC SECURITY MODE COMPLETE message to the GANC. The MS includes the calculated MAC value in the IE "Ciphering Command MAC".

8a.7 Transport channel modification

There are two versions of the transport channel modification procedure, the circuit transport channel modification procedure and the packet transport channel modification procedure. As illustrated in the following sub-clauses, these two procedures use the same messages and the same basic message flows (as illustrated in the following figure), but differ in the content of the messages.
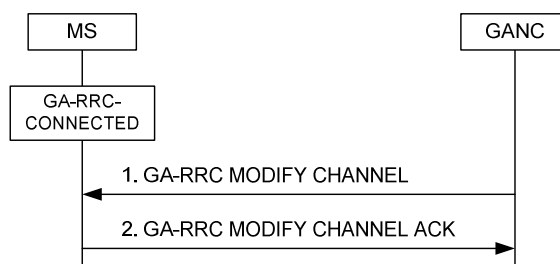
Figure 8a.7.1 Transport channel modification, normal flow

8a.7.1 Circuit transport channel modification

8a.7.1.1 Initiation of circuit transport channel modification

The GANC initiates the circuit transport channel (CTC) modification procedure when it determines that one or more active CTCs require modification; e.g., based on information received from the MSC in the RAB Assignment Request message or based on local GANC logic.

The following CTC parameters may be modified:

- RAB Configuration

- Sample Size

- GANC RTP UDP Port

- GANC IP Address

- Multi-rate Configuration 2

- RTP Redundancy Configuration

- GANC RTCP UDP Port

- NAS Synchronisation Indicator

    The GANC only includes the IEs which specify modifications to the existing CTC parameters.

One or more CTCs may be modified using a single instance of the channel modification procedure; however, it is not possible to modify both circuit and packet transport channels using a single instance of the channel modification procedure.

The GANC begins the modification of the CTC(s) by transmitting the GA-RRC MODIFY CHANNEL message to the MS. The message contains the IE "CN Domain Identity" (indicating CS domain) and IE "CTC Modification List" which includes the parameters necessary to describe the modifications to each circuit transport channel.

8a.7.1.2 Reception of GA-RRC MODIFY CHANNEL (CS domain) by the MS

On receipt of the GA-RRC MODIFY CHANNEL message indicating the CS domain, the MS shall process the specified CTC modifications.

On completion of the modification of the CTC(s), the MS shall:

- transmit a GA-RRC MODIFY CHANNEL ACK message including the IE "CN Domain Identity" and the IE "CTC Modification Ack List". For each CTC specified in the IE "CTC Modification Ack List":

- include the IE "RAB ID" for the CTC with the same value as received in the GA-RRC MODIFY CHANNEL message in the IE "RAB ID";

- include the IE "GA-RRC Cause" indicating either success (i.e., value '0') or a failure cause value;

- for each CTC that is successfully modified (i.e., GA-RRC Cause value is '0'):

- include the modified parameter values currently used by the MS.

When the MS has sent the GA-RRC MODIFY CHANNEL ACK message, it shall start transmitting RTP packets based on the successful parameter modifications. The MS shall be able to receive RTP packets with the old parameters until the MS determines that the first RTP packet using the new parameters has been received.

8a.7.1.3 Reception of GA-RRC MODIFY CHANNEL ACK (CS domain) by GANC

On reception of the GA-RRC MODIFY CHANNEL ACK message indicating the CS domain, the GANC shall configure itself for transmission of RTP packets to the MS using the new parameter values for the successfully modified CTC(s). The GANC shall be able to receive RTP packets with the old parameters until the GANC determines that the first RTP packet using the new parameters has been received.

8a.7.2 Packet transport channel modification

8a.7.2.1 Initiation of packet transport channel modification

The GANC initiates the packet transport channel (PTC) modification procedure when it determines that one or more active PTCs require modification; e.g., based on information received from the SGSN in the RAB Assignment Request message or based on local GANC logic.

The following PTC parameters may be modified:

- RAB Configuration

- GANC UDP Port

- GANC IP Address

    The GANC only includes the IEs which specify modifications to the existing PTC parameters.

One or more PTCs may be modified using a single instance of the channel modification procedure; however, it is not possible to modify both circuit and packet transport channels using a single instance of the channel modification procedure.

The GANC begins the modification of the PTC(s) by transmitting the GA-RRC MODIFY CHANNEL message to the MS. The message contains the IE "CN Domain Identity" (indicating PS domain) and IE "PTC Modification List" which includes the parameters necessary to describe the modifications to each packet transport channel.

8a.7.2.2 Reception of GA-RRC MODIFY CHANNEL (PS domain) by the MS

On receipt of the GA-RRC MODIFY CHANNEL message indicating the PS domain, the MS shall process the specified PTC modifications.

On completion of the modification of the PTC(s), the MS shall:

- transmit a GA-RRC MODIFY CHANNEL ACK message including the IE "CN Domain Identity" and the IE "PTC Modification Ack List". For each PTC specified in the IE "PTC Modification Ack List":

- include the IE "RAB ID" for the PTC with the same value as received in the GA-RRC MODIFY CHANNEL message in the IE "RAB ID";

- include the IE "GA-RRC Cause" indicating either success (i.e., value '0') or a failure cause value;

- for each PTC that is successfully modified (i.e., GA-RRC Cause value is '0'):

- include the modified parameter values currently used by the MS.

When the MS has sent the GA-RRC MODIFY CHANNEL ACK message, it shall start transmitting GA-RRC PDU messages based on the successful parameter modifications. The MS shall be able to receive GA-RRC PDU messages with the old parameters until the MS determines that the first GA-RRC PDU message using the new parameters has been received.

8a.7.2.3 Reception of GA-RRC MODIFY CHANNEL ACK (PS domain) by GANC

On reception of the GA-RRC MODIFY CHANNEL ACK message indicating the PS domain, the GANC shall configure itself for transmission of GA-RRC PDU messages to the MS using the new parameter values for the successfully modified PTC(s). The GANC shall be able to receive GA-RRC PDU messages with the old parameters until the GANC determines that the first GA-RRC PDU message using the new parameters has been received.

8a.8 Transport channel deactivation

8a.8.1 Transport channel deactivation request by MS

If the MS needs to deactivate one or more transport channels for a particular domain, it shall send the GA-RRC DEACTIVATE CHANNEL REQUEST message to the GANC and start timer TU5002 for the domain. The MS shall include the IE "CN Domain Identity" and the IE "GA-RRC Cause". The GA-RRC Cause value shall be one of the following:

#0:   normal release (e.g., due to inactivity timer timeout)

#115: unspecified failure
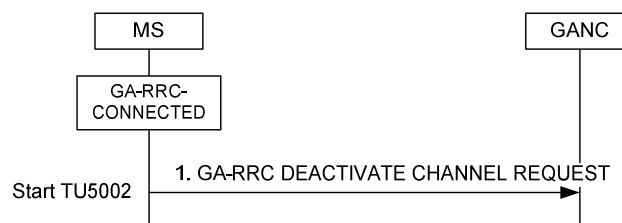
Figure 8a.8.1 Transport channel deactivation request by MS

8a.8.2 Reception of GA-RRC DEACTIVATE CHANNEL REQUEST by GANC

When the GANC receives the GA-RRC DEACTIVATE CHANNEL REQUEST message, it shall request the selected CN domain to release the identified RABs associated with the MS. The GANC selects the CN domain based on the value of the received IE "CN Domain Identity". Note that the GANC may also request the selected CN domain to release the Iu connection for the MS in this case, based on local policy settings.

8a.8.3 Initiation of transport channel deactivation by GANC

The GANC normally initiates this procedure when it receives the RAB Assignment message from the CN indicating RAB release; however, the GANC may also initiate this procedure under certain failure conditions.
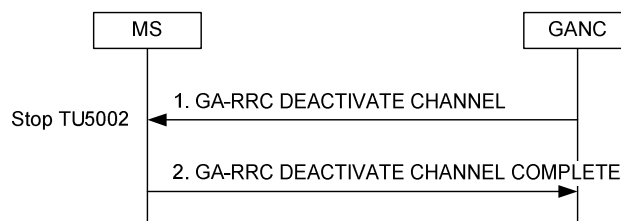
Figure 8a.8.3 Transport channel deactivation, normal flow

One or more circuit or packet transport channels may be deactivated using a single instance of the channel deactivation procedure; however, it is not possible to deactivate both circuit and packet transport channels using a single instance of the channel deactivation procedure.

The GA-RRC DEACTIVATE CHANNEL message includes the IE "GA-RRC Cause" with value as follows:

#0: normal event, e.g. deactivate due to RAB release request from CN

#115: unspecified failure

#10: relocation cancelled (e.g., the handover procedure is stopped because the call has been cleared)

8a.8.4 Reception of GA-RRC DEACTIVATE CHANNEL by MS

When the MS receives the GA-RRC DEACTIVATE CHANNEL message, it shall:

- deactivate the CTC(s) or PTC(s) identified in the IE "RAB ID List";

- send a GA-RRC DEACTIVATE CHANNEL COMPLETE message to the GANC.

8a.8.5 Failure cases

8a.8.5.1 Timer TU5002 expiry

If timer TU5002 expires in the MS, the MS shall release the associated transport channel(s).

8a.9 PS domain user plane data transfer

When the corresponding GA-RRC PTC has been activated, both the MS and the GANC can transfer PS domain user data using the GA-RRC PDU message as illustrated in the following figure:
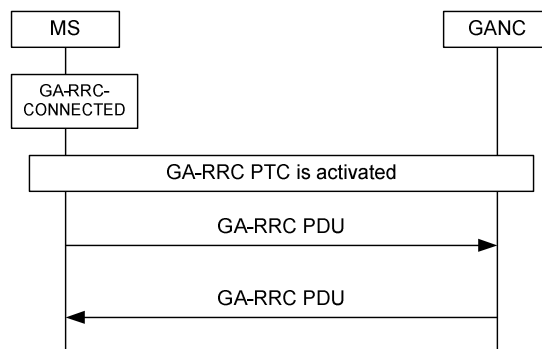
Figure 8a.9.1 GA-RRC PS domain user data transfer

8a.9.1 MS initiates uplink PS domain user plane data transfer

Assuming that the GA-RRC PTC associated with the identified RAB has been activated as specified in sub-clause 8a.4.2, the MS is able to immediately forward any uplink PS domain user data packets for the RAB to the GANC using the PTC. Upon request from the upper layers to transfer an uplink PS domain user data packet associated with a RAB to the GANC, the PS domain GA-RRC sublayer entity in the MS shall restart the TU4001 timer for the PTC, encapsulate the complete PS domain user data packet within a GA-RRC PDU message, and send the GA-RRC PDU message to the GANC using the associated GA-RRC PTC.

If sequencing has been activated for the PTC (i.e., Delivery Order is requested in the IE "RAB Configuration" associated with the PTC), the MS shall include GA-RRC PDU sequence number information in the GA-RRC PDU message sent to the GANC using the PTC. The GA-RRC PDU sequence number information handling is specified in sub-clause 11.1.3b.2.

Note: The GTP-U G-PDU messages from the CN may include GTP-U sequence number information even though Delivery Order is not requested in the RAB Assignment (e.g., the GGSN implementation may always include GTP-U sequence number information). However, GTP-U messages from the GANC to the CN may not include sequence number information in this case (i.e., even though sequence number information is included from CN to GANC).

8a.9.2   Processing of the received GA-RRC PDU message by the GANC

Upon receiving the GA-RRC PDU message from the MS, the GANC shall relay the GA-RRC PDU payload within a GTP-U G-PDU message to the SGSN via the Iu-ps interface using the GTP-U protocol as defined in [53].

Note that all uplink GA-RRC PDU messages sent by the MS terminate at the GANC.

8a.9.3   GANC initiates downlink PS domain user plane data transfer

Assuming that the GA-RRC PTC associated with the identified RAB has been activated as specified in sub-clause 8a.4.2, the GANC is able to immediately forward any downlink PS domain user data packets for the RAB to the MS using the PTC. Upon receiving a downlink GTP-U G-PDU message for the MS from the CN, the GANC shall relay the GTP-U G-PDU payload within a GA-RRC PDU message to the MS using the associated GA-RRC PTC.

8a.9.4   Processing of the received GA-RRC PDU message by the MS

Upon receiving the GA-RRC PDU message from the GANC, the MS shall restart the TU4001 timer for the PTC, extract the received PS domain user data packet and forward the contents to the upper layers in the MS via the PDCP SAP as per standard UMTS.

If sequencing has been activated for the PTC, the MS shall increment the expected downlink GA-RRC PDU sequence number for each GA-RRC PDU message received from the GANC using the PTC.

Note that all downlink GA-RRC PDU messages received by the MS are sent from the GANC.

8a.9.5   Abnormal Cases

8a.9.5.1   TU4001 timer expiry

If timer TU4001 expires, the MS shall request deactivation of the PTC as specified in sub-clause 8a.8.1.

8a.9.5.2   GANC receives a GA-RRC PDU message while the GA-RRC PTC activation procedure is in progress

Upon receiving an uplink GA-RRC PDU message while the GA-RRC PTC activation procedure for the PTC is in progress, the GANC will process the request as if the GA-RRC PTC was active.

8a.9.5.3   GANC receives a GA-RRC PDU message and the GA-RRC PTC is not active

Upon receiving an uplink GA-RRC PDU message that is associated with a GA-RRC PTC that does not exist, the GANC shall discard the message and initate PTC deactivation as defined in sub-clause 8a.8.

8a.9.5.4   Handling of out-of-sequence packets

Packets received out-of-sequence by the MS shall be processed as described in sub-clause 11.1.3b.2.

8a.9.5.5   MS receives a GA-RRC PDU message while the GA-RRC PTC activation procedure is in progress

Upon receiving a downlink GA-RRC PDU message before sending the response to a received PTC activation request, the MS shall queue the received GA-RRC PDU message and process the message immediately after completing the PTC activation.

8a.9.5.6   Uplink PS domain user data transfer failed due to lower layer failure

If a lower layer failure is detected while attempting to send an uplink PS domain user data packet, the MS shall declare the procedure as failed and send the corresponding indication to upper layers.

8a.10 Handover to GAN Iu mode

The handover to GAN Iu mode procedure is applicable when the MS is in the GA-RC-REGISTERED state.

The preparation phase of the handover to GAN Iu mode procedure is normally initiated when the GANC sends the GA-RRC RELOCATION REQUEST message to the MS, as illustrated in Figure 8a.10.1.

The exception is when the GANC receives a Relocation Request message that does not include the IMSI parameter from a MSC. This exception case is described in sub-clause 8a.10.5.
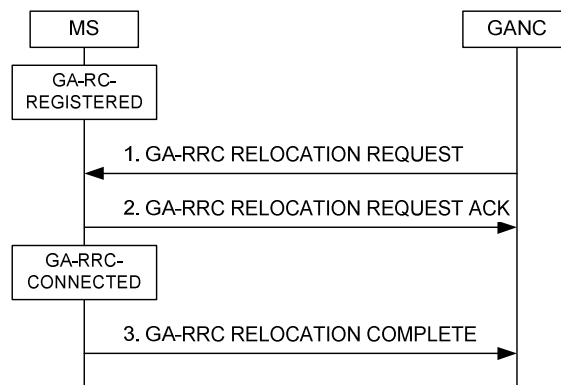
Figure 8a.10.1: Handover to GAN Iu mode, successful case

8a.10.1 Reception of GA-RRC RELOCATION REQUEST by the MS

The GA-RRC RELOCATION REQUEST message contains the IE "CN Domains to Handover" indicating the CS domain, the PS domain or both CS and PS domains. If the CS domain or both CS and PS domains is indicated, the message includes the IE "CTC Activation List". If the PS domain or both CS and PS domains is indicated, the message includes the IE "PTC Activation List".

The MS shall act on the received GA-RRC RELOCATION REQUEST message containing the IE "CTC Activation List" as follows:

- for each CTC specified in the IE "CTC Activation List":

- store the RAB ID;

- if the IE "RAB Configuration" indicates that the CTC is for AMR or AMR-WB speech, use the format specified in Annex A.1 and Annex D to code and decode the RTP packets;

- if the IE "RAB Configuration" indicates that the CTC is for circuit switched data, use the format specified in Annex A.2 to code and decode the RTP packets;

- use the value indicated by the IE "Sample Size" as the minimum sample size for the coding and decoding of the RTP packets, if the MS is not able to use the indicated value. If the circuit transport channel is for AMR or AMR-WB speech with RTP redundancy, the sample size is defined as the size of the new speech sample in each RTP packet, not including any redundant speech samples;

- configure the uplink RTP packets to be transmitted to the UDP port and IP address identified by the IE "RTP UDP Port" and the IE "GANC IP address", respectively;

- use the Payload Type included in the IE "Payload Type" for the PT field in the RTP header for the RTP packets;

- if received, use the configuration included in the IE "Multi-rate Configuration 2" for the circuit transport channel that is for AMR or AMR-WB speech;

- if received, use the configuration included in the IE "RTP Redundancy Configuration" for the circuit transport channel that is for AMR or AMR-WB speech. The redundancy policy is defined for each of the AMR modes specified in the IE "Multi-rate Configuration 2". The level of redundancy can span from no redundancy to

double redundancy. In the same active codec set, a lower codec mode shall not be associated with a lower redundancy level then a higher codec mode. For example, the highest mode in the set is used with no redundancy, the next lower with single redundancy and rest of the modes with double redundancy.

- if received, pass the contents of the NAS Synchronisation Indicator to upper layers.

The MS shall act on the received GA-RRC RELOCATION REQUEST message containing the IE "PTC Activation List" as follows:

- for each PTC specified in the IE "PTC Activation List":

- store the RAB ID;

- allocate local PTC resources based on the values in the IE "RAB Configuration";

- use the TEID value included in the IE "GANC TEID" for the TEID field in the GA-RRC PDU messages to be sent to the GANC;

- use the TEID value included in the IE "MS TEID" to verify the TEID field in the GA-RRC PDU messages to be received from the GANC;

- configure the uplink GA-RRC PDU messages to be transmitted to the UDP port and IP address identified by the IE "GANC UDP Port" and the IE "GANC IP address", respectively.

On completing the above procedures, the MS shall:

- transmit a GA-RRC RELOCATION REQUEST ACK message including the IE "CN Domains to Handover" with value the same as received in the GA-RRC RELOCATION REQUEST message. If the CS domain or both CS and PS domains is indicated, the message shall include the IE "CTC Activation Ack List". If the PS domain or both CS and PS domains is indicated, the message shall include the IE "PTC Activation Ack List".

- For each CTC specified in the IE "CTC Activation Ack List" (if included):

- include the IE "RAB ID" for the CTC with the same value as received in the GA-RRC RELOCATION REQUEST message in the IE "RAB ID";

- include the IE "GA-RRC Cause" indicating either success (i.e., value '0') or a failure cause value;

- for each CTC that is successfully configured (i.e., GA-RRC Cause value is '0'):

- include the allocated UDP port number in the IE "RTP UDP Port" for the downlink RTP packets to be sent from the GANC to the MS;

- include the selected RTP sample size, to be used for uplink and downlink RTP packets, in the IE "Sample Size";

- include the Payload Type in the IE "Payload Type";

- if the IE "RTCP UDP Port" was received in the GA-RRC RELOCATION REQUEST message and the MS is capable of supporting RTCP, activate the uplink RTCP stream and include the IE "RTCP UDP Port" for the downlink RTCP packets to be sent from the GANC to the MS.

- For each PTC specified in the IE "PTC Activation Ack List" (if included):

- include the IE "RAB ID" for the PTC with the same value as received in the GA-RRC RELOCATION REQUEST message in the IE "RAB ID";

- include the IE "GA-RRC Cause" indicating either success (i.e., value '0') or a failure cause value;

- for each PTC that is successfully configured (i.e., GA-RRC Cause value is '0'):

- include the allocated UDP port number in the IE "MS UDP Port" for the downlink GA-RRC PDU messages to be sent from the GANC to the MS.

After transmitting the GA-RRC RELOCATION REQUEST ACK message to the GANC, the GA-RRC sub-layer entity (if only one of CS and PS domains is subject to handover) or entities (if both CS and PS domains are subject to handover) in the MS transitions to the GA-RRC CONNECTED state.

8a.10.2   Reception of GA-RRC RELOCATION REQUEST ACK by the GANC

On reception of the GA-RRC RELOCATION REQUEST ACK message, the GANC shall do the following:

- If the IE "CN Domains to Handover" indicates either the CS domain or both domains, the GANC shall configure itself for transmission of RTP packets to the "RTP UDP Port" indicated in the message and RTCP packets to the "RTCP UDP Port" indicated in the message (if included) for each successfully activated CTC.

- If the IE "CN Domains to Handover" indicates either the PS domain or both domains, the GANC shall configure itself for transmission of GA-RRC PDU messages to the "MS UDP Port" indicated in the message for each successfully activated PTC.

- The GANC then continues with the relocation preparation process with the CN.

8a.10.3   Normal execution

The normal execution phase of the handover to GAN Iu mode procedure is initiated when the source radio access technology (e.g. GERAN or UTRAN) orders the MS to handover (GERAN) or relocate (UTRAN) to GAN Iu mode.

- The exception is when the GANC receives a Relocation Request message that does not include the IMSI parameter from a MSC. This exception case is described in sub-clause 8a.10.5.

The execution procedure is applicable when the MS is in the GA-RC-REGISTERED state provided the conditions described in Annex C.2: "(Source-RAT) Measurement Report for Handover and Cell Change Order to GAN Iu mode" are met.

The handover order in GERAN is sent via the INTER SYSTEM TO UTRAN HANDOVER COMMAND message which contains a HANDOVER TO UTRAN message. The handover order in UTRAN is sent via the PHYSICAL CHANNEL RECONFIGURATION message. If the UARFCN and PSC parameters included in either of the HANDOVER TO UTRAN message or the PHYSICAL CHANNEL RECONFIGURATION message (both are specified in [40]) match those of the GAN Iu mode cell, the MS shall:

- send a GA-RRC RELOCATION COMPLETE message to the GANC;

- in the case of PS domain handover, start timer TU4001 for each of the successfully activated PTC(s);

- switch the serving RR to GAN Iu mode; i.e. attach the GA-RRC sub-layer entities to the RR-SAP.

8a.10.4   Reception of GA-RRC RELOCATION COMPLETE by the GANC

On reception of the GA-RRC RELOCATION COMPLETE message, the GANC shall indicate handover detection and completion to the CN.

8a.10.5   Exception case: No IMSI in CS domain Relocation Request

The following exception procedures are applicable if the handover is for the CS domain only and the GANC did not receive the IMSI parameter in the Relocation Request message from the MSC. The procedure is illustrated in Figure 8a.10.5.
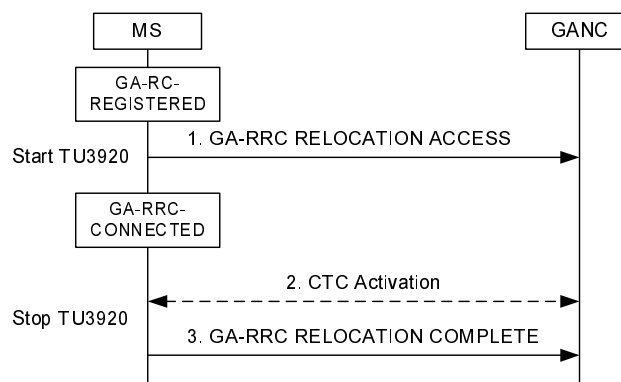
Figure 8a.10.5: Handover to GAN Iu mode, exception case

In this case, the MS will not receive the GA-RRC RELOCATION REQUEST message from the GANC before receiving the handover order from the source radio access technology, as described in sub-clause 8a.10.3.

If the UARFCN and PSC parameters included in either of the HANDOVER TO UTRAN message or the PHYSICAL CHANNEL RECONFIGURATION message match those of the GAN Iu mode cell, the GA-RRC CS domain sub-layer entity in the MS shall:

- if the handover is not for a signalling channel only, the MS shall:

    - send a GA-RRC RELOCATION ACCESS message to the network including the complete UTRAN RRC handover command message in the IE "UTRAN RRC Message" and enter the GA-RRC-CONNECTED state for the CS domain (Note: The MS shall extract the UTRAN RRC *Handover to UTRAN Command* message from the GERAN RRC Handover to UTRAN Command IE that is present in the GERAN RRC *Inter System to UTRAN Command* message);

    - start timer TU3920;

- otherwise, the MS shall:

    - immediately send a GA-RRC RELOCATION COMPLETE message to the GANC;

    - enter the GA-RRC-CONNECTED state for the CS domain;

    - switch the serving RR to GAN Iu mode; i.e. attach the GA-RRC sub-layer entities to the RR-SAP.

On receipt of the GA-RRC RELOCATION ACCESS message, the GANC shall initiate CTC activation as specified in sub-clause 8a.4.1.

On receipt of the GA-RRC ACTIVATE CHANNEL COMPLETE message, the MS shall:

- stop timer TU3920;

- send a GA-RRC RELOCATION COMPLETE message to the GANC;

- switch to GAN Iu mode; i.e. attach the GA-RRC sub-layer entities to the RR-SAP.

On reception of the GA-RRC RELOCATION COMPLETE message, the GANC shall indicate handover detection and completion to the CN.

If the CTC activation procedure fails or the timer TU3920 expires before CTC activation is completed, the MS shall:

- terminate the procedure including release of the associated GA-RRC resources;

- resume the connection in the source radio access technology used before the handover;

- indicate the failure to the source radio access technology.

8a.11   Handover from GAN Iu mode

The purpose of this procedure is to transfer, upon request from the MS (and under the control of the GANC), a connection between the MS and the GANC to another radio access technology (e.g. GERAN or UTRAN).

The procedure is applicable when one or both of the GA-RRC sub-layer entities in the MS are in GA-RRC-CONNECTED state.
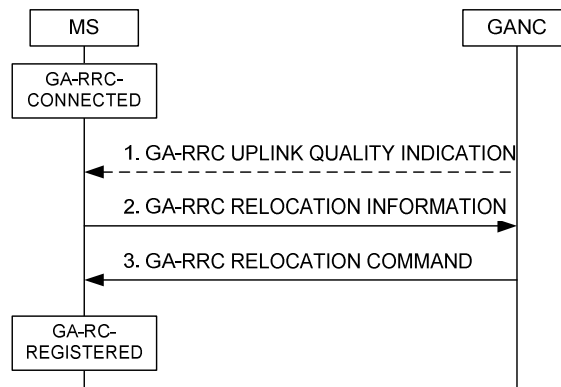
Figure 8a.11.1: Handover from GAN Iu mode, successful case
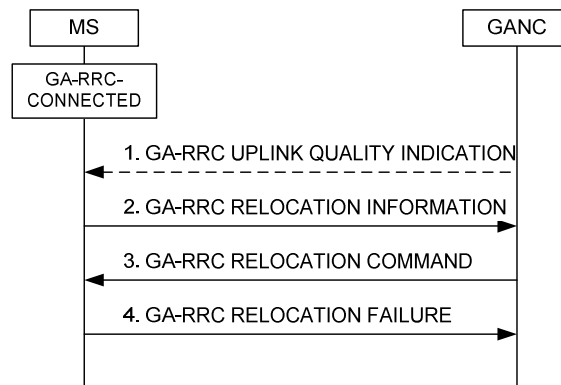
Figure 8a.11.2: Handover from GAN Iu mode, failure case

8a.11.1 Initiation

The procedure may be initiated by the MS based on:

- local measurements of GAN coverage signal quality;

- reception of a GA-RRC UPLINK QUALITY INDICATION message indicating poor uplink quality in the *UL Quality Indication* IE; If the UL Quality Indication IE indicates "Network problem" a handover out to GERAN or UTRAN should be attempted. In case the UL Quality Indication information element shows "Radio problem" or "Undetermined problem" a search for a new access point should be done before the handover out is initiated;

- reception of RTCP packets indicating poor uplink quality (i.e., in the CS case);

- excessive loss or delay in the received RTP packets (i.e., in the CS case).

When the MS decides to trigger the handover from GAN Iu mode, it shall:

- send a GA-RRC RELOCATION INFORMATION message to the GANC including a list of candidate/ target cell identifiers ranked in order of preference which is the most recent list available from the other radio access technology (e.g. GSM RR) and including the received signal strength for each identified GERAN or UTRAN cell. The MS may include GERAN cells, UTRAN cells or both.

8a.11.2 Reception of GA-RRC RELOCATION INFORMATION by the GANC

The GANC should signal the need for handover to the CN.

If the CN grants the handover request, the GANC should send a GA-RRC RELOCATION COMMAND message to the MS.

The GA-RRC RELOCATION COMMAND message should only indicate a target cell which was reported by the MS in the GA-RRC RELOCATION INFORMATION message.

8a.11.3 Reception of GA-RRC RELOCATION COMMAND by the MS

The MS shall:

- suspend all NAS layer signalling transmissions;

- start the connection establishment to the target radio access technology (e.g. GERAN or UTRAN) by using the contents of the IE "UTRAN RRC Message". This message carries information about the candidate/ target cell identifier and radio parameters relevant for the target radio access technology.

A MS with simultaneously active PS and CS sessions in GAN Iu mode shall follow the procedure as outlined in [40] when it switches to the target cell.

NOTE: The requirements concerning the establishment of the radio connection towards the target radio access technology (e.g. GERAN) and the signalling procedure are outside of the scope of this specification.

8a.11.4 Successful completion of the handover from GAN Iu mode

Upon successfully completing the handover from GAN Iu mode, the GANC should:

- release all radio resources associated with the GAN connection.

Upon successfully completing the handover from GAN Iu mode, the MS shall:

- switch to the target radio access technology (e.g. GERAN or UTRAN) mode; i.e. detach the GA-RRC sub-layer entities from the RR-SAP;

- enter the GA-RC-REGISTERED state (but in GERAN/UTRAN mode).

NOTE: The release of the GAN radio resources is initiated from the target RAT. The MS may deregister from the GANC (as defined in sub-clause 6.4) after successfully completing the handover. If the MS chooses to deregister from the GANC, it may do so either immediately after successfully completing the handover or after sending the GA-RRC RELEASE COMPLETE message to the GANC in response to the GA-RRC RELEASE message from the GANC.

8a.11.5 MS fails to complete requested handover

If the MS does not succeed in establishing a connection to the target radio access technology, the MS shall:

- revert back to the GAN Iu mode configuration;

- return a GA-RRC RELOCATION FAILURE message to the GANC and resume normal operation as if the GA-RRC RELOCATION COMMAND message has not been received. The GA-RRC Cause value shall be set to value 'Relocation Failure In Target CN/RNC Or Target System' as specified in [52].

8a.11.6 Reception of GA-RRC RELOCATION FAILURE by the GANC

The GANC may initiate the release of resources in the target radio access technology.

8a.11.7 Abnormal Cases

If the GA-RRC RELOCATION COMMAND message instructs the MS:

- to perform a non-supported scenario, or

- to use a non-supported configuration,

the MS shall return a GA-RRC RELOCATION FAILURE message with GA-RRC Cause value set to 'Unspecified failure' or other appropriate cause as defined in [52] and resume normal operation as if the GA-RRC RELOCATION COMMAND message has not been received.

9 Error handling procedures

9.1 General

The procedures specified in this specification apply to those messages which pass the checks described in this sub-clause.

This sub-clause also 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 providing recovery mechanisms for error situations they define a compatibility mechanism for future extensions of the protocols.

Sub-clauses 9.2 to 9.4 shall be applied in order of precedence.

In this sub-clause the following terminology is used:

- An IE is defined to be syntactically incorrect in a message if it contains at least one value defined as "reserved" in sub-clause 11, or if its value part violates rules of clause 11. However it is not a syntactical error that an IE specifies in its length indicator a greater length than defined in clause 11.

- A message is defined to have semantically incorrect contents if it contains information which, possibly dependent on the state of the receiver, is in contradiction to the resources of the receiver and/or to the procedural part of this specification.

The procedures below apply to GA-RC/GA-CSR, GA-PSR, and GA-RRC messages, unless explicitly specified otherwise. The MS shall use the GA-CSR STATUS message to indicate problems with the GA-RC and GA-CSR protocols, the GA-PSR STATUS message to indicate problems with the GA-PSR protocol, and the GA-RRC STATUS message to indicate problems with the GA-RRC protocol.

9.2 Message too short

When a message is received that is too short to contain a complete message header and all the mandatory information elements, that message shall be ignored.

9.3 Invalid Message Header

If the MS receives a message over UDP with message type not defined or not implemented, it shall ignore the message.

If the MS receives a message over TCP with protocol discriminator not defined or not implemented, it shall ignore the message.

If the MS receives a message with Skip Indicator IE not encoded as 0000 or Length IE greater than 2048, it shall ignore the message.

If the MS receives a message over TCP with message type not defined for the specific PD (GA-RC/GA-CSR, GA-PSR or GA-RRC) or not implemented, it shall return a GA-CSR STATUS, GA-PSR STATUS or GA-RRC STATUS message, respectively, with cause "message type non-existent or not implemented".

If the MS receives a message not compatible with the protocol state, the MS shall ignore the message and shall return a (GA-CSR, GA-PSR or GA-RRC) STATUS message with cause "Message type not compatible with protocol state".

9.4 Invalid Information Elements

If the MS receives a GA-RC/GA-CSR, GA-PSR or GA-RRC message with a missing or syntactically incorrect mandatory IE, the MS shall ignore the message and shall return a (GA-CSR, GA-PSR or GA-RRC) STATUS message with cause "Invalid mandatory information". In addition, if the message was a GA-CSR RELEASE message or GA-RRC RELEASE message, the actions taken shall be the same as specified in sub-clause 7.5 or sub-clause 8a.5, respectively.

The MS shall ignore all unknown IEs in received messages.

The MS shall treat all optional IEs that are syntactically incorrect in a message as not present in the message.

If the MS diagnoses a missing or unexpected conditional IE or when it receives at least one syntactically incorrect conditional IE, it shall ignore the message and shall return a (GA-CSR, GA-PSR or GA-RRC) STATUS message with cause value "conditional IE error".

If the MS receives a message with semantically incorrect contents, it shall ignore the message and shall return a (GA-CSR, GA-PSR or GA-RRC) STATUS message with cause value "semantically incorrect message".

9.5 Handling of lower layer faults

The handling of lower layer failures in the MS while in the GA-RC-DEREGISTERED state is described in sub-clauses 5.6.2 and 6.2.4.2.

The handling of lower layer failures in the MS while not in the GA-RC-DEREGISTERED state is described below:

For all lower layer failures in the MS (for example related to DNS, IPsec or TCP failures other than RST), the MS shall:

- release the TCP connection towards the current GANC, if established,

- stop timer TU3906,

- release the secure connection towards SEGW of the current GANC, if established, as defined in sub-clause 4.5,

- start timer TU3905, and

- enter GA-RC-DEREGISTERED state.

9.6 Out of sequence IEs

The MS shall ignore all out of sequence IEs in a message. The network should take the same approach.

10 Message functional definitions and contents

10.1 GA-RC and GA-CSR Messages

Table 10.1.1 summarizes the GA-RC and GA-CSR messages.

Table 10.1.1: GA-RC and GA-CSR Messages

Discovery messages:	Reference
GA-RC DISCOVERY REQUEST	10.1.2
GA-RC DISCOVERY ACCEPT	10.1.3
GA-RC DISCOVERY REJECT	10.1.4
Registration messages:	**Reference**
GA-RC REGISTER REQUEST	10.1.5
GA-RC REGISTER ACCEPT	10.1.6
GA-RC REGISTER REDIRECT	10.1.7
GA-RC REGISTER REJECT	10.1.8
GA-RC DEREGISTER	10.1.9
GA-RC REGISTER UPDATE UPLINK	10.1.10
GA-RC REGISTER UPDATE DOWNLINK	10.1.11
GA-CSR connection establishment messages:	**Reference**
GA-CSR REQUEST	10.1.12
GA-CSR REQUEST ACCEPT	10.1.13
GA-CSR REQUEST REJECT	10.1.24
Ciphering messages:	**Reference**
GA-CSR CIPHERING MODE COMMAND	10.1.35
GA-CSR CIPHERING MODE COMPLETE	10.1.36
Traffic Channel establishment messages:	**Reference**
GA-CSR ACTIVATE CHANNEL	10.1.15
GA-CSR ACTIVATE CHANNEL ACK	10.1.16
GA-CSR ACTIVATE CHANNEL COMPLETE	10.1.18
GA-CSR ACTIVATE CHANNEL FAILURE	10.1.17
GA-CSR CHANNEL MODE MODIFY	10.1.40
GA-CSR CHANNEL MODE MODIFY ACKNOWLEDGE	10.1.41
Channel release messages:	**Reference**
GA-CSR RELEASE	10.1.19
GA-CSR RELEASE COMPLETE	10.1.20
GA-CSR CLEAR REQUEST	10.1.37
Handover messages:	**Reference**
GA-CSR HANDOVER ACCESS	10.1.29
GA-CSR HANDOVER COMPLETE	10.1.30
GA-CSR UPLINK QUALITY INDICATION	10.1.31
GA-CSR HANDOVER INFORMATION	10.1.32
GA-CSR HANDOVER COMMAND	10.1.33
GA-CSR HANDOVER FAILURE	10.1.34
Paging messages:	**Reference**
GA-CSR PAGING REQUEST	10.1.21
GA-CSR PAGING RESPONSE	10.1.22
Miscellaneous message:	**Reference**
GA-CSR UPLINK DIRECT TRANSFER	10.1.23
GA-CSR DOWNLINK DIRECT TRANSFER	10.1.25
GA-CSR CLASSMARK ENQUIRY	10.1.26
GA-CSR CLASSMARK CHANGE	10.1.27
GA-CSR STATUS	10.1.28
GA-RC KEEP ALIVE	10.1.14
GA-CSR GPRS SUSPENSION REQUEST	10.1.38
GA-RC SYNCHRONIZATION INFORMATION	10.1.39
GA-RC CELL BROADCAST INFO	10.1.14a
GA-CSR UTRAN CLASSMARK CHANGE	10.1.42

10.1.1 (void)

10.1.2 GA-RC DISCOVERY REQUEST

The MS transmits this message to the Provisioning GANC in order to obtain the address information of a Default GANC.

Direction: MS to GANC

Table 10.1.2.1: GA-RC DISCOVERY REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0000	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RC DISCOVERY REQUEST Message Type	Message Type 11.1.1.4	M	V	1		
1	IMSI	Mobile Identity 11.2.1	M	TLV	10		
2	GAN Release Indicator	GAN Release Indicator 11.2.2	M	TLV	3		
7	GAN Classmark	GAN Classmark 11.2.7	M	TLV	4		
3	AP Radio Identity	Radio Identity 11.2.3	C	TLV	9		
6	GERAN/UTRAN coverage Indication	GERAN/UTRAN coverage Indicator 11.2.6	M	TLV	3		
4	GERAN Cell Identity	GERAN Cell Identity 11.2.4	C	TLV	4		
5	Location Area Identification	Location Area Identification 11.2.5	C	TLV	n		
41	Routing Area Code	Routing Area Code 11.2.41	C	TLV	n		
21	Register Reject Cause	Register reject Cause 11.2.21	C	TLV	3		
11	Redirection Counter	Redirection Counter 11.2.11	C	TLV	3		
9	Default GANC-SEGW IP address	IP Address 11.2.9	C	TLV	7-19		
10	Default GANC-SEGW FQDN	Fully Qualified Domain/Host Name 11.2.10	C	TLV	5-258		
97	Default GANC IP address	IP Address 11.2.9	C	TLV	7-19		
98	Default GANC FQDN	Fully Qualified Domain/Host Name 11.2.10	C	TLV	5-258		
73	3G Cell Identity	3G Cell Identity 11.2.73	C	TLV	6		
130	Tracking Area Identity	Tracking Area Identity 11.2.114	O	TLV	8		
132	E-UTRAN Camping Indicator	E-UTRAN Camping Indicator 11.2.116	O	TLV	4		
131	E-UTRAN Cell Identity	E-UTRAN Cell Identity 11.2.115	C	TLV	7		

10.1.2.1 AP Radio Identity

The AP Radio identity shall be included if the MS connects via an AP over the unlicensed radio.

10.1.2.2 GERAN Cell Identity

The GERAN Cell Identity shall be included, if the MS is in an area with GSM Coverage. The GERAN Cell Identity is retrieved from the GSM System information. If the GERAN Cell Identity information element is included, it is not permitted to include the 3G Cell Identity information element or the E-UTRAN Cell Identity information element.

10.1.2.3 Location Area Identification

The most recent Location Area Identification shall be included, if available in the MS. Following cases are identified:

- Normal service or limited service over GERAN/UTRAN.
  In this case the LAI received in the GERAN or UTRAN System Information is included.

- Normal service or limited service over E-UTRAN.
  In this case the LAI is not included.

- MS has not found GERAN/UTRAN/E-UTRAN coverage.
  In this case the LAI is taken from the SIM, if available.

10.1.2.4 Routing Area Code

The Routing Area Code (RAC) shall be included, if available in the MS. Following cases are identified:

- Normal service over GERAN/UTRAN with GPRS support
  In this case the RAC received in the GERAN or UTRAN System Information is included.

- Normal service or limited service over E-UTRAN.
  In this case the RAC is not included.

- MS has not found GERAN/UTRAN/E-UTRAN coverage
  In this case the RAC is taken from the SIM, if available.

- Normal service over GERAN/UTRAN without GPRS support or limited service
  The RAC is not included.

10.1.2.5 Register Reject Cause

The Register Reject Cause shall be included if

The MS reattempts GA-RC Discovery Request after failing to connect to the default GANC.

10.1.2.6 Redirection Counter

The Redirection Counter IE shall be included if Register Reject Cause IE is included.

10.1.2.7 Default GANC-SEGW IP address

The conditional IE Default GANC-SEGW IP address shall be included if the conditional IE Default GANC-SEGW FQDN is not included. It is not permitted to include both Default GANC-SEGW IP address and Default GANC-SEGW FQDN in the same message. One of these IEs shall be included if Register Reject Cause IE is included.

10.1.2.8 Default GANC-SEGW FQDN

The conditional IE Default GANC-SEGW FQDN shall be included if the conditional IE Default GANC-SEGW IP address is not included. It is not permitted to include both Default GANC-SEGW IP address and Default GANC-SEGW FQDN in the same message. One of these IEs shall be included if Register Reject Cause IE is included.

10.1.2.9 Default GANC IP address

The conditional IE Default GANC IP address shall be included if the conditional IE Default GANC FQDN is not included. It is not permitted to include both Default GANC IP address and Default GANC FQDN in the same message. One of these IEs shall be included if Register Reject Cause IE is included.

10.1.2.10   Default GANC FQDN

The conditional IE Default GANC FQDN shall be included if the conditional IE Default GANC IP address is not included. It is not permitted to include both Default GANC IP address and Default GANC FQDN in the same message. One of these IEs shall be included if Register Reject Cause IE is included.

10.1.2.11   3G Cell Identity

The 3G Cell Identity shall be included, if the MS is in an area with UTRAN Coverage. The 3G Cell Identity is retrieved from the UTRAN System information. If the 3G Cell Identity information element is included, it is not permitted to include the GERAN Cell Identity information element.

10.1.2.12   Tracking Area Identity

The most recent Tracking Area Identity shall be included, if the MS supports E-UTRAN and the TAI is available in the MS. Following cases are identified:

- Normal service or limited service over E-UTRAN.
  In this case the TAI received in the E-UTRAN System Information is included.

- Normal service or limited service over GERAN/UTRAN.
  In this case the TAI is not included.

- MS has not found GERAN/UTRAN/E-UTRAN coverage.
  In this case the TAI is taken from the USIM, if available.

10.1.2.13   E-UTRAN Camping Indicator

The E-UTRAN Camping Indicator IE shall be included if the MS is camped on a E-UTRAN cell.

10.1.2.14   E-UTRAN Cell Identity

The E-UTRAN Cell Identity IE shall be included if the MS is camped on a E-UTRAN cell, as indicated by the E-UTRAN Camping Indicator. The MS obtains the E-UTRAN Cell Identity value from the E-UTRAN System information. If the E-UTRAN Cell Identity information element is included, it is not permitted to include the GERAN Cell Identity information element or the 3G Cell Identity information element.

10.1.3   GA-RC DISCOVERY ACCEPT

The Provisioning GANC sends information of the Default GANC and SEGW associated with the Default GANC the MS should use.

Direction: GANC to MS

Table 10.1.3.1: GA-RC DISCOVERY ACCEPT message content`

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0000	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RC DISCOVERY ACCEPT Message Type	Message Type 11.1.1.4	M	V	1		
9	Default GANC-SEGW IP address	IP Address 11.2.9	C	TLV	7-19		
10	Default GANC-SEGW FQDN	Fully Qualified Domain/Host Name 11.2.10	C	TLV	5-258		
97	Default GANC IP address	IP Address 11.2.9	C	TLV	7-19		
98	Default GANC FQDN	Fully Qualified Domain/Host Name 11.2.10	C	TLV	5-258		
103	GANC TCP port number	Communication port 11.2.25	O	TLV	4		

10.1.3.1 Default GANC-SEGW IP address

The conditional IE Default GANC-SEGW IP address shall be included if the conditional IE Default GANC-SEGW FQDN is not included. It is not permitted to include both Default GANC-SEGW IP address and Default GANC-SEGW FQDN in the same message.

10.1.3.2 Default GANC-SEGW FQDN

The conditional IE Default GANC-SEGW FQDN shall be included if the conditional IE Default GANC-SEGW IP address is not included. It is not permitted to include both Default GANC-SEGW IP address and Default GANC-SEGW FQDN in the same message.

10.1.3.3 Default GANC IP address

The conditional IE Default GANC IP address shall be included if the conditional IE Default GANC FQDN is not included. It is not permitted to include both Default GANC IP address and Default GANC FQDN in the same message.

10.1.3.4 Default GANC FQDN

The conditional IE Default GANC FQDN shall be included if the conditional IE Default GANC IP address is not included. It is not permitted to include both Default GANC IP address and Default GANC FQDN in the same message.

10.1.4 GA-RC DISCOVERY REJECT

The Provisioning GANC rejects the Discovery Request from the MS.

Direction: GANC to MS

Table 10.1.4.1: GA-RC DISCOVERY REJECT message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0000	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RC DISCOVERY REJECT Message Type	Message Type 11.1.1.4	M	V	1		
12	Discovery Reject Cause	Discovery Reject Cause 11.2.12	M	TLV	3		
24	TU3902 Timer	TU3902 Timer 11.2.24	C	TLV	4		

10.1.4.1 TU3902 Timer

The TU3902 Timer IE shall be included if the Discovery Reject Cause 'Network Congestion' is returned to the MS.

10.1.5 GA-RC REGISTER REQUEST

The MS registers with the GANC in order to establish a MS context in the GANC and receive the needed GAN system information. The MS also uses this message to request a list of PLMN identities, when the MS is in manual PLMN selection mode.

> Direction: MS to GANC

Table 10.1.5.1: GA-RC REGISTER REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0000	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RC REGISTER REQUEST message identity	Message Type 11.1.1.4	M	V	1		
1	IMSI	Mobile Identity 11.2.1	M	TLV	10		
2	GAN Release Indicator	GAN Release Indicator 11.2.2	M	TLV	3		
7	GAN Classmark	GAN Classmark 11.2.7	M	TLV	4		
3	AP Radio Identity	Radio Identity 11.2.3	C	TLV	9-n		
96	MS Radio identity	Radio Identity 11.2.3	M	TLV	9-n		
17	GSM RR/UTRAN RRC State	GSM RR/ UTRAN RRC State 11.2.17	M	TLV	3		
6	Coverage Indication	GERAN/UTRAN coverage Indicator 11.2.6	M	TLV	3		
4	GERAN Cell Identity	GERAN Cell Identity 11.2.4	C	TLV	4		
5	Location Area Identification	Location Area Identification 11.2.5	C	TLV	7		
41	Routing Area Code	Routing Area Code 11.2.41	C	TLV	3		
8	Geographic Location	Geographical Location 11.2.8	O	TLV	9-n		
42	AP location	AP Location 11.2.42	O	TLV	7-n		
21	Register Reject Cause	Register reject Cause 11.2.21	C	TLV	3		
11	Redirection Counter	Redirection Counter 11.2.11	C	TLV	3		
9	Last GANC-SEGW IP address	IP Address 11.2.9	C	TLV	7-19		
10	Last GANC-SEGW FQDN	Fully Qualified Domain/Host Name 11.2.10	C	TLV	5-258		
97	Last GANC IP address	IP Address 11.2.9	C	TLV	7-19		
98	Last GANC FQDN	Fully Qualified Domain/Host Name 11.2.10	C	TLV	5-258		
61	AP Service Name	AP Service Name 11.2.61	C	TLV	4-260		
68	Registration indicators	Registration Indicators 11.2.68	C	TLV	3		
69	GAN PLMN List	GAN PLMN List 11.2.69	C	TLV	n		
71	Required GAN Services	Required GAN Services 11.2.71	O	TLV	3		
73	3G Cell Identity	3G Cell Identity 11.2.73	C	TLV	6		
82	3G UARFCN	3G UARFCN	O	TLV	4		

ETSI

		11.2.82					
74	3G Security Capability	3G Security Capability 11.2.111	C	TLV	6		
130	Tracking Area Identity	Tracking Area Identity 11.2.114	O	TLV	8		
132	E-UTRAN Camping Indicator	E-UTRAN Camping Indicator 11.2.116	O	TLV	4		
131	E-UTRAN Cell Identity	E-UTRAN Cell Identity 11.2.115	C	TLV	7		

10.1.5.1   GERAN Cell Identity

The GERAN Cell Identity shall be included, if the MS is in an area with GSM Coverage. The GERAN Cell Identity is retrieved from the GSM System information. If the GERAN Cell Identity information element is included, it is not permitted to include the 3G Cell Identity information element or the E-UTRAN Cell Identity information element.

10.1.5.2   Location Area Identification

The most recent Location Area Identification shall be included, if available in the MS. Following cases are identified:

- Normal service or limited service over GERAN/UTRAN
  In this case the LAI received in the GERAN/UTRAN System Information is included.

- Normal service or limited service over E-UTRAN.
  In this case the LAI is not included.

- MS has not found GERAN/UTRAN/E-UTRAN coverage
  In this case the LAI is taken from the SIM, if available.

10.1.5.3   Routing Area Code

The Routing Area Code (RAC) shall be included, if available in the MS. Following cases are identified:

- Normal service over GERAN/UTRAN with GPRS support
  In this case the RAC received in the GSM System Information is included.

- Normal service or limited service over E-UTRAN.
  In this case the RAC is not included.

- MS has not found GERAN/UTRAN/E-UTRAN coverage
  In this case the RAC is taken from the SIM, if available.

- Normal service over GERAN/UTRAN without GPRS support or limited service
  The RAC is not included.

10.1.5.4   Register Reject Cause

The Register Reject Cause shall be included if the MS reattempts GA-RC Register Request after failing to connect to a Serving GANC.

10.1.5.5   Redirection Counter

The Redirection Counter IE shall be included if Register Reject Cause IE is included.

10.1.5.6   Last GANC-SEGW IP address

The conditional IE Last GANC-SEGW IP address shall be included if the conditional IE Last GANC-SEGW FQDN is not included. It is not permitted to include both Last GANC-SEGW IP address and Last GANC-SEGW FQDN in the same message. One of these IEs shall be included if Register Reject Cause is included.

10.1.5.7   Last GANC-SEGW FQDN

The conditional IE Last GANC-SEGW FQDN shall be included if the conditional IE Last GANC-SEGW IP address is not included. It is not permitted to include both Last GANC-SEGW IP address and Last GANC-SEGW FQDN in the same message. One of these IEs shall be included if Register Reject Cause is included.

10.1.5.8   Last GANC IP address

The conditional IE Last GANC IP address shall be included if the conditional IE Last GANC FQDN is not included. It is not permitted to include both Last GANC IP address and Last GANC FQDN in the same message. One of these IEs shall be included if Register Reject Cause is included.

10.1.5.9   Last GANC FQDN

The conditional IE Last GANC FQDN shall be included if the conditional IE Last GANC IP address is not included. It is not permitted to include both Last GANC IP address and Last GANC FQDN in the same message. One of these IEs shall be included if Register Reject Cause is included.

10.1.5.10   AP Radio Identity

The AP Radio identity shall be included if the MS connects via an AP over the unlicensed radio.

10.1.5.11   AP Service Name

The AP Service Name shall be included, if available, and if the MS connects via an AP over the unlicensed radio.

10.1.5.12   Registration Indicators

The MS shall include this information element when attempting to register to the Default GANC. The presence of this Information Element indicates to the GANC that it is the Default GANC for that MS.

10.1.5.13   GAN PLMN List

The GAN PLMN List information element shall be included only when attempting to register with the Default GANC and if no more PLMNs can be selected from the GAN PLMN List received from the Default GANC.

10.1.5.14   3G Cell Identity

The 3G Cell Identity IE shall be included if the MS is in an area with UTRAN Coverage. The 3G Cell Identity is retrieved from the UTRAN System information. If the 3G Cell Identity information element is included, it is not permitted to include the GERAN Cell Identity information element.

10.1.5.15   3G UARFCN

The 3G UARFCN IE shall be included if the MS is currently camped on a UTRAN cell and the MS indicates support for GAN Iu mode in the GAN Classmark IE.

10.1.5.16   3G Security Capability

The 3G Security Capability IE shall be included if the MS indicates support for GAN Iu mode in the GAN Classmark IE.

10.1.5.17   Tracking Area Identity

The most recent Tracking Area Identity shall be included, if the MS supports E-UTRAN and the TAI is available in the MS. Following cases are identified:

-     Normal service or limited service over E-UTRAN.
      In this case the TAI received in the E-UTRAN System Information is included.

- Normal service or limited service over GERAN/UTRAN.
  In this case the TAI is not included.

- MS has not found GERAN/UTRAN/E-UTRAN coverage.
  In this case the TAI is taken from the USIM, if available.

10.1.5.18 E-UTRAN Camping Indicator

The E-UTRAN Camping Indicator IE shall be included if the MS is camped on a E-UTRAN cell.

10.1.5.19 E-UTRAN Cell Identity

The E-UTRAN Cell Identity IE shall be included if the MS is camped on a E-UTRAN cell, as indicated by the E-UTRAN Camping Indicator. The MS obtains the E-UTRAN Cell Identity value from the E-UTRAN System information. If the E-UTRAN Cell Identity information element is included, it is not permitted to include the GERAN Cell Identity information element or the 3G Cell Identity information element.

10.1.6 GA-RC REGISTER ACCEPT

The GANC provides system information to the MS using this message. The contents of this message are a collection of IEs from system information 3 and 13 of GERAN specifications plus some additions.

Direction: GANC to MS

Table 10.1.6.1: GA-RC REGISTER ACCEPT message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0000	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RC REGISTER ACCEPT message identity	Message Type 11.1.1.4	M	V	1		
4	Cell Identity	Cell Identity 11.2.4	M	TLV	4		
5	Location Area Identification	Location Area Identification 11.2.5	M	TLV	7		
14	GAN Control Channel Description	GAN Control Channel Description 11.2.14	M	TLV	8		
23	TU3910 Timer	TU3910 Timer 11.2.23	M	TLV	4		
22	TU3906 Timer	TU3906 Timer 11.2.22	M	TLV	4		
19	GAN Band	GAN Band 11.2.19	M	TLV	3		
37	TU3920 Timer	TU3920 Timer 11.2.37	M	TLV	4		
13	GAN Cell Description	GAN Cell Description 11.2.13	O	TLV	4		
43	TU4001 Timer	TU4001 Timer 11.2.43	C	TLV	4		
60	TU4003 Timer	TU4003 Timer 11.2.60	C	TLV	4		
44	Location Status	Location Status 11.2.44	O	TLV	3		
62	GAN Service Zone Information	GAN Service Zone Information 11.2.62	O	TLV	5-133		
67	Serving GANC table indicator	Serving GANC table indicator 11.2.67	O	TLV	3		
112	TU4004 Timer	TU4004 Timer 11.2.78	C	TLV	3		
79	GAN Mode Indicator	GAN Mode Indicator 11.2.79	O	TLV	3		
81	GAN Iu Mode Cell Description	GAN Iu Mode Cell Description 11.2.81	O	TLV	6		
129	Handover Reporting Control	Handover Reporting Control 11.2.113	O	TLV	4		

10.1.6.1 TU4001 and TU4003

These information elements are included in the message, if GPRS is supported by the GANC.

10.1.6.2 GAN Service Zone Information

This information element is included by the HPLMN, if the network is configured with GAN Service Zone information.

10.1.6.3 Serving GANC Table Indicator

The optional IE Serving GANC Table Indicator shall be included when the GA-RC REGISTRATION ACCEPT is sent from the Default GANC.

NOTE: the GANC knows from the presence of IE Registration Indicators in GA-RC REGISTER REQUEST, whether it is the Default GANC.

10.1.6.4 GAN Band

This information element is applicable if and only if the MS is directed to operate in GAN A/Gb mode; otherwise, the contents of this IE shall be disregarded.

10.1.6.5 TU4004 Timer

This information element shall be included if the IE "GANC Control Channel Description" indicates that the GANC supports PS handover.

10.1.6.6 GAN Mode Indicator

This information element shall be included if the IE "GAN Classmark" received by the GANC in the GA-RC REGISTER REQUEST message included the GAN Mode Support Indicator field with value other than 'Unspecified'.

10.1.6.7 GAN Cell Description

This information element may be included if the IE "GAN Mode Indicator" is included and has value 'The MS shall operate in GAN A/Gb mode' or if the IE "GAN Mode Indicator" is not included.

10.1.6.8 GAN Iu Mode Cell Description

This information element may be included if the IE "GAN Mode Indicator" is included and has value 'The MS shall operate in GAN Iu mode'.

10.1.7 GA-RC REGISTER REDIRECT

The GANC may use this message to redirect the MS to another GANC. In this case the message will contain the Serving GANC-SEGW and Serving GANC information. The message may also contain information about one or more PLMN identities where the MS may be served while in GAN coverage.

Direction: GANC to MS

Table 10.1.7.1: GA-RC REGISTER REDIRECT message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0000	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RC REGISTER REDIRECT Message Type	Message Type 11.1.1.4	M	V	1		
9	Serving GANC-SEGW IP address	IP Address 11.2.9	C	TLV	7-19		
10	Serving GANC-SEGW FQDN	Fully Qualified Domain/Host Name 11.2.10	C	TLV	5-258		
97	Serving GANC IP address	IP Address 11.2.9	C	TLV	7-19		
98	Serving GANC FQDN	Fully Qualified Domain/Host Name 11.2.10	C	TLV	5-258		
103	Serving GANC TCP port number	Communication port 11.2.25	O	TLV	4		
67	Serving GANC table indicator	Serving GANC table indicator 11.2.67	O	TLV	3		
69	GAN PLMN List	GAN PLMN List 11.2.69	C	TLV	n		

10.1.7.1 Serving GANC-SEGW IP address

The conditional IE Serving GANC-SEGW IP address shall be included if neither the IE Serving GANC-SEGW FQDN nor the IE GAN PLMN List is included.

10.1.7.2 Serving GANC-SEGW FQDN

The conditional IE Serving GANC-SEGW FQDN shall be included if neither the IE Serving GANC-SEGW IP address nor the IE GAN PLMN List is included.

10.1.7.3 Serving GANC IP address

The conditional IE Serving GANC IP address shall be included if neither the IE Serving GANC FQDN nor the IE GAN PLMN List is included.

10.1.7.4 Serving GANC FQDN

The conditional IE Serving GANC FQDN shall be included if neither the IE Serving GANC IP address nor the IE GAN PLMN List is included.

10.1.7.5 Serving GANC TCP port number

The optional IE Serving GANC TCP port number is included if the network is configured to use another than the default TCP port (as defined in sub-clause 12.1.2) for registrations. If this information element is included, then it is not permitted to include the GAN PLMN List information element.

10.1.7.5a Serving GANC Table Indicator

The optional IE Serving GANC Table Indicator shall be included when the GA-RC REGISTRATION REDIRECT is sent from the Default GANC.

NOTE: The GANC knows from the presence of IE Registration Indicators in GA-RC REGISTER REQUEST, whether it is the Default GANC.

10.1.7.6 GAN PLMN List

The conditional IE GAN PLMN List contains information about 1 or more PLMNs that may provide GAN service to the MS in its current location. If this information element is included, then it is not permitted to include any of the following information elements: Serving GANC-SEGW IP address, Serving GANC-SEGW FQDN, Serving GANC IP address, Serving GANC FQDN and Serving GANC TCP port number.

10.1.8 GA-RC REGISTER REJECT

The GAN uses this message to reject the registration request from a MS.

Direction: GANC to MS

Table 10.1.8.1: GA-RC REGISTER REJECT message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0000	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RC REGISTER REJECT Message Type	Message Type 11.1.1.4	M	V	1		
21	Register Reject Cause	Register Reject Cause 11.2.21	M	TLV	3		
16	TU3907 Timer	TU3907 Timer 11.2.16	C	TLV	4		
58	Location Black List indicator	Location Black List indicator 11.2.58	C	TLV	3		
5	Location Area Identification	Location Area Identification 11.2.5	C	TLV	7		

10.1.8.1 TU3907 Timer

The TU3907 Timer IE shall be included if the Register Reject Cause 'Network Congestion' is returned to the MS.

10.1.8.2 Location Black List indicator

The Location Black List indicator IE shall be included if the Register Reject Cause 'Location not allowed' is returned to the MS.

10.1.8.3 Location Area Identification

The Location Area Identification IE shall be included if the Register Reject Cause 'Location not allowed' is returned to the MS.

10.1.9 GA-RC DEREGISTER

The GANC on receiving this message removes all contexts associated with the MS in the GANC. The MS on receiving this message releases all GA-RC, GA-CSR and GA-PSR resources.

Direction: MS to GANC, GANC to MS

Table 10.1.9.1: GA-RC DEREGISTER message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0000	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RC DEREGISTER Message Type	Message Type 11.1.1.4	M	V	1		
21	Deregister Cause	Register Reject Cause 11.2.21	M	TLV	3		
58	Location Black List indicator	Location Black List indicator 11.2.58	C	TLV	3		
5	Location Area Identification	Location Area Identification 11.2.5	C	TLV	7		
16	TU3907 Timer	TU3907 Timer 11.2.16	C	TLV	4		

10.1.9.1 Location Black List indicator

The Location Black List indicator IE shall be included if the Register Reject Cause 'Location not allowed' is returned to the MS.

10.1.9.2 Location Area Identification

The Location Area Identification IE shall be included if the Register Reject Cause 'Location not allowed' is returned to the MS.

10.1.9.3 TU3907 Timer

The TU3907 Timer IE shall be included if the Register Reject Cause "Network Congestion" is returned to the MS.

10.1.10 GA-RC REGISTER UPDATE UPLINK

The MS shall send this message when it needs to update the GAN with the updated AP and GSM cell identities.

Direction: MS to GAN

Table 10.1.10.1: GA-RC REGISTER UPDATE UPLINK message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0000	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RC REGISTER UPDATE UPLINK message identity	Message Type 11.1.1.4	M	V	1		
3	AP Radio Identity	Radio Identity 11.2.3	O	TLV	9		
6	Coverage Indication	GERAN/UTRAN coverage Indicator 11.2.6	O	TLV	3		
4	GERAN Cell Identity	GERAN Cell Identity 11.2.4	C	TLV	4		
5	Location Area Identification	Location Area Identification 11.2.5	C	TLV	7		
41	Routing Area Code	Routing Area Code 11.2.41	C	TLV	3		
8	Geographic Location	Geographical Location 11.2.8	O	TLV	9-n		
42	AP Location	AP Location 11.2.42	O	TLV	7-n		
71	Required GAN Services	Required GAN Services 11.2.71	O	TLV	3		
73	3G Cell Identity	3G Cell Identity 11.2.73	C	TLV	6		
61	AP Service Name	AP Service Name 11.2.61	C	TLV	4-260		
82	3G UARFCN	3G UARFCN 11.2.82	O	TLV	4		
130	Tracking Area Identity	Tracking Area Identity 11.2.114	O	TLV	8		
132	E-UTRAN Camping Indicator	E-UTRAN Camping Indicator 11.2.116	O	TLV	4		
131	E-UTRAN Cell Identity	E-UTRAN Cell Identity 11.2.115	C	TLV	7		

10.1.10.1 GERAN Cell Identity

The GERAN Cell Identity shall be included, if GERAN/UTRAN Coverage Indication IE is included and the MS is in an area with GSM Coverage. The GERAN Cell Identity is retrieved from the GSM System information. If the GERAN Cell Identity information element is included, it is not permitted to include the 3G Cell Identity information element or the E-UTRAN Cell Identity information element.

10.1.10.2 Location Area Identification

The most recent Location Area Identification shall be included, if available in the MS and if GERAN/UTRAN Coverage Indication IE is included. Following cases are identified:

- Normal service or limited service over GERAN or UTRAN
  In this case the LAI received in the GERAN/UTRAN System Information is included.

- Normal service or limited service over E-UTRAN.
  In this case the LAI is not included.

- MS has not found GERAN/UTRAN/E-UTRAN coverage
  In this case the LAI is taken from the SIM, if available.

10.1.10.3   Routing Area Code

The Routing Area Code (RAC) shall be included, if available in the MS and if "Coverage Indication" is included. Following cases are identified:

-      Normal service over GERAN/UTRAN with GPRS support
       In this case the RAC received in the GERAN/UTRAN System Information is included.

-      Normal service or limited service over E-UTRAN.
       In this case the RAC is not included.

-      MS has not found GERAN/UTRAN/E-UTRAN coverage
       In this case the RAC is taken from the SIM, if available.

-      Normal service over GERAN/UTRAN without GPRS support or limited service
       The RAC is not included.

10.1.10.4   3G Cell Identity

The 3G Cell Identity shall be included, if GERAN/UTRAN Coverage Indication IE is included and the MS is in an area with UTRAN Coverage. The 3G Cell Identity is retrieved from the UTRAN System information. If the 3G Cell Identity information element is included, it is not permitted to include the GERAN Cell Identity information element or the E-UTRAN Cell Identity information element.

10.1.10.5   AP Service Name

The AP Service Name information element shall be included, if available, and if the AP Radio Identity information element is included.

10.1.10.6   3G UARFCN

The 3G UARFCN IE shall be included if the MS experiences any of the following while registered for GAN Iu mode:

-      The MS acquires UTRAN coverage for the first time after reporting no coverage during its last GAN registration.

-      The MS establishes a new UTRAN serving cell as a result of Intra-RAT handover while in GERAN/UTRAN/E-UTRAN mode and the UARFCN of the new UTRAN serving cell is different from the UARFCN indicated during its last GAN Registration or GAN Registration Update.

-      The MS establishes a new UTRAN serving cell as a result of Inter-RAT handover to UTRAN while in GERAN/UTRAN/E-UTRAN mode.

-      The MS enters connected mode in a UTRAN cell while in GERAN/UTRAN/E-UTRAN mode and the UARFCN of the serving UTRAN cell is different from the UARFCN indicated during its last GAN Registration/GAN Registration Update or a UARFCN was not provided during its last GAN Registration/GAN Registration Update.

10.1.10.7   Tracking Area Identity

The most recent Tracking Area Identity shall be included, if the MS supports E-UTRAN and the TAI is available in the MS. Following cases are identified:

-      Normal service or limited service over E-UTRAN.
       In this case the TAI received in the E-UTRAN System Information is included.

-      Normal service or limited service over GERAN/UTRAN.
       In this case the TAI is not included.

-      MS has not found GERAN/UTRAN/E-UTRAN coverage.
       In this case the TAI is taken from the USIM, if available.

10.1.10.8   E-UTRAN Camping Indicator

The E-UTRAN Camping Indicator IE shall be included if the MS is camped on a E-UTRAN cell.

10.1.10.9   E-UTRAN Cell Identity

The E-UTRAN Cell Identity IE shall be included if the MS is camped on a E-UTRAN cell, as indicated by the E-UTRAN Camping Indicator. The MS obtains the E-UTRAN Cell Identity value from the E-UTRAN System information. If the E-UTRAN Cell Identity information element is included, it is not permitted to include the GERAN Cell Identity information element or the 3G Cell Identity information element.

10.1.11 GA-RC REGISTER UPDATE DOWNLINK

The network sends this message to the MS to indicate change in GAN system information or MS location status.

   Direction: GANC to MS

Table 10.1.11.1: GA-RC REGISTER UPDATE DOWNLINK message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0000	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RC REGISTER UPDATE DOWNLINK message identity	Message Type 11.1.1.4	M	V	1		
4	Cell Identity	Cell Identity 11.2.4	O	TLV	4		
5	Location Area Identification	Location Area Identification 11.2.5	O	TLV	7		
14	GAN Control Channel Description	GAN Control Channel Description 11.2.14	O	TLV	8		
23	TU3910 Timer	TU3910 Timer 11.2.23	O	TLV	4		
22	TU3906 Timer	TU3906 Timer 11.2.22	O	TLV	4		
19	GAN Band	GAN Band 11.2.19	O	TLV	3		
37	TU3920 Timer	TU3920 Timer 11.2.37	O	TLV	4		
13	GAN Cell Description	GAN Cell Description 11.2.13	O	TLV	4		
43	TU4001 Timer	TU4001 Timer 11.2.43	O	TLV	4		
60	TU4003 Timer	TU4003 Timer 11.2.60	O	TLV	4		
44	Location Status	Location Status 11.2.44	O	TLV	3		
62	GAN Service Zone Information	GAN Service Zone Information 11.2.62	O	TLV	5-133		
81	GAN Iu Mode Cell Description	GAN Iu Mode Cell Description 11.2.81	O	TLV	6		

10.1.11.1 GAN Service Zone Information

This information element is included from the HPLMN, if the network is configured with UMA Service Zone information.

10.1.11.2 GAN Cell Description

This information element may be included if and only if the MS is operating in GAN A/Gb mode.

10.1.11.3 GAN Iu Mode Cell Description

This information element may be included if and only if the MS is operating in GAN Iu mode.

10.1.12 GA-CSR REQUEST

The MS sends this message to the network to establish the GA-CSR Connection.

Direction: MS to GANC

Table 10.1.12.1: GA-CSR REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR REQUEST message identity	Message Type 11.1.1.4	M	V	1		
50	Establishment Cause	Establishment Cause 11.2.50	M	TLV	3		

10.1.13 GA-CSR REQUEST ACCEPT

The GANC sends this message to the MS to indicate that is has accepted the establishment of the GA-CSR Connection.

Direction: GANC to MS

Table 10.1.13.1: GA-CSR REQUEST ACCEPT message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR REQUEST ACCEPT message identity	Message Type 11.1.1.4	M	V	1		

10.1.14 GA-RC KEEP ALIVE

The MS sends this message to the GANC.

Direction: MS to GANC

Table 10.1.14.1: GA-RC KEEP ALIVE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0000	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RC KEEP ALIVE Message Type	Message Type 11.1.1.4	M	V	1		

10.1.14a GA-RC CELL BROADCAST INFO

The GANC sends this message to the MS.

Direction: GANC to MS

Table 10.1.14a.1: GA-RC CELL BROADCAST INFO message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0000	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RC CELL BROADCAST INFO Message Type	Message Type 11.1.1.4	M	V	1		
72	Broadcast Container	Broadcast container 11.2.72	M	TLV	n-m		

10.1.15 GA-CSR ACTIVATE CHANNEL

The GANC uses this message to establish a traffic channel on GAN.

Direction: GANC to MS

Table 10.1.15.1: GA-CSR ACTIVATE CHANNEL message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR ACTIVATE CHANNEL message identity	Message Type 11.1.1.4	M	V	1		
27	Channel Mode	Channel Mode 11.2.27	M	TLV	3		
53	Sample Size	Sample Size 11.2.53	M	TLV	3		CS payload sample size in ms
97	IP Address	IP Address 11.2.9	M	TLV	7-19		
104	RTP UDP Port	Communication Port 11.2.25	M	TLV	4		
54	Payload Type	Payload Type 11.2.54	O	TLV	3		
55	Multi-rate Configuration	Multi-rate Configuration 11.2.55	C	TLV	3-n		
63	RTP Redundancy Configuration	RTP Redundancy Configuration 11.2.63	C	TLV	3-6		
105	RTCP UDP Port	Communication Port 11.2.25	O	TLV	4		
133	Bandwidth-efficient Mode Indicator	Bandwidth-efficient Mode Indicator 11.2.117	O	TLV	4		

10.1.15.1   Payload Type

The Payload Type information Element is included when the speech codec signaled uses dynamic Payload Type.

10.1.15.2   Multi-rate Configuration

The Multi-rate Configuration information element is included when the Channel Mode is speech with a speech version using AMR.

10.1.15.3   RTP Redundancy Configuration

The RTP Redundancy Configuration information element is included when the Channel Mode is speech with a speech version using AMR, and the MS has indicated support for RTP Redundancy through the GAN Classmark IE. The redundancy level is defined for each of the AMR modes in the Multi-rate Configuration. The level of redundancy can span from no redundancy to double redundancy.

10.1.15.4   RTCP UDP Port

The RTCP UDP port information element is used to indicate the UDP port for RTCP, if RTCP shall be used towards the network.

10.1.15.5   Bandwidth-efficient Mode Indicator

The Bandwidth-efficient Mode Indicator information element is included if RFC 4867 [48] bandwidth-efficient mode shall be used to code and decode the CS payload samples on the traffic channel.

10.1.16 GA-CSR ACTIVATE CHANNEL ACK

The MS indicates the communication port information for the downlink stream to the Serving GANC.

Direction:　　　MS to GANC

Table 10.1.16.1: GA-CSR ACTIVATE CHANNEL ACK message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR ACTIVATE CHANNEL ACK message identity	Message Type 11.1.1.4	M	V	1		
104	RTP UDP Port	Communication Port 11.2.25	M	TLV	4		
53	Sample Size	Sample Size 11.2.53	M	TLV	3		CS payload sample size in ms
54	Payload Type	Payload Type 11.2.54	O	TLV	3		
105	RTCP UDP Port	Communication Port 11.2.25	O	TLV	4		

10.1.16.1　Payload Type

The Payload Type IE is included when the speech codec signaled uses dynamic Payload Type. It shall be set to the same value as the Payload Type IE of the GA-CSR CHANNEL ACTIVATE message.

10.1.16.2　RTCP UDP Port

The RTCP UDP port information element is used to indicate the UDP port for RTCP, if RTCP shall be used towards the mobile station.

10.1.16.3　Sample Size

The MS shall indicate what sample size it is using and what the network shall use in the downlink. The MS shall follow the minimum sample size indication sent by the network in GA-CSR ACTIVATE CHANNEL.

10.1.17 GA-CSR ACTIVATE CHANNEL FAILURE

The MS indicates failure to establish the channel to the GANC.

Direction:　　　MS to GANC

Table 10.1.17.1: GA-CSR ACTIVATE CHANNEL FAILURE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length ndicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR ACTIVATE CHANNEL FAILURE message identity	Message Type 11.1.1.4	M	V	1		
29	RR cause	RR cause 11.2.29	M	TLV	3		

10.1.18 GA-CSR ACTIVATE CHANNEL COMPLETE

The Serving GANC acknowledges completion of the traffic channel establishment.

Direction: GANC to MS

Table 10.1.18.1: GA-CSR ACTIVATE CHANNEL COMPLETE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR ACTIVATE CHANNEL COMPLETE message identity	Message Type 11.1.1.4	M	V	1		

10.1.19 GA-CSR RELEASE

This message is used to instruct the MS to release all GA-CSR related resources associated with the connection to the Serving GANC.

Direction: GANC to MS

Table 10.1.19.1: GA-CSR RELEASE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR RELEASE message identity	Message Type 11.1.1.4	M	V	1		
29	RR cause	RR cause 11.2.29	M	TLV	3		
31	GPRS Resumption	GPRS Resumption 11.2.31	O	TLV	3		

10.1.20 GA-CSR RELEASE COMPLETE

The MS acknowledges release of all GA-CSR related resources to the Serving GANC.

Direction: MS to GANC

Table 10.1.20.1: GA-CSR RELEASE COMPLETE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR RELEASE COMPLETE message identity	Message Type 11.1.1.4	M	V	1		

10.1.21 GA-CSR PAGING REQUEST

Direction: GANC to MS

Table 10.1.21.1: GA-CSR PAGING REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR PAGING REQUEST message identity	Message Type 11.1.1.4	M	V	1		
51	Channel Needed	Channel Needed 11.2.51	M	TLV	3		
1	TMSI or IMSI	Mobile Identity 11.2.1	M	TLV	7-10		

10.1.22 GA-CSR PAGING RESPONSE

The MS responds to the page using this message.

Direction: MS to GANC

Table 10.1.22.1: GA-CSR PAGING RESPONSE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR PAGING RESPONSE message identity	Message Type 11.1.1.4	M	V	1		
48	Ciphering Key Sequence Number	Ciphering Key Sequence Number 11.2.48	M	TLV	3		
28	Mobile Station Classmark 2	Mobile Station Classmark 2 11.2.28	M	TLV	5		
1	Mobile Identity	Mobile Identity 11.2.1	M	TLV	7-10		
50	Establishment Cause	Establishment Cause 11.2.50	M	TLV	3		

10.1.23 GA-CSR UPLINK DIRECT TRANSFER

The MS communicates with the CN by encapsulating CC/MM/SS/SMS messages in this container.

Direction: MS to GANC

Table 10.1.23.1: GA-CSR UPLINK DIRECT TRANSFER message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR UPLINK DIRECT TRANSFER message identity	Message Type 11.1.1.4	M	V	1		
26	L3 message	L3 Message 11.2.26	M	TLV	Var. Length		
49	SAPI ID	SAPI ID 11.2.49	M	TLV	3		

10.1.24 GA-CSR REQUEST REJECT

The GANC sends this message to the MS to indicate that is has rejected the establishment of the GA-CSR Connection.

Direction: GANC to MS

Table 10.1.24.1: GA-CSR REQUEST REJECT message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR REQUEST REJECT message identity	Message Type 11.1.1.4	M	V	1		
29	RR cause	RR cause 11.2.29	M	TLV	3		

10.1.25 GA-CSR DOWNLINK DIRECT TRANSFER

The CN communicates with the MS by encapsulating CC/MM/SS/SMS messages in this container.

Direction: GANC to MS

Table 10.1.25.1: GA-CSR DOWNLINK DIRECT TRANSFER message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR DOWNLINK DIRECT TRANSFER message identity	Message Type 11.1.1.4	M	V	1		
26	L3 message	L3 Message 11.2.26	M	TLV	Var. Length		

10.1.26 GA-CSR CLASSMARK ENQUIRY

The CN obtains classmark information of the mobile through this enquiry message.

Direction: GANC to MS

Table 10.1.26.1: GA-CSR CLASSMARK ENQUIRY message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR CLASSMARK ENQUIRY message identity	Message Type 11.1.1.4	M	V	1		
65	Classmark Enquiry Mask	Classmark Enquiry Mask 11.2.65	O	TLV	3		

10.1.27 GA-CSR CLASSMARK CHANGE

The MS sends classmark information indicating it's capabilities to the network using this message.

Direction: MS to GANC

Table 10.1.27.1: GA-CSR CLASSMARK CHANGE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR CLASSMARK CHANGE message identity	Message Type 11.1.1.4	M	V	1		
28	Mobile Station Classmark 2	Mobile Station Classmark 2 11.2.28	M	TLV	5		
56	Additional Mobile Station Classmark Information	Mobile Station Classmark 3 11.2.56	C	TLV	3-34		

10.1.27.1   Additional Mobile Station Classmark Information

This IE shall be included if and only if the CM3 bit in the *Mobile Station Classmark 2* IE is set to 1.

10.1.28 GA-CSR STATUS

The MS communicates to the GANC various error conditions.

Direction: MS to GANC

Table 10.1.28.1: GA-CSR STATUS message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR STATUS message identity	Message Type 11.1.1.4	M	V	1		
29	RR Cause	RR Cause 11.2.29	M	TLV	3		
52	PDU in Error	PDU in Error 11.2.52	M	TLV	6 - 257		

10.1.29 GA-CSR HANDOVER ACCESS

Direction: MS to GANC

Table 10.1.29.1: GA-CSR HANDOVER ACCESS message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR HANDOVER ACCESS message identity	Message Type 11.1.1.4	M	V	1		
26	Handover To GAN Command	L3 Message 11.2.26	M	TLV	Var. Length		

10.1.29.1   Handover To GAN Command

This information element contains the entire (RR) HANDOVER COMMAND message received via the source radio access technology.

10.1.30   GA-CSR HANDOVER COMPLETE

Direction: MS to GANC

Table 10.1.30.1: GA-CSR HANDOVER COMPLETE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR HANDOVER COMPLETE message identity	Message Type 11.1.1.4	M	V	1		

10.1.31   GA-CSR UPLINK QUALITY INDICATION

The GANC indicates changes in the uplink quality, which may be used by the MS to trigger the handover from GAN procedure.

Direction: GANC to MS

Table 10.1.31.1: GA-CSR UPLINK QUALITY INDICATION message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR UL QUALITY INDICATION message identity	Message Type 11.1.1.4	M	V	1		
33	UL Quality Indication	UL Quality Indication 11.2.33	M	V	3		

10.1.32 GA-CSR HANDOVER INFORMATION

The MS triggers the handover from GAN procedure indicating the list of cell identifiers in the target radio access technology.

     Direction: MS to GANC

Table 10.1.32.1: GA-CSR HANDOVER INFORMATION message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR HANDOVER INFORMATION message identity	Message Type 11.1.1.4	M	V	1		
15	GERAN Cell Identifier List	Cell Identifier List 11.2.15	O	TLV	n		
106	GERAN Received Signal Level List	GERAN Received Signal Level List 11.2.70	C	TLV	n		
66	UTRAN Cell Identifier List	UTRAN Cell Identifier List 11.2.66	O	TLV	n		
107	UTRAN Received Signal Level List	UTRAN Received Signal Level List 11.2.70b	C	TLV	n		

10.1.32.1 GERAN Cell Identifier List

The GERAN Cell Identifier List information element shall be included if Handover to a GERAN cell is requested by the mobile station. The cells are ranked in descending order of preference according to measured value.

10.1.32.2 GERAN Received Signal Level List

The GERAN Received Signal Level List information element shall be included if the GERAN Cell Identifier List information element is included. It contains the Received signal quality for each cell included in the GERAN Cell Identifier List information element. The order of the measurements in the GERAN Received Signal Level List shall be the same as the order of the Cell identifiers included in the GERAN Cell Identifier List information element.

10.1.32.3 UTRAN Cell Identifier List

The UTRAN Cell Identifier List information element shall be included if Handover to an UTRAN cell is requested by the mobile station. The cells are ranked in descending order according to measured Ec/No value.

10.1.32.4 UTRAN Received Signal Level List

The UTRAN Received Signal Level List information element shall be included if the UTRAN Cell Identifier List information element is included. It contains the Received signal quality for each cell included in the UTRAN Cell Identifier List information element. The order of the measurements in the UTRAN Received Signal Level List shall be the same as the order of the Cell identifiers included in the UTRAN Cell Identifier List information element.

     NOTE: At least one of the cell identifier list IEs must be present.

10.1.33 GA-CSR HANDOVER COMMAND

The GANC orders the MS to handover from GAN.

Direction: GANC to MS

Table 10.1.33.1: GA-CSR HANDOVER COMMAND message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR HANDOVER COMMAND message identity	Message Type 11.1.1.4	M	V	1		
32	Handover From GAN Command	Handover From GAN Command 11.2.32	M	TLV	n		

10.1.33.1 Handover From GAN Command

If the target radio access technology is GERAN, the value part of the Handover From GAN Command IE is coded as the HANDOVER COMMAND message specified in [12]. If the target RAT is UTRAN, the value part of the Handover From GAN Command IE is coded as the INTER SYSTEM TO UTRAN HANDOVER COMMAND message specified in [12].

10.1.34 GA-CSR HANDOVER FAILURE

The MS indicates a failure to complete the requested handover from GAN.

Direction: MS to GANC

Table 10.1.34.1: GA-CSR HANDOVER FAILURE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR HANDOVER FAILURE message identity	Message Type 11.1.1.4	M	V	1		
29	RR Cause	RR Cause 11.2.29	M	TLV	3		

10.1.34.1 RR Cause

If the target radio access technology is GERAN/UTRAN, this information element is coded as the RR Cause IE in [12].

10.1.35 GA-CSR CIPHERING MODE COMMAND

The network sends this message to the MS to indicate the ciphering configuration for future handover to GERAN.

Direction: GANC to MS

Table 10.1.35.1: GA-CSR CIPHERING MODE COMMAND message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR CIPHERING MODE COMMAND message identity	Message Type 11.1.1.4	M	V	1		
30	Ciphering Mode Setting	Cipher Mode Setting 11.2.30	M	TLV	3		
45	Cipher Response	Cipher Response 11.2.45	M	TLV	3		
46	Random number	Ciphering Command RAND 11.2.46	M	TLV	18		

10.1.36 GA-CSR CIPHERING MODE COMPLETE

The MS sends this message to the GANC to acknowledge the ciphering configuration as well as to authenticate that the MS holds the correct Kc.

> Direction: MS to GANC

Table 10.1.36.1: GA-CSR CIPHERING MODE COMPLETE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR CIPHERING MODE COMPLETE message identity	Message Type 11.1.1.4	M	V	1		
47	Message Authentication Code	Ciphering Command MAC 11.2.47	M	TLV	14		
1	Mobile Equipment Identity	Mobile Identity 11.2.1	C	TLV	11		

10.1.36.1 Mobile Equipment Identity

This information element is included according the value of the Mobile Equipment Identity Request of the GA-CSR CIPHERING MODE COMMAND.

10.1.37 GA-CSR CLEAR REQUEST

The MS sends this message to the network to indicate that the network should release the signalling connection and related resources.

> Direction: MS to GANC

Table 10.1.37.1: GA-CSR CLEAR REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR CLEAR REQUEST message identity	Message Type 11.1.1.4	M	V	1		
29	RR cause	RR cause 11.2.29	M	TLV	3		

10.1.38 GA-CSR GPRS SUSPENSION REQUEST

This message is used by the MS to request the suspension of the GPRS downlink data transfer when transitioning to dedicated mode.

> Direction: MS to GANC.

Table 10.1.38.1: GA-CSR GPRS SUSPENSION REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR GPRS SUSPENSION REQUEST message identity	Message Type 11.1.1.4	M	V	1		
34	TLLI	TLLI 11.2.34	M	TLV	6		
36	Suspension cause	Suspension Cause 11.2.36	M	TLV	3		
18	Routing Area Identification	Routing Area Identification 11.2.18	M	TLV	8		

10.1.39 GA-RC SYNCHRONIZATION INFORMATION

This message is sent by the MS after successful re-establishment of the TCP connection as defined in sub-clause 9.5.

> Direction: MS to GANC.

Table 10.1.39.1: GA-RC SYNCHRONIZATION INFORMATION message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0000	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RC SYNCHRONIZATION INFORMATION message identity	Message Type 11.1.1.4	M	V	1		
1	IMSI	Mobile Identity 11.2.1	M	TLV	10		
20	GAN State	GAN State 11.2.20	M	TLV	3		

10.1.40 GA-CSR CHANNEL MODE MODIFY

This message is sent by the network to the mobile station to request the setting of the mode for the indicated channel(s).

Table 10.1.40.1: GA-CSR CHANNEL MODE MODIFY message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR CHANNEL MODE MODIFY message identity	Message Type 11.1.1.4	M	V	1		
27	Channel Mode	Channel Mode 11.2.27	O	TLV	3		
55	Multi-rate Configuration	Multi-rate Configuration 11.2.55	C	TLV	3-n		
63	RTP Redundancy Configuration	RTP Redundancy Configuration 11.2.63	C	TLV	3-6		
53	Sample Size	Sample Size 11.2.53	O	TLV	3		CS payload sample size in ms
97	IP Address	IP Address 11.2.9	O	TLV	7-19		
104	RTP UDP Port	Communication Port 11.2.25	O	TLV	4		
105	RTCP UDP Port	Communication Port 11.2.25	O	TLV	4		

10.1.40.1 Channel Mode

The Channel Mode IE shall be included if the GANC is changing the current Channel Mode.

10.1.40.2 Multi-rate Configuration

The Multi-rate Configuration information element is included when the Channel Mode is speech with a speech version using AMR.

10.1.40.3 RTP Redundancy Configuration

The Redundancy Configuration information element is included when the Channel Mode is speech with a speech version using AMR, and the MS has indicated support for RTP Redundancy through the GAN Classmark IE. The redundancy level is defined for each of the AMR modes in the Multi-rate Configuration. The level of redundancy can span from no redundancy to double redundancy.

10.1.40.4 Sample Size

The Sample Size IE shall be included if the GANC is changing the current Sample Size. The MS should use the value indicated by the IE "Sample Size" as the minimum sampling size for the coding and decoding of the CS payload samples, if the MS is not able to use the indicated value.

10.1.40.5 IP Address

The IP Address IE shall be included if the GANC is changing the local IP address used for an active user plane session.

10.1.40.6 RTP UDP Port

The RTP UDP Port IE shall be included if the GANC is changing the local UDP Port used for RTP for an active user plane session.

10.1.40.7 RTCP UDP Port

The RTCP UDP Port IE shall be included if the GANC is changing the local UDP Port used for RTCP for an active user plane session.

10.1.41 GA-CSR CHANNEL MODE MODIFY ACKNOWLEDGE

This message is sent by the mobile station to the network to indicate the successful or unsuccessful execution of a channel mode modify request

Table 10.1.41.1: GA-CSR CHANNEL MODE MODIFY ACKNOWLEDGE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR CHANNEL MODE MODIFY ACKNOWLEDGE message identity	Message Type 11.1.1.4	M	V	1		
27	Channel Mode	Channel Mode 11.2.27	M	TLV	3		
53	Sample Size	Sample Size 11.2.53	O	TLV	3		CS payload sample size in ms

10.1.41.1 Channel Mode

The Channel Mode IE shall always be included by the MS. It contains the currently used Channel Mode.

10.1.41.2 Sample Size

The Sample Size IE shall be included by the MS if it was included in the GA-CSR CHANNEL MODE MODIFY. It contains the currently used Sample Size.

10.1.42 GA-CSR UTRAN CLASSMARK CHANGE

The MS sends UTRAN Classmark information indicating its UTRAN capabilities to the network using this message.

Direction: MS to GANC

Table 10.1.42.1: GA-CSR UTRAN CLASSMARK CHANGE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-CSR UTRAN CLASSMARK CHANGE message identity	Message Type 11.1.1.4	M	V	1		
64	UTRAN Classmark	UTRAN Classmark 11.2.64	M	TLV	n		

10.2 GA-PSR Messages

Table 10.2.1 summarizes the GA-PSR messages.

Table 10.2.1: GA-PSR Messages

GA-PSR TC Management messages:	Reference	Transport Layer used
GA-PSR-ACTIVATE-UTC-REQ	10.2.1	TCP
GA-PSR-ACTIVATE-UTC-ACK	10.2.2	TCP
GA-PSR-DEACTIVATE-UTC-REQ	10.2.3	TCP
GA-PSR-DEACTIVATE-UTC-ACK	10.2.4	TCP
GPRS Tunnelling messages:	**Reference**	
GA-PSR-DATA	10.2.5	TCP
GA-PSR-UNITDATA	10.2.6	UDP
GAN Specific Signalling messages:	**Reference**	
GA-PSR-PS-PAGE	10.2.7	TCP
GA-PSR-DFC-REQ	10.2.9	UDP
GA-PSR-UFC-REQ	10.2.8	UDP
GA-PSR-STATUS	10.2.10	TCP
GA-PSR HANDOVER COMPLETE	10.2.11	TCP
GA-PSR UPLINK QUALITY INDICATION	10.2.12	TCP
GA-PSR HANDOVER INFORMATION	10.2.13	TCP
GA-PSR HANDOVER COMMAND	10.2.14	TCP
GA-PSR HANDOVER CONTINUE	10.2.15	TCP
GA-PSR HANDOVER FAILURE	10.2.16	TCP

10.2.1 GA-PSR-ACTIVATE-UTC-REQ

This message is sent either by the MS or GANC to initiate GA-PSR Transport Channel activation.

Direction: GANC to MS, MS to GANC.

Table 10.2.1.1: GA-PSR-ACTIVATE-UTC-REQ message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-PSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0010	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-PSR-ACTIVATE-UTC-REQ message identity	GA-PSR Message Type 11.1.2.1	M	V	1		
	TLLI	TLLI 11.1.2.2	M	V	4		
100	UDP Port for GPRS user data transport	Communication Port 11.2.25	M	TLV	4		
99	IP address for GPRS user data transport	IP Address 11.2.9	O	TLV	7-19		

10.2.1.1 IP address for GPRS user data transport

This IE shall be included by the GANC and shall not be included by the MS. It contains GANC IP address for GPRS user data transport if GANC initiates activation.

10.2.1.2 UDP Port for GPRS user data transport

This information element contains MS UDP port for GPRS user data transport if MS initiates activation. It contains GANC UDP port for GPRS user data transport if GANC initiates activation.

10.2.2 GA-PSR-ACTIVATE-UTC-ACK

This message is sent either by the MS or GANC to confirm GA-PSR Transport Channel activation.

Direction: GANC to MS, MS to GANC.

Table 10.2.2.1: GA-PSR-ACTIVATE-UTC-ACK message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-PSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0010	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-PSR-ACTIVATE-UTC-ACK message identity	GA-PSR Message Type 11.1.2.1	M	V	1		
	TLLI	TLLI 11.1.2.2	M	V	4		
99	IP address for GPRS user data transport	IP Address 11.2.9	O	TLV	7-19		
100	UDP Port for GPRS user data transport	Communication Port Identity 11.2.25	C	TLV	4		
39	GA-PSR TC Activation Status	GA-PSR Cause 11.2.39	M	TLV	3		

10.2.2.1 IP address for GPRS user data transport

This IE shall be included by the GANC and shall not be included by the MS. It contains GANC IP address for GPRS user data transport if MS initiates successful activation.

10.2.2.2 UDP Port for GPRS user data transport

This information element must be included if the GA-PSR cause indicates success (0) and contains the following:

GANC UDP port for GPRS user data transport if MS initiates activation.

MS UDP port for GPRS user data transport if GANC initiates activation.

10.2.3 GA-PSR-DEACTIVATE-UTC-REQ

This message is sent by the MS or by the GANC to initiate GA-PSR Transport Channel deactivation.

Direction: MS to GANC, GANC to MS.

Table 10.2.3.1: GA-PSR-DEACTIVATE-UTC-REQ message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-PSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0010	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-PSR-DEACTIVATE-UTC-REQ message identity	GA-PSR Message Type 11.1.2.1	M	V	1		
	TLLI	TLLI 11.1.2.2	M	V	4		
39	GA-PSR TC Deactivation Cause	GA-PSR Cause 11.2.39	M	TLV	3		

10.2.4 GA-PSR-DEACTIVATE-UTC-ACK

This message is sent by the GANC or by the MS to confirm GA-PSR Transport Channel deactivation.

Direction: GANC to MS, MS to GANC.

Table 10.2.4.1: GA-PSR-DEACTIVATE-UTC-ACK message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-PSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0010	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-PSR-DEACTIVATE-UTC-ACK message identity	Message Type 11.1.2.1	M	V	1		
	TLLI	TLLI 11.1.2.2	M	V	4		

10.2.5 GA-PSR-DATA

This message is used both in uplink and downlink direction to tunnel GPRS signalling and SMS messages.

Direction: GANC to MS and MS to GANC.

Table 10.1.5.1: GA-PSR-DATA message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-PSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0010	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-PSR-DATA message identity	GA-PSR Message Type 11.1.2.1	M	V	1		
	TLLI	TLLI 11.1.2.2	M	V	4		
38	Requested QoS	QoS 11.2.38	C	TLV	3		
35	Packet Flow Identifier	Packet Flow Identifier 11.2.35	O	TLV	3		
57	LLC PDU	LLC-PDU 11.2.57	M	TLV	2-1562		

10.2.5.1   Requested QoS

This Information Element is Mandatory for uplink packets only i.e. in the direction from MS to GANC. This IE shall not be included in downlink packets i.e. in the direction from GANC to MS.

10.2.5.2   Packet Flow Identifier

This Information Element is present only if packet flow management procedures are supported.

10.2.6 GA-PSR-UNITDATA

This message is used to tunnel uplink and downlink GPRS user data messages (on the GA-PSR TC over UDP) between the MS and GANC.

Direction: GANC to MS and MS to GANC.

Table 10.2.6.1: GA-PSR-UNITDATA message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	GA-PSR-UNITDATA message identity	GA-PSR Message Type 11.1.3.1	M	V	1		
	TLLI	TLLI 11.1.3.2	M	V	4		
	Sequence Number	Sequence Number 11.1.3.3	M	V	2		
38	Requested QoS	QoS 11.2.38	C	TLV	3		
35	Packet Flow Identifier	Packet Flow Identifier 11.2.35	O	TLV	3		
57	LLC PDU	LLC-PDU 11.2.57	M	TLV	2-1562		

10.2.6.1 Requested QoS

This Information Element is Mandatory for uplink packets only i.e. in the direction from MS to GANC. This IE shall not be included in downlink packets i.e. in the direction from GANC to MS.

10.2.6.2 Packet Flow Identifier

This Information Element is present only if packet flow management procedures are supported.

10.2.7 GA-PSR-PS-PAGE

This message is used by the GANC to forward the packet page for PS services to the MS.

Direction: GANC to MS.

Table 10.2.7.1: GA-PSR-PS-PAGE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-PSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0010	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-PSR-PS-PAGE message identity	GA-PSR Message Type 11.1.2.1	M	V	1		
	Reserved	TLLI 11.1.2.2	M	V	4	0	To keep GA-PSR-signalling message header consistent.
1	Mobile Identity	Mobile Identity 11.2.1	M	TLV	7-10		

10.2.7.1 Mobile Identity

The mobile identity IE contains either IMSI or P-TMSI based on the request from SGSN.

10.2.8 GA-PSR-UFC-REQ

This message is sent by the GANC to the MS (on the GA-PSR TC over UDP) to initiate uplink flow control procedure.

Direction: GANC to MS.

Table 10.2.8.1: GA-PSR-UFC-REQ message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	GA-PSR-UFC-REQ message identity	GA-PSR Message Type 11.1.3.1	M	V	1		
	TLLI	TLLI 11.1.3.2	M	V	4		
	Sequence Number	Sequence Number 11.1.3.3	M	V	2		
40	Requested Uplink User Data Rate	User Data Rate 11.2.40	M	TLV	5		
35	Packet Flow Identifier	Packet Flow Identifier 11.2.35	O	TLV	3		
59	Reset Indicator	Reset Indicator 11.2.59	O	TLV	3		

10.2.8.1 Packet Flow Identifier

This Information Element is included if the request is related to a specific PFC (e.g. not included when PFM procedures are not supported).

10.2.8.2 Reset Indicator

This information element is included if the GANC initiates an uplink flow control condition reset.

10.2.9 GA-PSR-DFC-REQ

This message is sent by the MS to the GANC (on the GA-PSR TC over UDP) to initiate downlink flow control procedure.

Direction: MS to GANC.

Table 10.2.9.1: GA-PSR-DFC-REQ message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	GA-PSR-DFC-REQ message identity	GA-PSR Message Type 11.1.3.1	M	V	1		
	TLLI	TLLI 11.1.3.2	M	V	4		
	Sequence Number	Sequence Number 11.1.3.3	M	V	2		
40	Requested Downlink User Data Rate	User Data Rate 11.2.40	M	TLV	5		
35	Packet Flow Identifier	Packet Flow Identifier 11.2.35	O	TLV	3		

10.2.9.1 Packet Flow Identifier

This Information Element is included if the request is related to a specific PFC (e.g. not included when PFM procedures are not supported).

10.2.10 GA-PSR STATUS

This message is used to indicate protocol errors.

Direction: MS to GANC.

Table 10.2.10.1: GA-PSR STATUS message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-PSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0010	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-PSR-STATUS message identity	GA-PSR Message Type 11.1.2.1	M	V	1		
	TLLI	TLLI 11.1.2.2	M	V	4		
39	GA-PSR Cause	GA-PSR Cause 11.2.39	M	TLV	3		
52	PDU in Error	PDU in Error 11.2.52	M	TLV	6 - 257		

10.2.11 GA-PSR HANDOVER COMPLETE

Direction: MS to GANC

Table 10.2.11.1: GA-PSR HANDOVER COMPLETE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-PSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0010	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-PSR HANDOVER COMPLETE message identity	GA-PSR Message Type 11.1.2.1	M	V	1		
	TLLI	TLLI 11.1.2.2	M	V	4		

10.2.12 GA-PSR UPLINK QUALITY INDICATION

The GANC indicates changes in the uplink quality, which may be used by the MS to trigger the PS handover from GAN procedure.

Direction: GANC to MS

Table 10.2.12.1: GA-PSR UPLINK QUALITY INDICATION message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-PSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0010	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-PSR UL QUALITY INDICATION message identity	GA-PSR Message Type 11.1.2.1	M	V	1		
	TLLI	TLLI 11.1.2.2	M	V	4		
33	UL Quality Indication	UL Quality Indication 11.2.33	M	TLV	3		

10.2.13 GA-PSR HANDOVER INFORMATION

The MS triggers the PS handover from GAN procedure indicating the list of cell identifiers in the target radio access technology.

Direction: MS to GANC

Table 10.2.13.1: GA-PSR HANDOVER INFORMATION message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-PSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0010	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-PSR HANDOVER INFORMATION message identity	GA-PSR Message Type 11.1.2.1	M	V	1		
	TLLI	TLLI 11.1.2.2	M	V	4		
15	GERAN Cell Identifier List	Cell Identifier List 11.2.15	C	TLV	n		
106	GERAN Received Signal Level List	GERAN Received Signal Level List 11.2.70	C	TLV	n		
66	UTRAN Cell Identifier List	UTRAN Cell Identifier List 11.2.66	C	TLV	n		
107	UTRAN Received Signal Level List	UTRAN Received Signal Level List 11.2.70b	C	TLV	n		

10.2.13.1 GERAN Cell Identifier List

See sub-clause 10.1.32.1.

10.2.13.2 GERAN Received Signal Level List

See sub-clause 10.1.32.2.

10.2.13.3 UTRAN Cell Identifier List

See sub-clause 10.1.32.3.

10.2.13.4 UTRAN Received Signal Level List

See sub-clause 10.1.32.4.

10.2.14 GA-PSR HANDOVER COMMAND

The GANC orders the MS to perform PS handover from GAN.

Direction: GANC to MS

Table 10.2.14.1: GA-PSR HANDOVER COMMAND message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-PSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0010	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-PSR HANDOVER COMMAND message identity	GA-PSR Message Type 11.1.2.1	M	V	1		
	TLLI	TLLI 11.1.2.2	M	V	4		
108	PS Handover to GERAN Command	PS Handover to GERAN Command 11.2.74	C	TLV	n		
109	PS Handover to UTRAN Command	PS Handover to UTRAN Command 11.2.75	C	TLV	n		
110	PS Handover to GERAN PSI	PS Handover to GERAN PSI 11.2.76	C	TLV	n		
111	PS Handover to GERAN SI	PS Handover to GERAN SI 11.2.77	C	TLV	n		

10.2.14.1   PS Handover to GERAN Command

If the target radio access technology is GERAN, the value part of the *PS Handover to GERAN Command* IE shall be included and coded as the PS HANDOVER COMMAND message specified in 3GPP TS 44.060 [45]. If this IE is present then the *PS Handover to UTRAN Command* IE shall not be present.

10.2.14.2   PS Handover to UTRAN Command

If the target radio access technology is UTRAN, the value part of the PS Handover to UTRAN Command IE shall be included and coded as the INTER SYSTEM TO UTRAN HANDOVER COMMAND message specified in 3GPP TS 25.331 [40]. If this IE is present then the *PS Handover to GERAN Command* IE, the *PS Handover to GERAN PSI* IE and the *PS Handover to GERAN SI* IE shall not be present.

10.2.14.3   PS Handover to GERAN PSI

If the target radio access technology is GERAN and PBCCH is present in the target cell, the value part of the *PS Handover to GERAN PSI* IE shall be included and coded as per the minimum set of PSI messages required for operation in A/Gb mode as defined for A/Gb mode to A/Gb mode PS handover (see 3GPP TS 44.060 [45]). When this IE is included the *PS Handover to GERAN SI* IE shall not be present.

10.2.14.4   PS Handover to GERAN SI

If the target radio access technology is GERAN and PBCCH is not present in the target cell, the value part of the *PS Handover to GERAN SI* IE shall be included and coded as per the minimum set of SI messages required for operation in A/Gb mode as defined for A/Gb mode to A/Gb mode PS handover (see 3GPP TS 44.060 [45]). When this IE is included the *PS Handover to GERAN PSI* IE shall not be present.

10.2.15 GA-PSR HANDOVER CONTINUE

The GANC indicates that the MS shall continue to wait for a **GA-PSR HANDOVER COMMAND** message instead of performing a rove-out.

Direction: GANC to MS

Table 10.2.15.1: GA-PSR HANDOVER CONTINUE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-PSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0010	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-PSR HANDOVER CONTINUE message identity	GA-PSR Message Type 11.1.2.1	M	V	1		
	TLLI	TLLI 11.1.2.2	M	V	4		

10.2.16 GA-PSR HANDOVER FAILURE

The MS indicates that a handover from GAN A/Gb mode (attempted as a result of receiving a **GA-PSR HANDOVER COMMAND** message) failed.

Direction:　　　　MS to GANC

Table 10.2.16.1: GA-PSR HANDOVER FAILURE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-PSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0010	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-PSR HANDOVER FAILURE message identity	GA-PSR Message Type 11.1.2.1	M	V	1		
	TLLI	TLLI 11.1.2.2	M	V	4		
39	GA-PSR Cause	GA-PSR Cause 11.2.39	M	TLV	3		

10.3 GA-RRC control plane messages

Table 10.3.1 summarizes the GA-RRC control plane messages.

Table 10.1.1: GA-RRC control plane messages

GA-RRC control plane messages:	Reference
GA-RRC REQUEST	10.3.1
GA-RRC REQUEST ACCEPT	10.3.2
GA-RRC REQUEST REJECT	10.3.3
GA-RRC RELEASE REQUEST	10.3.4
GA-RRC RELEASE	10.3.5
GA-RRC RELEASE COMPLETE	10.3.6
GA-RRC PAGING REQUEST	10.3.7
GA-RRC ACTIVATE CHANNEL	10.3.8
GA-RRC ACTIVATE CHANNEL ACK	10.3.9
GA-RRC ACTIVATE CHANNEL COMPLETE	10.3.10
GA-RRC MODIFY CHANNEL	10.3.11
GA-RRC MODIFY CHANNEL ACK	10.3.12
GA-RRC DEACTIVATE CHANNEL REQUEST	10.3.13
GA-RRC DEACTIVATE CHANNEL	10.3.14
GA-RRC DEACTIVATE CHANNEL COMPLETE	10.3.15
GA-RRC SECURITY MODE COMMAND	10.3.16
GA-RRC SECURITY MODE COMPLETE	10.3.17
GA-RRC INITIAL DIRECT TRANSFER	10.3.18
GA-RRC UPLINK DIRECT TRANSFER	10.3.19
GA-RRC DOWNLINK DIRECT TRANSFER	10.3.20
GA-RRC RELOCATION INFORMATION	10.3.21
GA-RRC RELOCATION COMMAND	10.3.22
GA-RRC RELOCATION ACCESS	10.3.23
GA-RRC RELOCATION COMPLETE	10.3.24
GA-RRC RELOCATION FAILURE	10.3.25
GA-RRC RELOCATION REQUEST	10.3.26
GA-RRC RELOCATION REQUEST ACK	10.3.27
GA-RRC UPLINK QUALITY INDICATION	10.3.28
GA-RRC STATUS	10.3.29

10.3.1   GA-RRC REQUEST

The MS sends this message to the GANC to establish the GA-RRC Connection for the indicated domain.

Direction: MS to GANC

Table 10.3.1.1: GA-RRC REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC REQUEST message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		
85	GA-RRC Establishment Cause	GA-RRC Establishment Cause 11.2.85	M	TLV	3		

10.3.2   GA-RRC REQUEST ACCEPT

The GANC sends this message to the MS to indicate that is has accepted the establishment of the GA-RRC Connection.

Direction: GANC to MS

Table 10.3.2.1: GA-RRC REQUEST ACCEPT message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC REQUEST ACCEPT message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		

10.3.3   GA-RRC REQUEST REJECT

The GANC sends this message to the MS to indicate that is has rejected the establishment of the GA-RRC Connection.

Direction: GANC to MS

Table 10.3.3.1: GA-RRC REQUEST REJECT message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC REQUEST REJECT message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		
86	GA-RRC Cause	GA-RRC Cause 11.2.86	M	TLV	4		

10.3.4   GA-RRC RELEASE REQUEST

The MS sends this message to the GANC to indicate that the GANC should initiate release of the signalling connection and related resources for the indicated domain.

Direction: MS to GANC

Table 10.3.4.1: GA-RRC RELEASE REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC RELEASE REQUEST message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		
86	GA-RRC Cause	GA-RRC Cause 11.2.86	M	TLV	4		

10.3.5   GA-RRC RELEASE

The GANC sends this message to the MS to instruct the MS to release all GA-RRC related resources for the indicated domain.

Direction: GANC to MS

Table 10.3.5.1: GA-RRC RELEASE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC RELEASE message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		
86	GA-RRC Cause	GA-RRC Cause 11.2.86	M	TLV	4		

10.3.6   GA-RRC RELEASE COMPLETE

The MS sends this message to the GANC to acknowledge the release of all GA-RRC related resources for the indicated domain.

Direction: MS to GANC

Table 10.3.6.1: GA-RRC RELEASE COMPLETE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC RELEASE COMPLETE message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		

10.3.7 GA-RRC PAGING REQUEST

The GANC uses this message to transmit paging information received from the CN to the MS.

Direction: GANC to MS

Table 10.3.7.1: GA-RRC PAGING REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC PAGING REQUEST message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		
1	IMSI or (P)-TMSI	Mobile Identity 11.2.1	M	TLV	7-10		
87	GA-RRC Paging Cause	GA-RRC Paging Cause 11.2.87	O	TLV	3		

10.3.8 GA-RRC ACTIVATE CHANNEL

The GANC sends this message to the MS to initiate channel activation.

Direction: GANC to MS

Table 10.3.8.1: GA-RRC ACTIVATE CHANNEL message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC ACTIVATE CHANNEL message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		
89	CTC Activation List	CTC Activation List 11.2.89	C	TLV	n		
115	PTC Activation List	PTC Activation List 11.2.96	C	TLV	n		

10.3.8.1 CTC Activation List

The CTC (Circuit Transport Channel) Activation List information element shall be included if the IE "CN Domain Identity" indicates the CS domain.

10.3.8.2 PTC Activation List

The PTC (Packet Transport Channel) Activation List information element shall be included if the IE "CN Domain Identity" indicates the PS domain.

10.3.9   GA-RRC ACTIVATE CHANNEL ACK

The MS sends this message to the GANC to acknowledge the channel activation request.

  Direction: MS to GANC

Table 10.3.9.1: GA-RRC ACTIVATE CHANNEL ACK message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC ACTIVATE CHANNEL ACK message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		
91	CTC Activation Ack List	CTC Activation Ack List 11.2.91	C	TLV	n		
117	PTC Activation Ack List	PTC Activation Ack List 11.2.98	C	TLV	n		

10.3.9.1   CTC Activation Ack List

The CTC Activation Ack List information element shall be included if the IE "CN Domain Identity" indicates the CS domain.

10.3.9.2   PTC Activation Ack List

The PTC Activation Ack List information element shall be included if the IE "CN Domain Identity" indicates the PS domain.

10.3.10 GA-RRC ACTIVATE CHANNEL COMPLETE

The GANC sends this message to the MS to indicate the completion of the channel activation.

  Direction: GANC to MS

Table 10.3.10.1: GA-RRC ACTIVATE CHANNEL COMPLETE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC ACTIVATE CHANNEL COMPLETE message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		

10.3.11 GA-RRC MODIFY CHANNEL

The GANC sends this message to the MS to initiate channel modification.

Direction: GANC to MS

Table 10.3.11.1: GA-RRC MODIFY CHANNEL message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC MODIFY CHANNEL message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		
93	CTC Modification List	CTC Modification List 11.2.93	C	TLV	n		
119	PTC Modification List	PTC Modification List 11.2.100	C	TLV	n		

10.3.11.1 CTC Modification List

The CTC (Circuit Transport Channel) Modification List information element shall be included if the IE "CN Domain Identity" indicates the CS domain.

10.3.11.2 PTC Modification List

The PTC (Packet Transport Channel) Modification List information element shall be included if the IE "CN Domain Identity" indicates the PS domain.

10.3.12 GA-RRC MODIFY CHANNEL ACK

The MS sends this message to the GANC to acknowledge the successful channel modification.

Direction: MS to GANC

Table 10.3.12.1: GA-RRC MODIFY CHANNEL ACK message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC MODIFY CHANNEL ACK message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		
94	CTC Modification Ack List	CTC Modification Ack List 11.2.94	C	TLV	n		
120	PTC Modification Ack List	PTC Modification Ack List 11.2.101	C	TLV	n		

10.3.12.1   CTC Modification Ack List

The CTC (Circuit Transport Channel) Modification Ack List information element shall be included if the IE "CN Domain Identity" indicates the CS domain.

10.3.12.2   PTC Modification Ack List

The PTC (Packet Transport Channel) Modification Ack List information element shall be included if the IE "CN Domain Identity" indicates the PS domain.

10.3.13 GA-RRC DEACTIVATE CHANNEL REQUEST

The MS sends this message to the GANC to request the GANC to deactivate the channel(s) identified in the message for the indicated domain.

Direction: MS to GANC

Table 10.3.13.1: GA-RRC DEACTIVATE CHANNEL REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC DEACTIVATE CHANNEL REQUEST message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		
84	RAB ID List	RAB ID List 11.2.84	M	TLV	n		
86	GA-RRC Cause	GA-RRC Cause 11.2.86	M	TLV	4		

10.3.14 GA-RRC DEACTIVATE CHANNEL

The GANC sends this message to the MS to instruct the MS to deactivate the channel(s) identified in the message for the indicated domain.

Direction: GANC to MS

Table 10.3.14.1: GA-RRC DEACTIVATE CHANNEL message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC DEACTIVATE CHANNEL message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		
84	RAB ID List	RAB ID List 11.2.84	M	TLV	n		

10.3.15 GA-RRC DEACTIVATE CHANNEL COMPLETE

The MS sends this message to the GANC to indicate the completion of the channel deactivation.

Direction: MS to GANC

Table 10.3.15.1: GA-RRC DEACTIVATE CHANNEL COMPLETE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC DEACTIVATE CHANNEL COMPLETE message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		

10.3.16 GA-RRC SECURITY MODE COMMAND

The GANC sends this message to the MS to indicate the selected integrity algorithm and (optionally) the selected encryption algorithm. The message also includes a random number used to authenticate the MS.

Direction:　　　GANC to MS

Table 10.3.16.1: GA-RRC SECURITY MODE COMMAND message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC SECURITY MODE COMMAND message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		
124	Selected Integrity Protection Algorithm	Selected Integrity Protection Algorithm 11.2.105	M	TLV	3		
46	Random Number	Ciphering Command RAND 11.2.46	M	TLV	18		
125	Selected Encryption Algorithm	Selected Encryption Algorithm 11.2.106	O	TLV	3		

10.3.17 GA-RRC SECURITY MODE COMPLETE

The MS sends this message to the GANC to provide the MS response to the authentication challenge.

Direction:　　　MS to GANC

Table 10.3.17.1: GA-RRC SECURITY MODE COMPLETE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC SECURITY MODE COMPLETE message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		
47	Message Authentication Code	Ciphering Command MAC 11.2.47	M	TLV	14		

10.3.18 GA-RRC INITIAL DIRECT TRANSFER

The MS sends this message to the GANC to transfer the initial NAS PDU from the MS to the indicated core network domain.

Direction: MS to GANC

Table 10.3.18.1: GA-RRC INITIAL DIRECT TRANSFER message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC INITIAL DIRECT TRANSFER message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		
88	Intra Domain NAS Node Selector	Intra Domain NAS Node Selector 11.2.88	M	TLV	5		
26	L3 Message	L3 Message 11.2.26	M	TLV	Var. Length		

10.3.19 GA-RRC UPLINK DIRECT TRANSFER

The MS sends this message to the GANC to transfer a subsequent (i.e., other than the initial) NAS PDU from the MS to the indicated core network domain.

Direction: MS to GANC

Table 10.3.19.1: GA-RRC UPLINK DIRECT TRANSFER message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC UPLINK DIRECT TRANSFER message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		
26	L3 Message	L3 Message 11.2.26	M	TLV	Var. Length		

10.3.20 GA-RRC DOWNLINK DIRECT TRANSFER

The GANC sends this message to the MS to transfer a NAS PDU from the indicated core network domain to the MS.

Direction: GANC to MS

Table 10.3.20.1: GA-RRC DOWNLINK DIRECT TRANSFER message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC DOWNLINK DIRECT TRANSFER message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
80	CN Domain Identity	CN Domain Identity 11.2.80	M	TLV	3		
26	L3 Message	L3 Message 11.2.26	M	TLV	Var. Length		

10.3.21 GA-RRC RELOCATION INFORMATION

The MS triggers the handover from GAN Iu mode procedure indicating the list of cell identifiers in the target radio access technology.

Direction: MS to GANC

Table 10.3.21.1: GA-RRC RELOCATION INFORMATION message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC RELOCATION INFORMATION message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
126	CN Domains to Handover	CN Domains to Handover 11.2.107	M	TLV	3		
15	GERAN Cell Identifier List	Cell Identifier List 11.2.15	O	TLV	n		
106	GERAN Received Signal Level List	GERAN Received Signal Level List 11.2.70	C	TLV	n		
66	UTRAN Cell Identifier List	UTRAN Cell Identifier List 11.2.66	O	TLV	n		
107	UTRAN Received Signal Level List	UTRAN Received Signal Level List 11.2.70b	C	TLV	n		
28	Mobile Station Classmark 2	Mobile Station Classmark 2 11.2.28	O	TLV	5		
56	Mobile Station Classmark 3	Mobile Station Classmark 3 11.2.56	O	TLV	3-34		
128	MS Radio Access Capability	MS Radio Access Capability 11.2.112	O	TLV	4-67		
64	UTRAN Classmark	UTRAN Classmark 11.2.64	C	TLV	n		

10.3.21.1 GERAN Cell Identifier List

The GERAN Cell Identifier List information element shall be included if handover to a GERAN cell is requested by the mobile station. The cells are ranked in descending order of preference according to measured value.

10.3.21.2 GERAN Received Signal Level List

The GERAN Received Signal Level List information element shall be included if the GERAN Cell Identifier List information element is included. It contains the received signal quality for each cell included in the GERAN Cell Identifier List information element. The order of the measurements in the GERAN Received Signal Level List shall be the same as the order of the cell identifiers included in the GERAN Cell Identifier List information element.

10.3.21.3 UTRAN Cell Identifier List

The UTRAN Cell Identifier List information element shall be included if handover to an UTRAN cell is requested by the mobile station. The cells are ranked in descending order according to measured Ec/No value.

10.3.21.4 UTRAN Received Signal Level List

The UTRAN Received Signal Level List information element shall be included if the UTRAN Cell Identifier List information element is included. It contains the received signal quality for each cell included in the UTRAN Cell Identifier List information element. The order of the measurements in the UTRAN Received Signal Level List shall be the same as the order of the cell identifiers included in the UTRAN Cell Identifier List information element.

NOTE: At least one of the cell identifier list IEs must be present.

10.3.21.5 Mobile Station Classmark 2

The Mobile Station Classmark 2 information element shall be included if the GERAN Cell Identifier List information element is included. It shall also be included if the MS is GERAN capable and the UTRAN Cell Identifier List information element is included.

10.3.21.6 Mobile Station Classmark 3

The Mobile Station Classmark 3 information element shall be included if the GERAN Cell Identifier List information element is included. It shall also be included if the MS is GERAN capable and the UTRAN Cell Identifier List information element is included.

10.3.21.7 MS Radio Access Capability

The MS Radio Access Capability information element shall be included if the GERAN Cell Identifier List information element is included. It shall also be included if the MS is GERAN capable and the UTRAN Cell Identifier List information element is included.

10.3.21.8 UTRAN Classmark

The UTRAN Classmark information element shall be included if the UTRAN Cell Identifier List information element is included. This IE includes the INTER RAT HANDOVER INFO message defined in TS 25.331 [40]. The INTER RAT HANDOVER INFO message shall include the UE security information IE and the UE security information2 IE, in addition to the mandatory content of the message.

10.3.22 GA-RRC RELOCATION COMMAND

The GANC sends this message to the MS to order the MS to handover from GAN Iu mode.

Direction: GANC to MS

Table 10.3.22.1: GA-RRC RELOCATION COMMAND message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC RELOCATION COMMAND message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
126	CN Domains to Handover	CN Domains to Handover 11.2.107	M	TLV	3		
78	UTRAN RRC Message	UTRAN RRC Message 11.2.111	M	TLV	n		
127	SRNS Relocation Info	UTRAN RRC Message 11.2.111	C	TLV	N		

10.3.22.1   UTRAN RRC Message

If the target radio access technology is GERAN, the value part of the UTRAN RRC Message IE is coded as the HANDOVER FROM UTRAN COMMAND message specified in [40]. If the target RAT is UTRAN, the value part of the UTRAN RRC Message IE is coded as the UTRAN reconfiguration message received from the target RNS as specified in [40]; e.g., PHYSICAL CHANNEL RECONFIGURATION.

10.3.22.2   SRNS Relocation Info

The SRNS Relocation Info information element includes the SRNS RELOCATION INFO message defined in TS 25.331 [40]. This IE shall be included if the target radio access technology is UTRAN. The content is the same as the SRNS RELOCATION INFO message content sent by the GANC to the target RNC in the Source RNC to Target RNC Transparent Container. Note that the type of this IE is the same as the UTRAN RRC Message defined in sub-clause 11.2.111, with the exception that the IEI is 2-octets in length.

10.3.23   GA-RRC RELOCATION ACCESS

The MS sends this message to the GANC to indicate that the MS has been commanded to handover a CS domain session to GAN Iu mode but the GA-RRC CS domain sub-layer entity in the MS is not yet in the GA-RRC CONNECTED state.

Direction: MS to GANC

Table 10.3.23.1: GA-RRC RELOCATION ACCESS message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC RELOCATION ACCESS message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
78	UTRAN RRC Message	UTRAN RRC Message 11.2.111	M	TLV	n		

10.3.23.1 UTRAN RRC Message

This information element contains the entire UTRAN RRC handover message received via the source radio access technology. If the source radio access technology is GERAN, the value part of the UTRAN RRC Message IE is coded as the HANDOVER TO UTRAN COMMAND message specified in [40]. If the source RAT is UTRAN, the value part of the UTRAN RRC Message IE is coded as the UTRAN reconfiguration message received from the target RNS as specified in [40]; e.g., PHYSICAL CHANNEL RECONFIGURATION.

10.3.24 GA-RRC RELOCATION COMPLETE

The MS sends this message to the GANC to indicate that the handover to GAN Iu mode is complete.

Direction: MS to GANC

Table 10.3.24.1: GA-RRC RELOCATION COMPLETE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC RELOCATION COMPLETE message identity	Message Type 11.1.1.4	M	V	1		
126	CN Domains to Handover	CN Domains to Handover 11.2.107	M	TLV	3		

10.3.25 GA-RRC RELOCATION FAILURE

The MS sends this message to the GANC to indicate failure to complete the handover from GAN Iu mode procedure.

Direction: MS to GANC

Table 10.3.25.1: GA-RRC RELOCATION FAILURE message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC RELOCATION FAILURE message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
86	GA-RRC Cause	GA-RRC Cause 11.2.86	M	TLV	4		

10.3.26 GA-RRC RELOCATION REQUEST

The GANC sends this message to the MS to request activation of one or more CTCs, one or more PTCs or a combination of CTCs and PTCs, for the purpose of handover to GAN Iu mode.

Direction: GANC to MS

Table 10.3.26.1: GA-RRC RELOCATION REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC RELOCATION REQUEST message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
126	CN Domains to Handover	CN Domains to Handover 11.2.107	M	TLV	3		
89	CTC Activation List	CTC Activation List 11.2.89	C	TLV	n		
115	PTC Activation List	PTC Activation List 11.2.96	C	TLV	n		

10.3.26.1 CTC Activation List

The CTC (Circuit Transport Channel) Activation List information element shall be included if the IE "CN Domains to Handover" indicates the CS domain or both CS and PS domains.

10.3.26.2 PTC Activation List

The PTC (Packet Transport Channel) Activation List information element shall be included if the IE "CN Domains to Handover" indicates the PS domain or both CS and PS domains.

10.3.27 GA-RRC RELOCATION REQUEST ACK

The MS sends this message to the GANC to acknowledge the relocation request.

Direction: MS to GANC

Table 10.3.27.1: GA-RRC RELOCATION REQUEST ACK message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC RELOCATION REQUEST ACK message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
126	CN Domains to Handover	CN Domains to Handover 11.2.107	M	TLV	3		
91	CTC Activation Ack List	CTC Activation Ack List 11.2.91	C	TLV	n		
117	PTC Activation Ack List	PTC Activation Ack List 11.2.98	C	TLV	n		

10.3.27.1   CTC Activation Ack List

The CTC Activation Ack List information element shall be included if the IE "CN Domains to Handover" indicates the CS domain or both CS and PS domains.

10.3.27.2   PTC Activation Ack List

The PTC Activation Ack List information element shall be included if the IE "CN Domains to Handover" indicates the PS domain or both CS and PS domains.

10.3.28 GA-RRC UPLINK QUALITY INDICATION

The GANC sends this message to the MS to indicate changes in the uplink quality, which may be used by the MS to trigger the handover from GAN Iu mode procedure.

Direction: GANC to MS

Table 10.3.28.1: GA-RRC UPLINK QUALITY INDICATION message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC UPLINK QUALITY INDICATION message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
33	UL Quality Indication	UL Quality Indication 11.2.33	M	V	3		

10.3.29 GA-RRC STATUS

The MS sends this message to the GANC to communicate various error conditions.

Direction: MS to GANC

Table 10.3.29.1: GA-RRC STATUS message content

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC STATUS message identity	GA-RRC Message Type 11.1.3a.1	M	V	1		
86	GA-RRC Cause	GA-RRC Cause 11.2.86	M	TLV	4		
52	PDU Error	PDU in Error 11.2.52	M	TLV	6-257		

10.4 GA-RRC PS user plane messages

Table 10.4.1 summarizes the GA-RRC PS user plane messages.

Table 10.4.1: GA-RRC PS user plane messages

GA-RRC control plane messages:	Reference
GA-RRC PDU	10.4.1

10.4.1 GA-RRC PDU

This message is used to tunnel uplink and downlink PS domain user data between the MS and the GANC. See sub-clause 11.1.3b for a description of the fields in this message.

Direction: MS to GANC and GANC to MS

8	7	6	5	4	3	2	1	
Version			PT	spare	E	S	PN	octet 1
Message Type								octet 2
Length								octet 3-4
TEID								octet 5-8
Sequence Number								octet 9-10
N-PDU Number								octet 11
Next Extension Header Type								octet 12
PS Domain User Data								
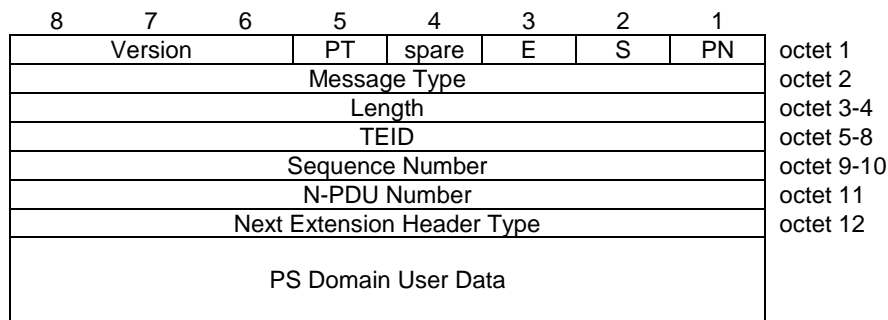
Figure 10.4.1.1: GA-RRC PDU message contents

11 General message format and information elements coding

11.1 Message coding principles

Five different message headers are defined in this specification:

- Message header for the GA-RC and GA-CSR messages (defined in sub-clause 11.1.1)

- Message header for the GA-PSR messages sent over the TCP-based signalling channel (defined in sub-clause 11.1.2)

- Message header for the GA-PSR messages sent over the UDP-based GA-PSR Transport Channel (defined in sub-clause 11.1.3)

- Message header for the GA-RRC messages sent over the TCP-based signalling channel (defined in sub-clause 11.1.3a)

- Message header for the GA-RRC messages sent over the UDP-based GA-RRC Packet Transport Channel (defined in sub-clause 11.1.3b)

The principles for information element coding are described in sub-clause 11.1.4.

11.1.1 GA-RC and GA-CSR message header information elements

Each GA-RC and GA-CSR message begins with a 4-octet message header, as shown in Table 11.1.1.1. This message header consists of the following information elements: Length Indicator, Protocol Discriminator, Skip Indicator and Message Type. These IEs are described in the following sub-clauses.

Note that these information elements are also present in both the GA-PSR message header and the GA-RRC message header defined in sub-clauses 11.1.2 and 11.1.3a, respectively. However, the GA-PSR and GA-RRC message headers include additional information elements.

Table 11.1.1.1: GA-RC and GA-CSR message header contents

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RC and GA-CSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0001	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RC and GA-CSR Message Type	Message Type 11.1.1.4	M	V	1		
	Here continues the list of IE's using TLV coding format and depending on Protocol Discriminator and Message Type as defined in clause 10.						

11.1.1.1   Length Indicator (LI)

The first two octets of the message header contains the Length Indicator (LI) information element. The LI is needed as each message is transported using TCP, which provides a 'stream-of-bytes' transmission i.e. no message concept, or message length concept is provided by TCP and this has to be handled in the application layer.

This field specifies the total length of the message **excluding** the 2 octets for Length Indicator.

Minimum value for LI is 2 and maximum value is defined as 2048.

For example: For a message of total length of 20 octets, this field is coded with the decimal value of 18. Then there follows 18 octets of message (i.e. total length of TCP-data is 20 octets).

8	7	6	5	4	3	2	1	
			LI MSB					octet 1
			LI LSB					octet 2
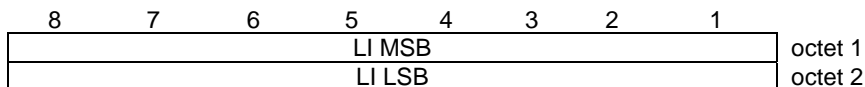
Figure 11.1.1.1.1. Length Indicator message header field

Table 11.1.1.1.1: Length Indicator message header field

LI value, Length Indicator value (octet 1 and 2)   In the LI value field bit 8 of octet 1 is the most significant bit and bit 1of octet 2 the least significant bit.   The Length Indicator consists of 2 octets.

11.1.1.2   Protocol Discriminator (PD)

Bits 1 to 4 of the third octet in the message header contain the Protocol Discriminator (PD) information element. The PD identifies the upper layer protocol to which the message belongs.

The following Protocol Discriminator values are defined:

Table 11.1.1.2.1: Protocol Discriminator Values

Protocol	PD Value
GA-RC	0
GA-CSR	1
GA-PSR	2
GA-RRC	3

11.1.1.3   Skip Indicator

Bits 5 to 8 of the third octet in the message header contain the Skip Indicator information element. A message received with Skip Indicator different from 0000 shall be ignored. A message received with Skip Indicator encoded as 0000 shall not be ignored (unless it is ignored for other reasons). A protocol entity sending any message shall encode the Skip Indicator as 0000.

11.1.1.4   Message Type

The Message Type IE is the fourth octet in the message header. Bit 8 of the Message Type value is the most significant bit and bit 1 is the least significant bit.

The following message types are defined for GA-RC and GA-CSR:

Table 11.1.1.4.1: Message Type values for GA-RC

GA-RC message name	Message Type value (decimal)	Message Type value (hex)
GA-RC DISCOVERY REQUEST	1	H'01
GA-RC DISCOVERY ACCEPT	2	H'02
GA-RC DISCOVERY REJECT	3	H'03
GA-RC REGISTER REQUEST	16	H'10
GA-RC REGISTER ACCEPT	17	H'11
GA-RC REGISTER REDIRECT	18	H'12
GA-RC REGISTER REJECT	19	H'13
GA-RC DEREGISTER	20	H'14
GA-RC REGISTER UPDATE UPLINK	21	H'15
GA-RC REGISTER UPDATE DOWNLINK	22	H'16
GA-RC CELL BROADCAST INFO	23	H'17
GA-RC KEEP ALIVE	116	H'74
GA-RC SYNCHRONIZATION INFORMATION	120	H'78

Table 11.1.1.4.2: Message Type values for GA-CSR

GA-CSR message name	Message Type value (decimal)	Message Type value (hex)
GA-CSR CIPHERING MODE COMMAND	32	H'20
GA-CSR CIPHERING MODE COMPLETE	33	H'21
GA-CSR ACTIVATE CHANNEL	48	H'30
GA-CSR ACTIVATE CHANNEL ACK	49	H'31
GA-CSR ACTIVATE CHANNEL COMPLETE	50	H'32
GA-CSR ACTIVATE CHANNEL FAILURE	51	H'33
GA-CSR CHANNEL MODE MODIFY	52	H'34
GA-CSR CHANNEL MODE MODIFY ACKNOWLEDGE	53	H'35
GA-CSR RELEASE	64	H'40
GA-CSR RELEASE COMPLETE	65	H'41
GA-CSR CLEAR REQUEST	66	H'42
GA-CSR HANDOVER ACCESS	80	H'50
GA-CSR HANDOVER COMPLETE	81	H'51
GA-CSR UPLINK QUALITY INDICATION	82	H'52
GA-CSR HANDOVER INFORMATION	83	H'53
GA-CSR HANDOVER COMMAND	84	H'54
GA-CSR HANDOVER FAILURE	85	H'55
GA-CSR PAGING REQUEST	96	H'60
GA-CSR PAGING RESPONSE	97	H'61
GA-CSR UPLINK DIRECT TRANSFER	112	H'70
GA-CSR DOWNLINK DIRECT TRANSFER	114	H'72
GA-CSR STATUS	115	H'73
GA-CSR CLASSMARK ENQUIRY	117	H'75
GA-CSR CLASSMARK CHANGE	118	H'76
GA-CSR GPRS SUSPENSION REQUEST	119	H'77
GA-CSR UTRAN CLASSMARK CHANGE	121	H'79
GA-CSR REQUEST	128	H'80
GA-CSR REQUEST ACCEPT	129	H'81
GA-CSR REQUEST REJECT	130	H'82

11.1.2 GA-PSR message header information elements over TCP

Each GA-PSR message sent over the TCP-based signalling channel begins with an 8-octet message header. This message header consists of the following information elements: Length Indicator, Protocol Discriminator, Skip Indicator, Message Type and TLLI. These IEs are described in the following sub-clauses.

Table 11.1.2.1: GA-PSR (TCP) message header contents

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-PSR Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0010	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-PSR Message Type	GA-PSR Message Type 11.1.2.1	M	V	1		
	TLLI	TLLI 11.1.2.2	M	V	4		
Here continues the list of IE's using TLV coding format and depending on Protocol Discriminator and Message Type as defined in clause 10.							

11.1.2.1 GA-PSR Message Type

The GA-PSR Message Type IE is the fourth octet in the GA-PSR (TCP) message header. Bit 8 of the GA-PSR Message Type value is the most significant bit and bit 1 is the least significant bit.

The following GA-PSR Message Type values are defined:

Table 11.1.2.1.1: GA-PSR Message Type values (TCP)

GA-PSR message name	GA-PSR Message Type value (decimal)
GA-PSR-DATA	1
GA-PSR-PS-PAGE	3
GA-PSR-ACTIVATE-UTC-REQ	8
GA-PSR-ACTIVATE-UTC-ACK	9
GA-PSR-DEACTIVATE-UTC-REQ	10
GA-PSR-DEACTIVATE-UTC-ACK	11
GA-PSR STATUS	12
GA-PSR HANDOVER COMPLETE	13
GA-PSR UPLINK QUALITY INDICATION	14
GA-PSR HANDOVER INFORMATION	15
GA-PSR HANDOVER COMMAND	16
GA-PSR HANDOVER CONTINUE	17
GA-PSR HANDOVER FAILURE	18

11.1.2.2 Temporary Logical Link Identity (TLLI)

Octets 5 to 8 of the GA-PSR (TCP) message header contain the Temporary Logical Link Identity (TLLI) information element. The TLLI identifies the MS this message was sent by or sent to.

11.1.3 GA-PSR message header information elements over UDP

Each GA-PSR message sent over the UDP-based GA-PSR Transport Channel begins with a 7-octet message header. This message header consists of the following information elements: GA-PSR Message Type, TLLI, and Sequence Number. These IEs are described in the following sub-clauses.

Table 11.1.3.1: GA-PSR (UDP) message header contents

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	GA-PSR Message Type	GA-PSR Message Type 11.1.3.1	M	V	1		
	TLLI	TLLI 11.1.3.2	M	V	4		
	Sequence Number	Sequence Number 11.1.3.3	M	V	2		
	Here continues the list of IE's using TLV coding format and depending on Protocol Discriminator and Message Type as defined in clause 10.						

11.1.3.1 GA-PSR Message Type

The GA-PSR Message Type IE is the first octet in the GA-PSR (UDP) message header. Bit 8 of the GA-PSR Message Type value is the most significant bit and bit 1 is the least significant bit.

The following GA-PSR Message Type values are defined:

Table 11.1.3.1.1: GA-PSR Message Type values (UDP)

GA-PSR message name	GA-PSR Message Type value (decimal)
GA-PSR UNITDATA	2
GA-PSR-UFC-REQ	6
GA-PSR-DFC-REQ	7

11.1.3.2 Temporary Logical Link Identity (TLLI)

Octets 2 to 5 of the GA-PSR (UDP) message header contain the Temporary Logical Link Identity (TLLI) information element. The TLLI identifies the MS this message was sent by or sent to.

11.1.3.3 Sequence Number

Octets 6 to 7 of the GA-PSR (UDP) message header contain the Sequence Number information element with value in the range of 0 to 65535.

11.1.3a GA-RRC message header information elements over TCP

Each GA-RRC message sent over the TCP-based signalling channel begins with a 4-octet message header. This message header consists of the following information elements: Length Indicator, Protocol Discriminator, Skip Indicator, and GA-RRC Message Type. These IEs are described in the following sub-clauses.

Table 11.1.3a.1: GA-RRC (TCP) message header contents

IEI	Information Element	Type/Reference	Presence	Format	Length	Value	Notes
	Length Indicator	Length Indicator 11.1.1.1	M	V	2		
	GA-RRC Protocol Discriminator	Protocol Discriminator 11.1.1.2	M	V	½	0011	
	Skip Indicator	Skip Indicator 11.1.1.3	M	V	½	0000	
	GA-RRC Message Type	GA-RRC Message Type 11.1.3a.1	M	V	1		
Other IEs as defined in sub-clause 10.3.							

11.1.3a.1 GA-RRC Message Type

The GA-RRC Message Type IE is the fourth octet in the GA-RRC (TCP) message header. Bit 8 of the GA-RRC Message Type value is the most significant bit and bit 1 is the least significant bit.

The following GA-RRC (TCP) Message Type values are defined:

Table 11.1.3a.1.1: GA-RRC Message Type values (TCP)

GA-RRC message name	GA-RRC Message Type value (decimal)
GA-RRC REQUEST	1
GA-RRC REQUEST ACCEPT	2
GA-RRC REQUEST REJECT	3
GA-RRC RELEASE REQUEST	4
GA-RRC RELEASE	5
GA-RRC RELEASE COMPLETE	6
GA-RRC PAGING REQUEST	7
GA-RRC ACTIVATE CHANNEL	8
GA-RRC ACTIVATE CHANNEL ACK	9
GA-RRC ACTIVATE CHANNEL COMPLETE	10
GA-RRC MODIFY CHANNEL	11
GA-RRC MODIFY CHANNEL ACK	12
GA-RRC DEACTIVATE CHANNEL REQUEST	13
GA-RRC DEACTIVATE CHANNEL	14
GA-RRC DEACTIVATE CHANNEL COMPLETE	15
GA-RRC SECURITY MODE COMMAND	16
GA-RRC SECURITY MODE COMPLETE	17
GA-RRC INITIAL DIRECT TRANSFER	18
GA-RRC UPLINK DIRECT TRANSFER	19
GA-RRC DOWNLINK DIRECT TRANSFER	20
GA-RRC RELOCATION INFORMATION	21
GA-RRC RELOCATION COMMAND	22
GA-RRC RELOCATION ACCESS	23
GA-RRC RELOCATION COMPLETE	24
GA-RRC RELOCATION FAILURE	25
GA-RRC RELOCATION REQUEST	26
GA-RRC RELOCATION REQUEST ACK	27
GA-RRC UPLINK QUALITY INDICATION	28
GA-RRC STATUS	29

11.1.3b GA-RRC message header over UDP

Each GA-RRC message sent over the UDP-based Packet Transport Channel begins with a message header that is as defined for the G-PDU message in the GTP-U protocol in [53]. The message header is shown below for information. See [53] for a description of each field.

8	7	6	5	4	3	2	1	
Version			PT	spare	E	S	PN	octet 1
Message Type								octet 2
Length								octet 3-4
TEID								octet 5-8
Sequence Number								octet 9-10
N-PDU Number								octet 11
Next Extension Header Type								octet 12
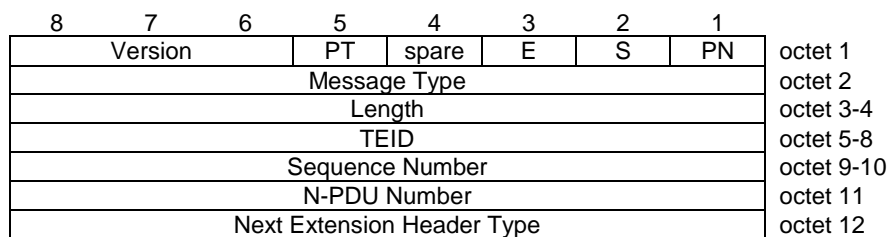
Figure 11.1.3b.1: GA-RRC (PTC) message header contents

Table 11.1.3b.1: GA-RRC (PTC) message header description

Version (octet 1)
The Version field shall be set to value '001'.

PT, Payload Type (octet 1)
The Payload Type field shall be set to value '1'.

E, Extensions Header Flag (octet 1)
The use of the Extensions Header Flag is described in [53]. The MS shall set the E field
to value '0' for all messages sent to the GANC and disregard all extension fields if
present in messages received from the GANC.

S, Sequence Number Flag (octet 1)
Bit
2
0   The Sequence Number field is not present or is present but not meaningful
1   The Sequence Number field is present
See sub-clause 11.1.3b.2 for the handling of this field.

PN, N-PDU Number Flag (octet 1)
Bit
1
0   The N-PDU Number field is not present or is present but not meaningful
1   The N-PDU Number field is present
The MS shall set PN to value '0' for all messages sent to the GANC.

Message Type (octet 2)
The GTP-U Message Type field carries the GA-RRC PTC Message Type value as
defined in sub-clause 11.1.3b.1.

Length (octet 3-4)
This field indicates the length in octets of the payload; i.e., the rest of the message
following the mandatory part of the header (that is the first 8 octets).
The MSB is octet 3 and the LSB is octet 4.

TEID, Tunnel Endpoint ID (octet 5-8)
This field contains the TEID value that has been assigned to the MS (for downlink
messages) or the GANC (for uplink messages) for the PTC to which this message
belongs. The format is as defined in sub-clause 11.2.110, "TEID" but with no IEI and no
length fields.

Sequence Number (octet 9-10)
This field shall be present if and only if any one or more of the S, PN and E flags are set.
This field is meaningful if and only if the Sequence Number Flag is set to 1. The handling
of this field is specified in sub-clause 11.1.3b.2.

N-PDU Number (octet 11)
This field shall be present if and only if any one or more of the S, PN and E flags are set.
This field is meaningful if and only if the N-PDU Number Flag is set to 1. If the Sequence
Number field shall be included in messages sent to the GANC, the MS shall fill the N-
PDU Number field with the value '00000000' for all messages sent to the GANC and
disregard all N-PDU Number fields if present in messages received from the GANC.

Next Extension Header Type (octet 11)
This field shall be present if and only if any one or more of the S, PN and E flags are set.
This field is meaningful if and only if the Extensions Header Flag is set to 1. If the
Sequence Number field shall be included in messages sent to the GANC, the MS shall fill
the Next Extensions Header Type field with the value '00000000' for all messages sent to
the GANC and disregard all extension fields if present in messages received from the
GANC.

11.1.3b.1 GA-RRC PTC Message Type

The GA-RRC PTC Message Type field is the second octet in the GA-RRC (PTC) message header. Bit 8 of the GA-RRC PTC Message Type value is the most significant bit and bit 1 is the least significant bit.

The following GA-RRC PTC message types are defined:

Table 11.1.3a.1.1: Message types for GA-RRC (UDP)

GA-RRC PTC message name	GA-RRC PTC Message Type value (decimal)
GA-RRC PDU	255

11.1.3b.2 GA-RRC Sequence Number Handling

The following describes the use of GA-RRC PDU message sequence numbering assuming sequencing has been activated for the PTC (i.e., Delivery Order is requested in the IE "RAB Configuration" associated with the PTC).

The sending MS shall use 0 for the value of the Sequence Number of the first GA-RRC PDU message in a tunnel, only during the PDP context activation, and shall increment the Sequence Number for each following GA-RRC PDU message. The value shall wrap to zero after 65535.

The receiving MS shall set the content of a counter to zero, only during the PDP context activation. When the receiving MS receives a valid GA-RRC PDU message, it shall increment this counter by one. This counter shall wrap to zero after 65535. It defines the 'Expected Sequence Number'.

Based on the received and Expected Sequence Number values, the receiving MS may decide whether or not to discard the received GA-RRC PDU message.

The receiving MS shall reorder the incoming T-PDUs in sequence if the Reordering Required flag in the PDP context is set. In this case, if needed, the receiving MS shall take into account a maximum number of valid received frames and a maximum elapsed time to assume that a GA-RRC PDU message was lost.

The sequence numbers allocated by the CN (down-link) and MS (uplink) are kept unchanged irrespective of the number of GA-RRC and GTP tunnels the PDU is transferred over. Therefore, GANC shall use on the Up interface for down-link PDUs the G-PDU sequence number received from the SGSN, and shall use on the Iu interface for uplink PDUs the GA-RRC PDU sequence number received from the MS. In case of SRNS relocation and intersystem change, the GANC shall tunnel PDUs without changing the G-PDU sequence numbers.

11.1.4 Information Element Coding principles

Each information element after the relevant message header is coded using the TLV principle as following:

- The first part of each IE is the *Type* field identifying the Information Element. The *Type* field is coded using either 1 or 2 octets. The *ext* field in octet 1 of the Information Element is the field extension bit and defines if the 2nd *Type* field octet is included:

    - if set to 0, then the *Type* field consists of one octet with a value less than or equal to 127 (see Figure 11.1.4.1);

8	7	6	5	4	3	2	1	
ext=0				*Type* value				octet 1
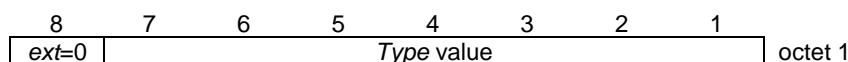
Figure 11.1.4.1: *Type* field structure (coding using one octet)

    - if set to 1, then the *Type* field consists of two octets with a value greater than 127 (see Figure 11.1.4.2).

8	7	6	5	4	3	2	1	
ext=1				*Type* value				octet 1
		Type value (cont.)						octet 1a
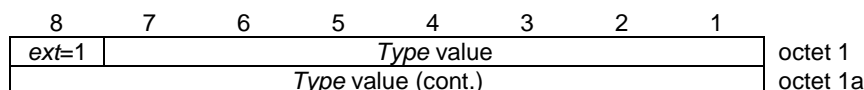
Figure 11.1.4.2: *Type* field structure (coding using two octets)

- The second part of each IE is the *Length* field identifying the length of the *Value* field of the Information Element. The *Length* field is coded using either 1 or 2 octets. The *ext* field in octet 2 of the information element is the field extension bit and defines if the 2nd *Length* field octet is included:

  - if set to 0, then the *Length* field consists of one octet with a value less than or equal to 127 (see Figure 11.1.4.3);

8	7	6	5	4	3	2	1	
ext=0				*Length* value				octet 2
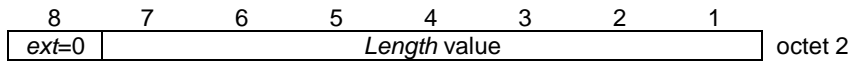
Figure 11.1.4.3: *Length* field structure (coding using one octet)

  - if set to 1, then the *Length* field consists of two octets with a value greater than 127 (see Figure 11.1.4.4).

8	7	6	5	4	3	2	1	
ext=1				*Length* value				octet 2
			Length value (cont.)					octet 2a
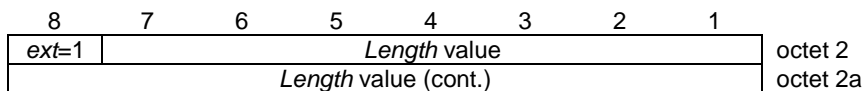
Figure 11.1.4.4: *Length* field structure (coding using two octets)

- The third part of each IE is the *Value* field of the Information Element. The length of the *Value* field depends on the *Type* field of the IE and is defined in the sub-clauses below 11.2.

When the *Type* field or the *Length* field extends over more than one octet, the order of bit values progressively decreases as the octet number increases. The least significant bit of the field is represented by the lowest numbered bit of the highest numbered octet of the field.

11.1.5   Network Byte order

The Network byte order shall be Big-Endian.

11.2 IE Type and Identifiers

Table 11.2.1: IE type and identifiers for Unlicensed Radio Resources management

IE	Identifier	Reference
Mobile Identity	1	11.2.1
GAN Release Indicator	2	11.2.2
Radio Identity	3	11.2.3
GERAN Cell Identity	4	11.2.4
Location Area Identification	5	11.2.5
GERAN/UTRAN coverage Indicator	6	11.2.6
GAN Classmark	7	11.2.7
Geographical Location	8	11.2.8
GANC-SEGW IP Address	9	11.2.9
GANC-SEGW Fully Qualified Domain/Host Name	10	11.2.10
Redirection Counter	11	11.2.11
Discovery Reject Cause	12	11.2.12
GAN Cell Description	13	11.2.13
GAN Control Channel Description	14	11.2.14
Cell Identifier List	15	11.2.15
TU3907 Timer	16	11.2.16
GSM RR/UTRAN RRC State	17	11.2.17
Routing Area Identification	18	11.2.18
GAN Band	19	11.2.19
GA-RC/GA-CSR/GA-PSR State	20	11.2.20
Register Reject Cause	21	11.2.21
TU3906 Timer	22	11.2.22
TU3910 Timer	23	11.2.23
TU3902 Timer	24	11.2.24
L3 Message	26	11.2.26
Channel Mode	27	11.2.27
Mobile Station Classmark 2	28	11.2.28
RR Cause	29	11.2.29
Cipher Mode Setting	30	11.2.30
GPRS Resumption	31	11.2.31
Handover From GAN Command	32	11.2.32
UL Quality Indication	33	11.2.33
TLLI	34	11.2.34
Packet Flow Identifier	35	11.2.35
Suspension Cause	36	11.2.36
TU3920 Timer	37	11.2.37
QoS	38	11.2.38
GA-PSR Cause	39	11.2.39
User Data Rate	40	11.2.40
Routing Area Code	41	11.2.41
AP Location	42	11.2.42
TU4001 Timer	43	11.2.43
Location Status	44	11.2.44
Cipher Response	45	11.2.45
Ciphering Command RAND	46	11.2.46
Ciphering Command MAC	47	11.2.47
Ciphering Key Sequence Number	48	11.2.48
SAPI ID	49	11.2.49
Establishment Cause	50	11.2.50
Channel Needed	51	11.2.51
PDU in Error	52	11.2.52
Sample Size	53	11.2.53
Payload Type	54	11.2.54
Multi-rate Configuration	55	11.2.55
Mobile Station Classmark 3	56	11.2.56
LLC-PDU	57	11.2.57
Location Black List indicator	58	11.2.58
Reset Indicator	59	11.2.59

IE	Identifier	Reference
TU4003 Timer	60	11.2.60
AP Service Name	61	11.2.61
GAN Service Zone Information	62	11.2.62
RTP Redundancy Configuration	63	11.2.63
UTRAN Classmark	64	11.2.64
Classmark Enquiry Mask	65	11.2.65
UTRAN Cell Identifier List	66	11.2.66
Serving GANC table indicator	67	11.2.67
Registration indicators	68	11.2.68
GAN PLMN List	69	11.2.69
Required GAN Services	71	11.2.71
Broadcast Container	72	11.2.72
3G Cell Identity	73	11.2.73
MS Radio Identity	96	11.2.3
GANC IP Address	97	11.2.9
GANC Fully Qualified Domain/ Host Name	98	11.2.10
IP address for GPRS user data transport	99	11.2.9
UDP Port for GPRS user data transport	100	11.2.25
GANC TCP port	103	11.2.25
RTP UDP port	104	11.2.25
RTCP UDP port	105	11.2.25
GERAN Received Signal Level List	106	11.2.70
UTRAN Received Signal Level List	107	11.2.70b
PS Handover to GERAN Command	108	11.2.74
PS Handover to UTRAN Command	109	11.2.75
PS Handover to GERAN PSI	110	11.2.76
PS Handover to GERAN SI	111	11.2.77
TU4004 Timer	112	11.2.78
GAN Mode Indicator	79	11.2.79
CN Domain Identity	80	11.2.80
GAN Iu Mode Cell Description	81	11.2.81
3G UARFCN	82	11.2.82
RAB ID	83	11.2.83
RAB ID List	84	11.2.84
GA-RRC Establishment Cause	85	11.2.85
GA-RRC Cause	86	11.2.86
GA-RRC Paging Cause	87	11.2.87
Intra Domain NAS Node Selector	88	11.2.88
CTC Activation List	89	11.2.89
CTC Description	90	11.2.90
CTC Activation Ack List	91	11.2.91
CTC Activation Ack Description	92	11.2.92
CTC Modification List	93	11.2.93
CTC Modification Ack List	94	11.2.94
CTC Modification Ack Description	95	11.2.95
PTC Activation List	115	11.2.96
PTC Description	116	11.2.97
PTC Activation Ack List	117	11.2.98
PTC Activation Ack Description	118	11.2.99
PTC Modification List	119	11.2.100
PTC Modification Ack List	120	11.2.101
PTC Modification Ack Description	121	11.2.102
RAB Configuration	122	11.2.103
Multi-rate Configuration 2	123	11.2.104
Selected Integrity Protection Algorithm	124	11.2.105
Selected Encryption Algorithm	125	11.2.106
CN Domains to Handover	126	11.2.107
3G Security Capability	74	11.2.108
NAS Synchronisation Indicator	75	11.2.109
GANC TEID	76	11.2.110

IE	Identifier	Reference
MS TEID	77	11.2.110
UTRAN RRC Message	78	11.2.111
SRNS Relocation Info	127	11.2.111
MS Radio Access Capability	128	11.2.112
Handover Reporting Control	129	11.2.113
Tracking Area Identity	130	11.2.114
E-UTRAN Cell Identity	131	11.2.115
E-UTRAN Camping Indicator	132	11.2.116
Bandwidth-efficient Mode Indicator	133	11.2.117

11.2.1   Mobile Identity

The purpose of the *Mobile Identity* information element is to provide either the international mobile subscriber identity, IMSI, the temporary mobile subscriber identity, TMSI/P-TMSI, the international mobile equipment identity, IMEI or the international mobile equipment identity together with the software version number, IMEISV.

8	7	6	5	4	3	2	1	
Mobile Identity IEI								octet 1
Length of mobile identity contents								octet 2, 2a
The rest of the IE is coded as in [8] not including IEI and length, if present.								octet 3 …. octet n
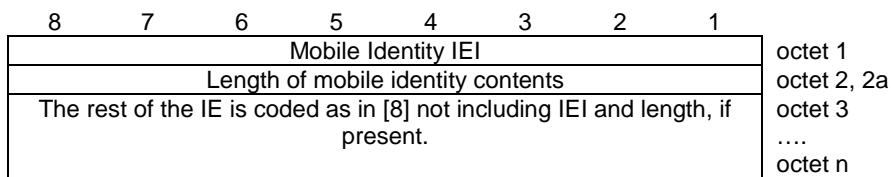
Figure 11.2.1.1: Mobile Identity information element

11.2.2   GAN Release Indicator

This information element is used to indicate the GAN Release supported.

8	7	6	5	4	3	2	1	
GAN Release Indicator IEI								octet 1
Length of GAN Release Indicator IE contents								octet 2
spare					URI			octet 3
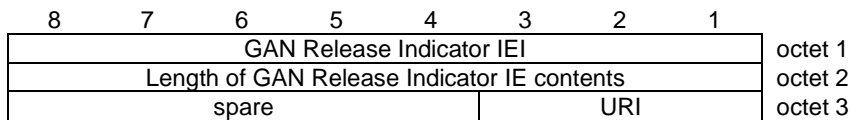
Figure 11.2.2.1: GAN Release Indicator information element

Table 11.2.2.1: GAN Release Indicator information element

```
URI, GAN Release Indicator (octet 3)
Bits
3  2  1
0  0  1   Release 1 (i.e. 3GPP Release-6)
0  1  0   Release 2 (i.e. 3GPP Release-7)
0  1  1   Release 3 (i.e. 3GPP Release-8)
All other values are reserved.
```

11.2.3   Access Identity

The Access Identity IE is used for transmission of identifiers of the Access Technologies e.g. the Bluetooth Device Address (BD_ADDR) or WLAN MAC Address.

8	7	6	5	4	3	2	1	
Access Identity IEI								octet 1
Length of Access Identity contents								octet 2
Spare				Type of identity				octet 3
Access Identity MSB value								octet 4
Access Identity LSB value								octet 9
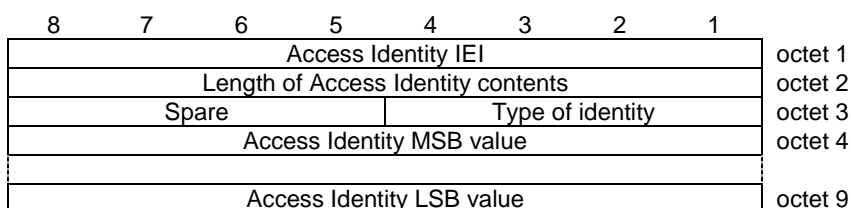
Figure 11.2.3.1: Access Identity information element

Table 11.2.3.1: Access Identity information element

Type of Identity (octet 3)				
Bits				
4	3	2	1	
0	0	0	0	IEEE MAC-address format
0	0	0	1	
	to			
1	1	1	1	All other values are for future use.

11.2.4 GERAN Cell Identity

The purpose of the *Cell Identity* information element is to identify a cell within a location area.

8	7	6	5	4	3	2	1	
GERAN Cell Identity IEI								octet 1
Length of GERAN Cell Identity IE contents								octet 2, 2a
The rest of the IE is coded as in [8] not including IEI and length, if present.								octet 3 …. octet n
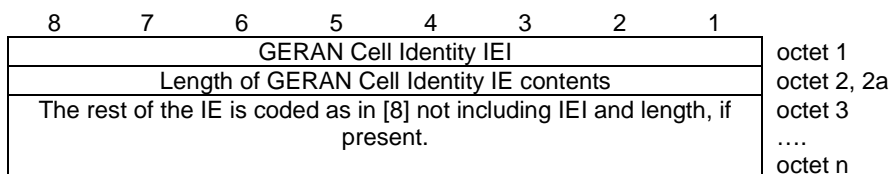
Figure 11.2.4.1 GERAN *Cell Identity* information element

11.2.5 Location Area Identification

The purpose of the *Location Area Identification* information element is to provide an unambiguous identification of location areas within the area covered by the GSM system.

8	7	6	5	4	3	2	1	
Location Area Identification IEI								octet 1
Length of Location Area Identification IE contents								octet 2, 2a
The rest of the IE is coded as in [8] not including IEI and length, if present.								octet 3 …. octet n
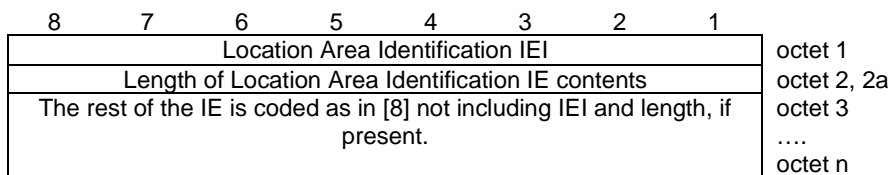
Figure 11.2.5.1: Location Area Identification information element

11.2.6 GERAN/UTRAN coverage Indicator

This information element is used to indicate the presence of GERAN/UTRAN coverage in the current MS location.

8	7	6	5	4	3	2	1	
GERAN/UTRAN coverage Indicator IEI								octet 1
Length of GERAN/UTRAN coverage Identity contents								octet 2
GCI								octet 3
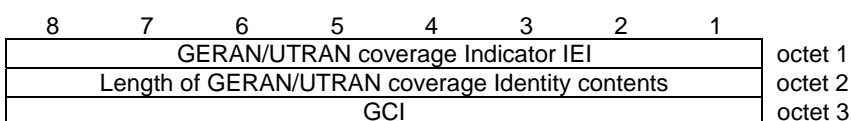
Figure 11.2.6.1 GERAN/UTRAN coverage Indicator information element

Table 11.2.6.1: GERAN/UTRAN coverage Indicator information element

GCI, GERAN/UTRAN coverage Indicator (octet 3)
0 Normal Service in the GERAN/UTRAN
1 Limited Service in the GERAN/UTRAN
2 MS has not found GERAN/UTRAN coverage (LAI information taken from SIM, if available). This value shall be used if the MS is camped on a E-UTRAN cell.
3 MS has found GERAN/UTRAN coverage, service state unknown
4-255 All other values are for future use

11.2.7 GAN Classmark

The purpose of the *GAN Classmark* information element is to provide the network with information concerning aspects of both the cellular and generic access interfaces, as well as the support for RTP redundancy of the mobile station equipment.

8	7	6	5	4	3	2	1	
GAN Classmark IEI								octet 1
Length of GAN Classmark IE contents								octet 2
spare		UC	GC	TGA				octet 3
spare				BMSI	GMSI		PS HO	RRS	octet 4
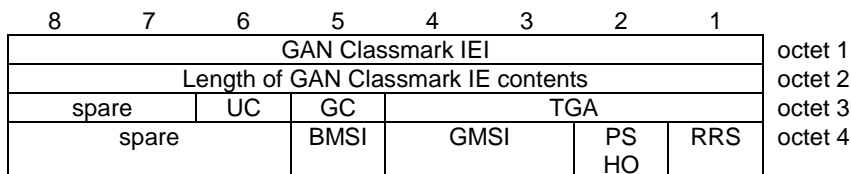
Figure 11.2.7.1: GAN Classmark information element

Table 11.2.7.1: GAN Classmark information element

TGA, Type of Generic Access (octet 3) This field is used to indicate the current Generic Access type used by the mobile station to access the GAN. Bit 4 3 2 1 0 0 0 0 no radio 0 0 0 1 Bluetooth 0 0 1 0 WLAN 802.11 1 1 1 1 unspecified All other values are reserved in Release 1.
GC, GERAN Capable (octet 3) Bit 5 0   The MS is not GERAN capable. 1   The MS is GERAN capable.
UC, UTRAN Capable (octet 3) Bit 6 0   The MS is not UTRAN capable. 1   The MS is UTRAN capable.
RRS, RTP Redundancy Support (octet 4) Bit1 0   RTP Redundancy not supported 1   RTP Redundancy supported
PS HO, PS Handover Capable (octet 4) Bit 2 0   The MS does not support PS handover to/from GAN A/Gb mode. 1   The MS supports PS handover to/from GAN A/Gb mode.
GMSI, GAN Mode Support Indicator (octet 4) Bits 4 3 0 0 Unspecified 0 1 The MS supports GAN A/Gb mode only 1 0 The MS supports GAN Iu mode only 1 1 The MS supports GAN A/Gb mode and GAN Iu mode
BMSI, Bandwidth-efficient Mode Support Indicator (octet 4) Bit 5 0   The MS does not support RFC 4867 [48] bandwidth-efficient mode. 1   The MS supports RFC 4867 [48] bandwidth-efficient mode.

11.2.8 Geographical Location

This is a variable length information element providing an estimate of a geographic location of a target MS.

It is coded as follows:

8	7	6	5	4	3	2	1	
Geographical Location Indicator IEI								octet 1
Length of Geographical Location value contents								octet 2, 2a
Location estimate								octet 3
								....
								octet n
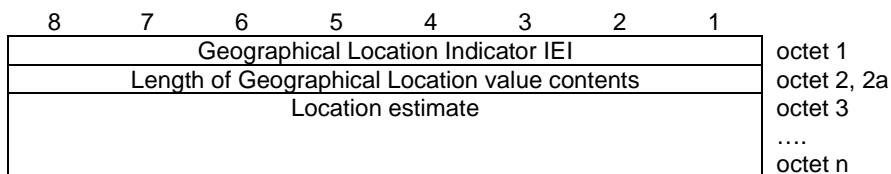
Figure 11.2.8.1: Geographical Location information element

The Location Estimate field is composed of 1 or more octets with an internal structure according to section 7 in [5].

11.2.9 IP Address

The IP Address information element contains one IP address.

8	7	6	5	4	3	2	1	
IP address IEI								octet 1
Length of IP address IE contents								octet 2, 2a
IP Address type								octet 3
Address information MSB								octet 4
Address information LSB								octet n
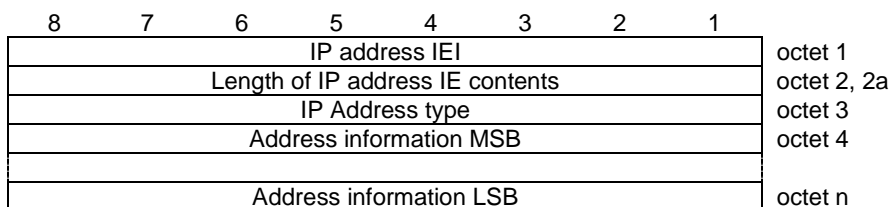
Figure 11.2.9.1: IP address information element

Table 11.2.9.1: IP address information element

```
IP address type number value (octet 3)
Bits
8 7 6 5 4 3 2 1
0 0 1 0 0 0 0 1    IPv4 address
0 1 0 1 0 1 1 1    IPv6 address

All other values shall be interpreted as Ipv4 address
in this version of the protocol.
```

If PDP type number indicates Ipv4, the Address information in octet 4 to octet 7 contains the Ipv4 address. Bit 8 of octet 4 represents the most significant bit of the IP address and bit 1 of octet 7 the least significant bit .

If PDP type number indicates Ipv6, the Address information in octet 4 to octet 19 contains the Ipv6 address. Bit 8 of octet 4 represents the most significant bit of the IP address and bit 1 of octet 19 the least significant bit.

11.2.10 Fully Qualified Domain/Host Name (FQDN)

The Fully Qualified Domain/Host Name (FQDN) information element contains the name of a network element (i.e. SEGW or a GANC). The information element is coded in string format.

8	7	6	5	4	3	2	1	
FQDN IEI								octet 1
Length of FQDN IE contents								octet 2, 2a
FQDN 1st character								octet 3
FQDN last character								octet n
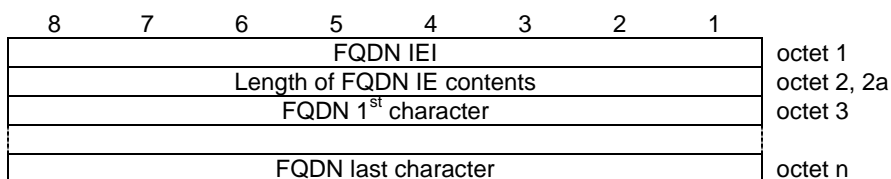
Figure 11.2.10.1: FQDN information element

Table 11.2.10.1: FQDN information element

FQDN, Fully Qualified Domain/Host Name value (octet 3 to octet n) The FQDN is coded as a string. This means that the 1st character of the string is coded in octet 3 and the last character of the string is coded in the last octet of this IE (octet n).

11.2.11 Redirection Counter

The purpose of this information element is to indicate to the GANC the number of times the MS has been redirect and still has not obtained service.

8	7	6	5	4	3	2	1	
Redirection Counter IEI								octet 1
Length of Redirection Counter contents								octet 2
Redirection Counter value								octet 3
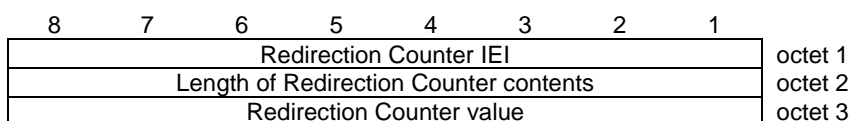
Figure 11.2.11.1: Redirection Counter information element

Table 11.2.11.1: Redirection Counter information element

Redirection Counter value (octet 3) In the Redirection Counter value field bit 8 of octet 3 is the most significant bit The value is given in number redirections The Redirection Counter value consists of 1 octets.

11.2.12 Discovery Reject Cause

The Discovery reject Cause information element contains information to the MS about the reason for a Discovery Reject. The MS shall act according to the cause value received.

8	7	6	5	4	3	2	1	
Discovery Reject Cause IEI								octet 1
Length of Discovery Reject Cause IE contents								octet 2
Discovery Reject Cause Value								octet 3
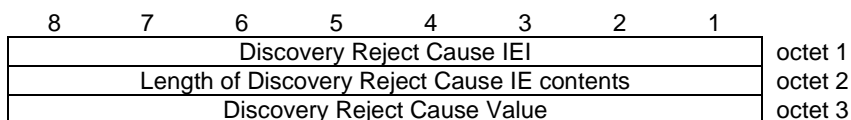
Figure 11.2.12.1: Discovery Reject Cause information element

Table 11.2.12.1: Discovery Reject Cause information element

Discovery Reject Cause (octet 3) Bits **3 2 1** 0 0 0   Network Congestion 0 0 1   Unspecified 0 1 0   IMSI not allowed 1 0 0   to 1 1 1   Reserved for future use.

11.2.13 GAN Cell Description

The purpose of the *GAN Cell Description* information element is to provide a minimum description of a GAN A/Gb mode cell, e.g. to identify the GAN A/Gb mode cell in order to be handed over from GERAN/UTRAN.

8	7	6	5	4	3	2	1	
GAN Cell Description IEI								octet 1
Length of GAN Cell Description value contents								octet 2, 2a
The rest of the IE is coded as in [12], Cell Description IE, not including IEI and length, if present.								octet 3 …. octet n
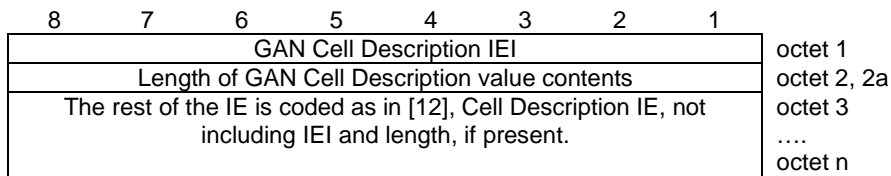
Figure 11.2.13.1: *GAN Cell Description* **information element**

11.2.14 GAN Control Channel Description

The purpose of the *Control Channel Description* information element is to provide a variety of information about the GAN service.

8	7	6	5	4	3	2	1	
GAN Control Channel Description IEI								octet 1
Length of GAN Control Channel Description contents								octet 2
MSCR	ATT	DTM	GPRS	NMO		ECMC	spare	octet 3
T3212 timeout value								octet 4
RAC								octet 5
spare		PS HO	3GECS	PFCFM	RE	ECMP	SGSNR	octet 6
AC C15	AC C14	AC C13	AC C12	AC C11	AC C10	AC C09	AC C08	octet 7
AC C07	AC C06	AC C05	AC C04	AC C03	AC C02	AC C01	AC C00	octet 8
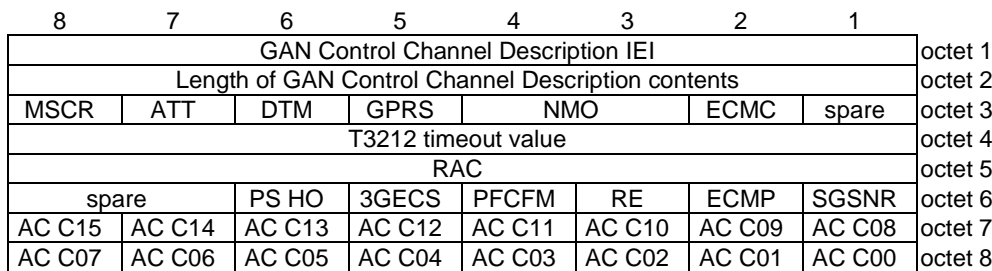
Figure 11.2.14.1: *GAN Control Channel Description* **information element**

Table 11.2.14.1: *GAN Control Channel Description* **information element**

ECMC, Early Classmark Sending Control (octet 3)
Bit
2
0   Early Classmark Sending is allowed
1   Early Classmark Sending is forbidden
This field shall be disregarded in GAN Iu mode.

NMO, Network Mode of Operation (octet 3)

Bit
4 3
0 0   Network Mode of Operation I
0 1   Network Mode of Operation II
1 0   Network Mode of Operation III (this value is not valid in GAN Iu mode)
1 1   Reserved

GPRS, GPRS Availability (octet 3)
Bit
5
0   GPRS available
1   GPRS not available
This field shall be disregarded in GAN Iu mode.

DTM, Dual Transfer Mode of Operation by network (octet 3)
Bit
6
0   Network does not support dual transfer mode
1   Network supports dual transfer mode
This field shall be disregarded in GAN Iu mode.

ATT, Attach-detach allowed (octet 3)

Bit

7

0   MSs in the cell are not allowed to apply IMSI attach and detach procedure.

1   MSs in the cell shall apply IMSI attach and detach procedure.

MSCR, MSC Release (octet 3)

Bit

8

0   MSC is Release '98 or older

1   MSC is Release '99 onwards

This field shall be disregarded in GAN Iu mode.

T3212 timeout value (octet 4)

The T3212 timeout value field is coded as the binary representation of the timeout value for periodic updating in decihours.

Range: 1 to 255

The value 0 is used for infinite timeout value i.e. periodic updating shall not be used within the cell.

RAC, Routing Area Code (octet 5)

This field is the binary representation of the Routing Area Code, see [3]. Bit 8 is the most significant bit and bit 1 is the least significant bit.

SGSNR, SGSN Release (octet 6)

Bit

1

0   SGSN is Release '98 or older

1   SGSN is Release '99 onwards

This field shall be disregarded in GAN Iu mode.

ECMP, Emergency Call Mode Preference (octet 6)

Bit

2

0   GERAN/UTRAN is preferred for Emergency calls

1   GAN is preferred for Emergency calls

RE, Call re-establishment allowed (octet 6)

Bit

3

0   Call Re-establishment allowed in the cell

1   Call Re-establishment not allowed in the cell

When call re-establishment is allowed, the mobile station may initiate call re-establishment if rove-in follows the RR/RRC connection failure in GSM/UMTS.

PFCFM, PFC_FEATURE_MODE (octet 6)
Bit
4
0   The network does not support packet flow context procedures.
1   The network supports packet flow context procedures.
This field shall be disregarded in GAN Iu mode.

3GECS, 3G Early Classmark Sending Restriction (octet 6)
Bit
5
0   UTRAN classmark change message shall note be sent with the Early classmark sending
1   The sending of UTRAN Classmark Sending messages is controlled by the Early Classmark
      Sending Control parameter
This field shall be disregarded in GAN Iu mode.

PS HO, PS Handover indicator (octet 6)
Bit
6
0   The network does not support PS handover between GERAN/UTRAN mode and GAN A/Gb
      mode.
1   The network supports PS handover between GERAN/UTRAN mode and GAN A/Gb mode.
This field shall be disregarded in GAN Iu mode.

AC CN, Access Control Class N (octet 7 and octet 8)

These fields are specified and described in 3GPP TS 44.018 and 3GPP TS 22.011.

11.2.15 Cell Identifier List

The Cell Identifier List information element is used to transfer multiple Cell Global Identifications in GAN.

8	7	6	5	4	3	2	1	
GAN Cell Identifier List IEI								octet 1
Length of GAN Cell Identifier List value contents								octet 2, 2a
The rest of the IE is coded as in [16], not including IEI and length, if present.								octet 3 …. octet n
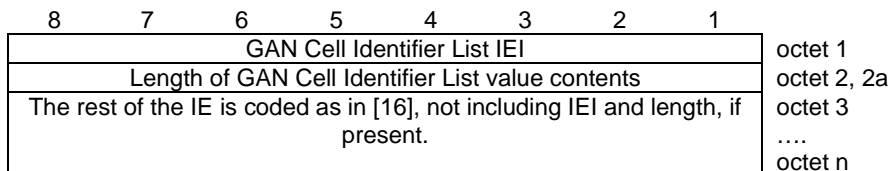
Figure 11.2.15.1: *Cell Identifier List* **information element**

> NOTE: Cell identification discriminator "The whole Cell Global Identification, CGI" as defined in [16] shall be used.

11.2.16 TU3907 Timer

The purpose of this information element is to indicate to the MS the minimum period of time it should wait before attempting Registration at the current GANC.

8	7	6	5	4	3	2	1	
TU3907 Timer IEI								octet 1
Length of TU3907 Timer IE contents								octet 2
TU3907 Timer value MSB								octet 3
TU3907Timer value LSB								octet 4

Figure 11.2.16.1: TU3907 Timer information element

Table 11.2.16.1: TU3907 Timer information element

TU3907 Timer value (octet 3 and 4)
In the TU3907 Timer value field bit 8 of octet 3 is the most significant bit and bit 1 of octet 4 the least significant bit.
The value is given in number of seconds.
The TU3907 Timer value consists of 2 octets.

11.2.17 GSM RR/UTRAN RRC State

This information element is used to indicate the state of the GSM RR or UTRAN RRC entity when the MS is registering for GAN service. If GSM-RR is the current serving RR entity, information about GSM RR shall be included and if UTRAN-RRC is the current serving RR entity, information about UTRAN RRC shall be included.

8	7	6	5	4	3	2	1	
GSM RR/UTRAN RRC State IEI								octet 1
Length of GSM RR/ UTRAN RRC State contents								octet 2
spare					GRS			octet 3
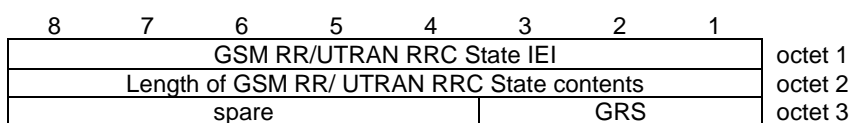
Figure 11.2.17.1 GSM RR/UTRAN RRC State information element

Table 11.2.17.1: GSM RR/UTRAN RRC State information element

GRS, GSM RR/UTRAN RRC State (octet 3) Bits 1-3
0 0 0   GSM RR is in IDLE state. 0 0 1   GSM RR is in DEDICATED state. 0 1 0   UTRAN RRC is in IDLE STATE 0 1 1   UTRAN RRC is in CELL_DCH STATE 1 0 0   UTRAN RRC is in CELL_FACH STATE 1 0 1   UTRAN RRC is in CELL_PCH STATE 1 1 0   UTRAN RRC is in URA_PCH STATE 1 1 1   Unknown
All other values are reserved for future use.

11.2.18 Routing Area Identification

The purpose of the *routing area identification* information element is to provide an unambiguous identification of routing areas within the GPRS coverage area.

8	7	6	5	4	3	2	1	
Routing Area Identification IEI								octet 1
Length of Routing Area Identification contents								octet 2
The rest of the IE is coded as in [8] not including IEI and length, if present.								octet 3 …. octet 8
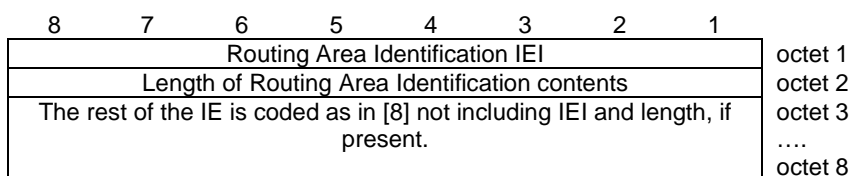
Figure 11.2.18.1: Routing Area Identification information element

11.2.19 GAN Band

The GAN Band information element is used to indicate to the mobile station the GSM Band that is associated with the GANC. The mobile station uses this information to construct the MS Classmark 2 information element. The GAN Band is applicable in GAN A/Gb mode only.

8	7	6	5	4	3	2	1	
GAN Band IEI								octet 1
Length of GAN Band contents								octet 2
spare				GAN Band				octet 3
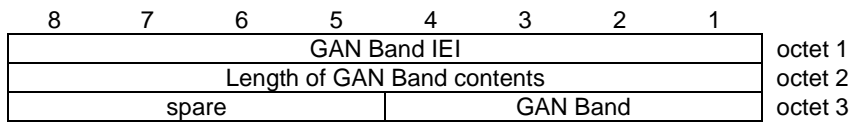
Figure 11.2.19.1: GAN Band information element

Table 11.2.19.1: GAN Band information element

GAN Band (4 bit field)
This field indicates the band applicable for the parameters in this structure.

Bits 4 - 1
4 3 2 1

0 0 0 0 E-GSM is supported
0 0 0 1 P-GSM is supported
0 0 1 0 GSM 1800 is supported
0 0 1 1 GSM 450 is supported
0 1 0 0 GSM 480 is supported
0 1 0 1 GSM 850 is supported
0 1 1 0 GSM 1900 is supported
0 1 1 1 GSM 700 is supported

All other values are reserved for future use and shall not be interpreted as an error.

11.2.20 GAN State

This information element is used to indicate the state of the GAN protocol sub-layer entities in the MS to the GANC.

8	7	6	5	4	3	2	1	
GAN State IEI								octet 1
Length of GAN State contents								octet 2
spare			GA-RRC-PS	GA-RRC-CS	UPS	URS		octet 3
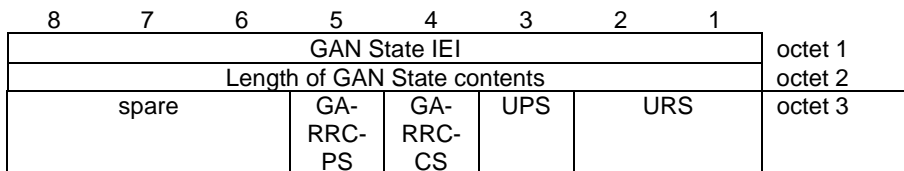
Figure 11.2.20.1 GAN State information element

Table 11.2.20.1: GAN State information element

```
URS, GA-RC/GA-CSR State (octet 3)
Bits 2-1
2 1
0 0        GA-CSR is in GA-CSR-IDLE state.
0 1        GA-CSR is in GA-CSR-DEDICATED state.
1 0        GA-RC is in GA-RC-REGISTERED state
           while in GERAN/UTRAN mode.

UPS, GA-PSR State (octet 3)
Bit
3
0          GA-PSR is in GA-PSR-STANDBY state.
1          GA-PSR is in GA-PSR-ACTIVE state.

GA-RRC-CS, GA-RRC (CS) State (octet 3)
Bit
4
0          GA-RRC (CS) is in GA-RRC-IDLE state.
1          GA-RRC (CS) is in GA-RRC-CONNECTED
           state.

GA-RRC-PS, GA-RRC (PS) State (octet 3)
Bit
5
0          GA-RRC (PS) is in GA-RRC-IDLE state.
1          GA-RRC (PS) is in GA-RRC-CONNECTED
           state.
```

11.2.21 Register Reject Cause

This information element contains the reason for Register reject or deregistration.

8	7	6	5	4	3	2	1	
Register Reject Cause IEI								octet 1
Length of Register Reject Cause IE contents								octet 2
RRC								octet 3
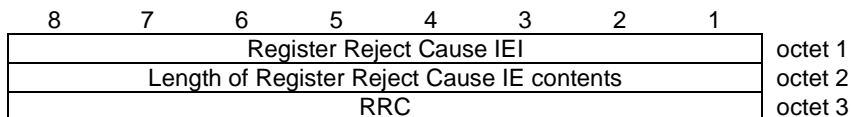
Figure 11.2.21.1: *Register Reject Cause* information element

Table 11.2.21.1: *Register Reject Cause* information element

Register Reject Cause (octet 3)	
0	Network Congestion
1	AP not allowed
2	Location not allowed
3	Invalid GANC
4	Geo Location not known
5	IMSI not allowed
6	Unspecified
7	GANC-SEGW certificate not valid
8	EAP_SIM authentication failed
9	TCP establishment failed
10	Redirection
11	EAP-AKA Authentication failed
12 to 255	Reserved for future use.

11.2.22 TU3906 Timer

The TU3906 Timer information element contains the value for the GA-RC Keep Alive mechanism, as described in section 5.5.

8	7	6	5	4	3	2	1	
TU3906 Timer IEI								octet 1
Length of TU3906 Timer IE contents								octet 2
TU3906 Timer value MSB								octet 3
TU3906 Timer value LSB								octet 4
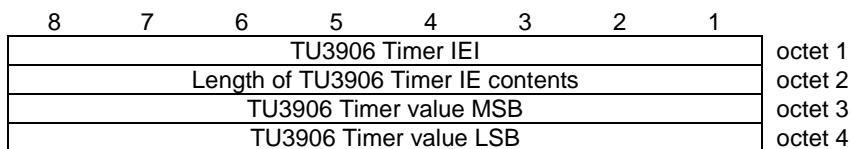
Figure 11.2.22.1: TU3906 Timer information element

Table 11.2.22.1: TU3906 Timer information element

TU3906 Timer value (octet 3 and 4)

In the TU3906 Timer value field bit 8 of octet 3 is the most significant bit and bit 1of octet 4 the least significant bit.

The value is given in number of seconds.

The TU3906 Timer value consists of 2 octets.

11.2.23   TU3910 Timer

When the MS roves out, it shall start timer TU3910 and shall not rove in until this timer has expired, unless the MS has detected loss of GERAN coverage.

8	7	6	5	4	3	2	1	
TU3910 Timer IEI								octet 1
Length of TU3910 Timer IE contents								octet 2
TU3910 Timer value MSB								octet 3
TU3910 Timer value LSB								octet 4
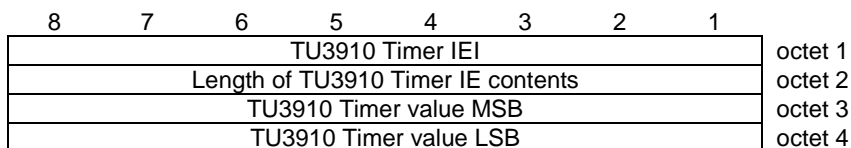
Figure 11.2.23.1: TU3910 Timer information element

Table 11.2.23.1: TU3910 Timer information element

TU3910 Timer (octet 3 and 4)

In the TU3910 Timer value field bit 8 of octet 3 is the most significant bit and bit 1of octet 4 the least significant bit.

The value is given in number of seconds.

The TU3910 value consists of 2 octets.

11.2.24   TU3902 Timer

The purpose of this information element is to indicate to the MS the minimum period of time it should wait before attempting the Discovery procedure again.

8	7	6	5	4	3	2	1	
TU3902 Timer IEI								octet 1
Length of TU3902 Timer IE contents								octet 2
TU3902 Timer value MSB								octet 3
TU3902 Timer value LSB								octet 4
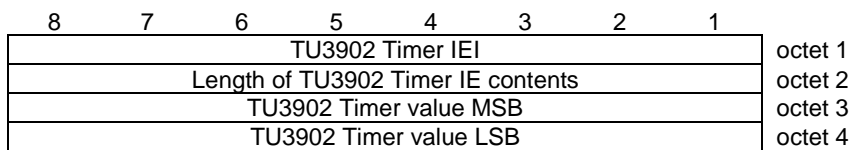
Figure 11.2.24.1: TU3902 Timer information element

Table 11.2.24.1: TU3902 Timer information element

TU3902 Timer value (octet 3 and 4)
In the TU3902 Timer value field bit 8 of octet 3 is the most significant bit and bit 1 of octet 4 the least significant bit.
The value is given in number of seconds.
The TU3902 Timer value consists of 2 octets.

11.2.25 Communication Port Identity

The Communication Port Identity information element is used to identify the TCP or UDP port for the connection.

8	7	6	5	4	3	2	1	
Communication Port Identity IEI								octet 1
Length of Communication Port Identity IE contents								octet 2
Communication Port MSB value								octet 3
Communication Port LSB value								octet 4

Figure 11.2.25.1: Communication Port information element

Even though it is only recommended in [35], RTP shall use an even destination UDP port number and the corresponding RTCP stream shall use the next higher (odd) destination UDP port number. E.g. UDP ports 49170 and 49171 form one RTP/RTCP UDP port pair.

11.2.26 L3 Message

The L3 Message information element contains the upper layer message to be transported using the GA-CSR protocol or the GA-RRC protocol between the MS and the core network.

8	7	6	5	4	3	2	1	
L3 Message IEI								octet 1
Length of L3 Message IE contents								octet 2, 2a
L3 Message contents, 1st octet								octet 3
L3 Message contents, last octet								octet n

Figure 11.2.26.1: L3 Message information element

11.2.27 Channel Mode

The *Channel Mode* information element gives information of the mode on coding/decoding and transcoding. The exact mode is determined by the contents of this IE and the channel type.

8	7	6	5	4	3	2	1	
Channel Mode IEI								octet 1
Length of Channel Mode IE contents								octet 2, 2a
The rest of the IE is coded as in [12], not including IEI and length, if present.								octet 3 …. octet n

Figure 11.27.1: Channel Mode information element

NOTE 1: Support for AMR FR codec, as specified in 3GPP TS 26.071 [7], is mandatory when operating in GAN A/Gb mode, with support for other codecs being optional.

11.2.28 Mobile Station Classmark 2

The purpose of the *Mobile Station Classmark 2* information element is to provide the network with information concerning aspects of both high and low priority of the mobile station equipment. This affects the manner in which the network handles the operation of the mobile station. The Mobile Station Classmark information indicates general mobile station characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.

8	7	6	5	4	3	2	1	
Mobile station classmark 2 IEI								octet 1
Length of mobile station classmark 2 contents								octet 2, 2a
The rest of the IE is coded as in [8], not including IEI and length, if present.								octet 3 …. octet n
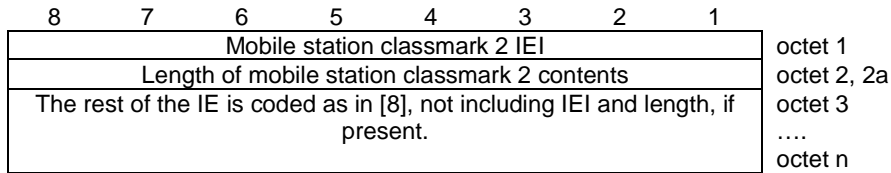
Figure 11.2.28.1: Mobile Station Classmark 2 information element

11.2.29 RR Cause

The purpose of the *RR Cause* information element is to provide the reason for release or the reason for completion of an assignment or handover.

8	7	6	5	4	3	2	1	
RR Cause IEI								octet 1
Length of RR Cause contents								octet 2, 2a
The rest of the IE is coded as in [12], not including IEI and length, if present.								octet 3 …. octet n
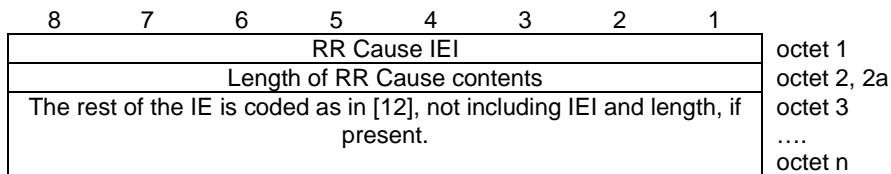
Figure 11.2.29.1: RR Cause information element

11.2.30 Cipher Mode Setting

The purpose of the *Cipher Mode Setting* information element is to indicate whether stream ciphering shall be started or not and if it is to be started, which algorithm to use. It is not used for ciphering when the MS is in GAN A/Gb mode or GAN Iu mode, but after handover from GAN A/Gb mode in the target RAT.

8	7	6	5	4	3	2	1	
Cipher Mode Setting IEI								octet 1
Length of Cipher Mode Setting IE contents								octet 2
spare				algorithm identifier			SC	octet 3
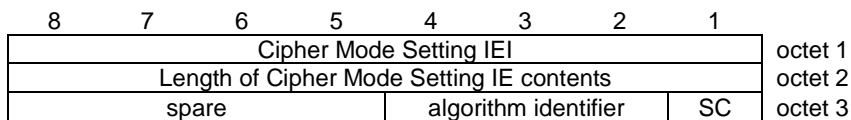
Figure 11.2.30.1: Cipher Mode Setting information element

NOTE: The coding of fields SC and algorithm identifier is defined in [12] as part of the Cipher Mode Setting IE.

11.2.31 GPRS Resumption

The purpose of the *GPRS Resumption* information element is to indicate whether the network has successfully resumed GPRS services or not.

8	7	6	5	4	3	2	1	
GPRS Resumption IEI								octet 1
Length of GPRS Resumption contents								octet 2, 2a
The rest of the IE is coded as in [12], not including IEI and length, if present.								octet 3 …. octet n
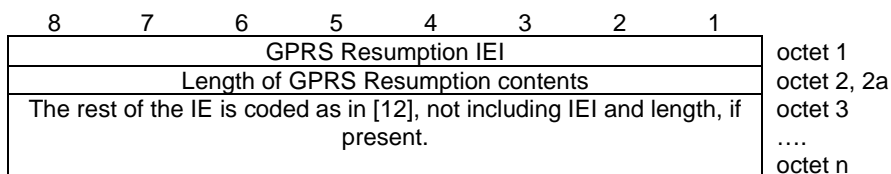
Figure 11.2.31.1: GPRS Resumption information element

11.2.32 Handover From GAN Command

The purpose of Handover From GAN Command information element is to provide information to the MS of handover from GAN. The Handover From GAN Command information element contains all information needed by the MS for handover from GAN.

8	7	6	5	4	3	2	1	
Handover from GAN Command IEI								octet 1
Length of Handover from GAN Command value contents								octet 2, 2a
If the target RAT is GERAN, the rest of the IE is coded as HANDOVER COMMAND message in [12]. If the target RAT is UTRAN, the rest of the IE is coded as INTER SYSTEM TO UTRAN HANDOVER COMMAND message in [12].								octet 3 …. octet n
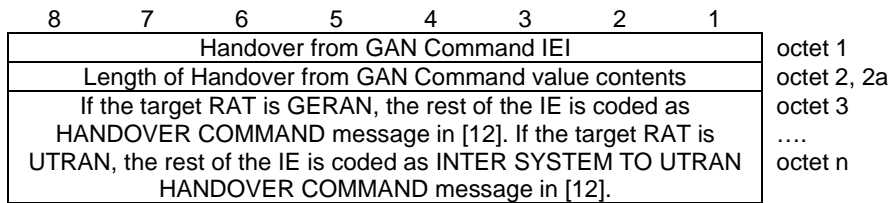
Figure 11.2.32.1: Handover From GAN Command information element

11.2.33 UL Quality Indication

This information element provides an indication to the MS that the GAN has detected insufficient signal quality on the uplink or is unable to support the service on the broadband network, thereby requiring the MS to trigger a Handover by providing the necessary information regarding the potential target cells in the other RAT. Handover from GAN can be triggered by GAN only if the MS has indicated presence of GSM coverage previously in the Register or Register Update messages.

8	7	6	5	4	3	2	1	
UL Quality Indication IEI								octet 1
Length of UL Quality Indication contents								octet 2
spare				ULQI				octet 3
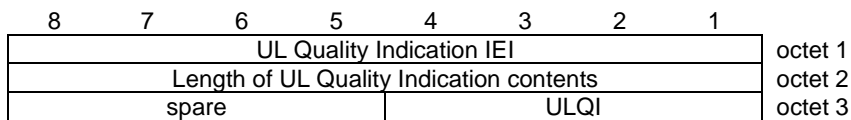
Figure 11.2.33.1: UL Quality Indication information element

Table 11.2.33.1: UL Quality Indication information element

```
ULQI, UL Quality Indication (octet 3)
Bits
4 3 2 1
0 0 0 0    Quality ok
0 0 0 1    Radio problem
0 0 1 0    Network problem
0 1 0 0    Undetermined problem
Other values are reserved for future use.
```

11.2.34 TLLI

The purpose of the *TLLI* information element is to provide the Temporary Logical Link Identifier.

8	7	6	5	4	3	2	1	
TLLI IEI								octet 1
Length of TLLI value contents								octet 2, 2a
The rest of the IE is coded as in [12], not including IEI and length, if present.								octet 3 …. octet n
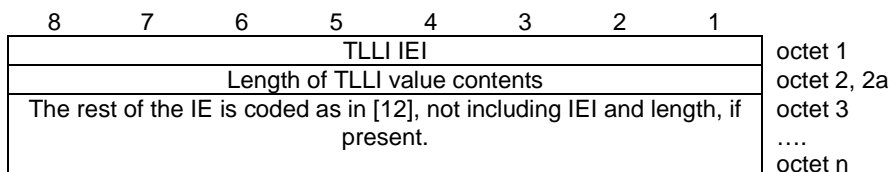
Figure 11.2.34.1: TLLI information element

11.2.35 Packet Flow Identifier

The *Packet Flow Identifier (PFI)* information element indicates the Packet Flow Identifier for a Packet Flow Context.

8	7	6	5	4	3	2	1	
Packet Flow Identifier IEI								octet 1
Length of Packet Flow Identifier value contents								octet 2, 2a
The rest of the IE is coded as in [8], not including IEI and length, if present.								octet 3 …. octet n
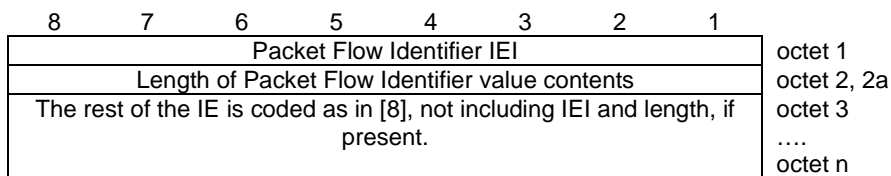
Figure 11.2.35.1: Packet Flow Identifier information element

11.2.36 Suspension Cause

The purpose of the *Suspension Cause* information element is to provide the reason for the GPRS suspension.

8	7	6	5	4	3	2	1	
Suspension Cause IEI								octet 1
Length of Suspension Cause value contents								octet 2, 2a
The rest of the IE is coded as in [12], not including IEI and length, if present.								octet 3 …. octet n
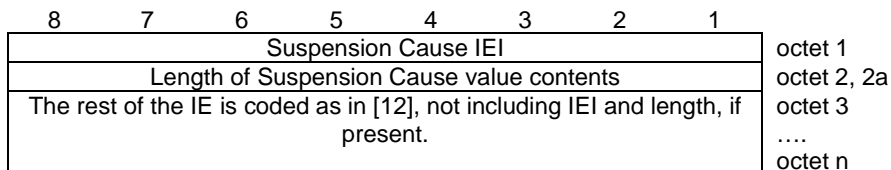
Figure 11.2.36.1: Suspension Cause information element

11.2.37 TU3920 Timer

The purpose of this information element is to indicate to the MS the maximum period of time it should wait before aborting the Handover to GAN (A/Gb mode or Iu mode) procedure.

8	7	6	5	4	3	2	1	
TU3920 Timer IEI								octet 1
Length of TU3920 Timer IE contents								octet 2
TU3920 Timer value MSB								octet 3
TU3920 Timer value LSB								octet 4

Figure 11.2.37.1: TU3920 Timer information element

Table 11.2. 37.1: TU3920 Timer information element

TU3920 Timer value (octet 3 and 4)

In the TU3920 Timer value field bit 8 of octet 3 is the most significant bit and bit 1 of octet 4 the least significant bit.

The value is given in number of hundreds of milliseconds.

The TU3920 Timer value consists of 2 octets.

11.2.38 QoS

This information element indicates the QoS Profile associated with a PDU.

8	7	6	5	4	3	2	1	
QoS IEI								octet 1
Length of QoS value contents								octet 2
spare	RLC_MODE	RADIO_PRIORITY		PEAK_THROUGHPUT_CLASS				octet 3
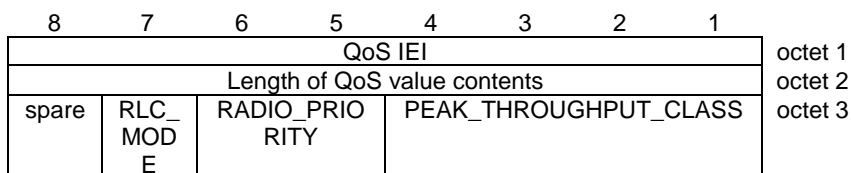
Figure 11.2.38.1: QoS information element

Table 11.2.38.1: QoS information element

```
PEAK_THROUGHPUT_CLASS (octet 3, bits 1-4)

This field is coded as PEAK_THROUGHPUT_CLASS field in
the Channel Request Description information
element specified in [45]

RADIO_PRIORITY (octet 3, bits 5-6)

This field is coded as RADIO_PRIORITY field in the
Channel Request Description information
element specified in [45]

RLC_MODE (octet 3, bit 7)

This field is coded as RLC_MODE field in the
Channel Request Description information
element specified in [45]
.
```

11.2.39 GA-PSR Cause

This information element indicates the status related to GAN specific signalling procedures.

8	7	6	5	4	3	2	1	
GA-PSR Cause IEI								octet 1
Length of GA-PSR Cause value contents								octet 2
GA-PSR Cause value								octet 3
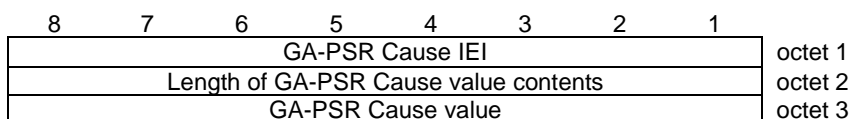
Figure 11.2.39.1: GA-PSR Cause information element

Table 11.2.39.1 GA-PSR Cause value

```
GA-PSR Cause (octet 3)

Value
0   "success"

2   "no available resources"
3   "GANC failure"
4   "not authorized for data service"
5   "message type non existent or not implemented"
6   "message type not compatible with the protocol state"
7   "invalid mandatory information"
8   "syntactically incorrect message"
9   "GPRS suspended"
10  "normal deactivation"

12  "conditional IE error"
13  "semantically incorrect message"
14  "PS handover failure - incorrect handover command"
15  "PS handover failure - target RAT access failure
16  "PS handover failure - missing SI/PSI information"
17  "PS handover failure - no uplink TBF allocation"

All other values are for future use.
```

11.2.40 User Data Rate

This information element indicates the User Data Rate used in flow control procedures:

8	7	6	5	4	3	2	1	
User Data Rate IEI								octet 1
Length of User Data Rate value contents								octet 2
R Value (MSB)								octet 3
								octet 4
R Value (LSB)								octet 5
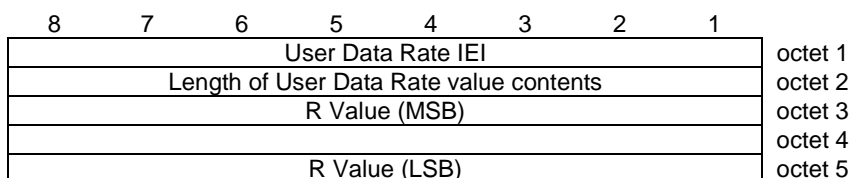
Figure 11.2.40.1: User Data Rate IE

Table 11.2.40.1: User Data Rate IE

R value (octets 3, 4 and 5)

In the R value field bit 8 of octet 3 is the most significant bit and bit 1 of octet 5 the least significant bit.

The R field is the binary encoding of the rate information expressed in 100 bits/sec increments, starting from 0 x 100 bits/sec until 16777215 x 100 bits/sec (1.6 Gbps).

11.2.41 Routing Area Code

The purpose of the *Routing Area Code IE* is to provide an unambiguous identification of routing areas within a location area.

8	7	6	5	4	3	2	1	
Routing Area Code IEI								octet 1
Length of the Routing Area Code value contents								octet 2
The rest of the IE is coded as in [3] not including IEI and length, if present.								octet 3
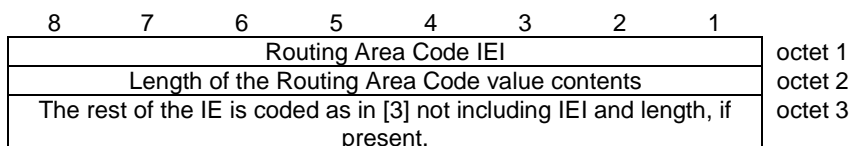
Figure 11.2.41.1: Routing Area Code information element

11.2.42 AP Location

The AP Location information element is to indicate the location of the MS or AP to the network.

8	7	6	5	4	3	2	1	
AP Location IEI								octet 1
Length of AP Location contents								octet 2, 2a
The rest of the IE is coded as in [25], not including IEI and length, if present.								octet 3 …. octet n
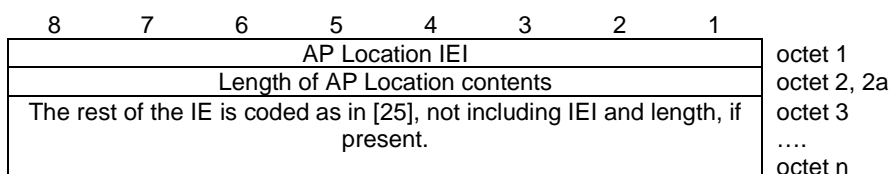
Figure 11.2.42.1: AP Location information element

11.2.43 TU4001 Timer

The purpose of this information element is to indicate to the MS the minimum period of time it should wait before deactivating an idle GAN A/Gb mode GA-PSR Transport Channel or GAN Iu mode Packet Transport Channel.
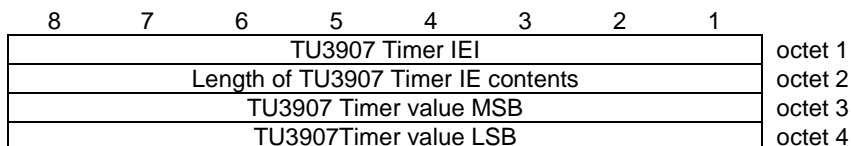
8	7	6	5	4	3	2	1	
TU4001 Timer IEI								octet 1
Length of TU4001 Timer IE contents								octet 2
TU4001 Timer value MSB								octet 3
TU4001 Timer value LSB								octet 4
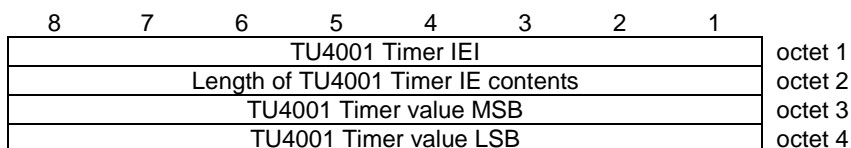
Figure 11.2.43.1: TU4001 Timer information element

Table 11.2.43.1: TU4001 Timer information element

TU4001 Timer value (octet 3 and 4) In the TU4001 Timer value field bit 8 of octet 3 is the most significant bit and bit 1 of octet 4 the least significant bit. The value is given in number of seconds. The TU4001Timer value consists of 2 octets.

11.2.44 Location Status

This information element indicates whether the GANC is able to identify the location for the specific MS. Based on network or operator policy, the network may accept a Registration Request from a MS, even if the location of the MS (or AP) is not known in the network. This IE may be used by the MS to provide an indication to the user as to whether the MS's location is known.

8	7	6	5	4	3	2	1	
Location Status IEI								octet 1
Length of Location Status value contents								octet 2
spare						LS		octet 3
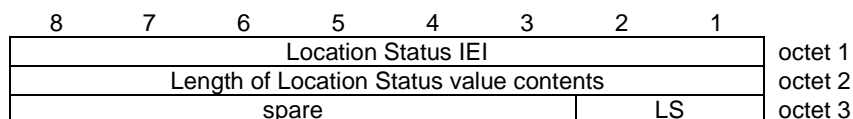
Figure 11.2.44.1 Location Status information element

Table 11.2.44.1: Location Status information element

LS, Location Status (octet 3) Bit 2 1 0 0   MS location known 0 1   MS location unknown All other value are for future use.

11.2.45 Cipher Response

The purpose of the *Cipher Response* information element is to indicate to the mobile station which information the mobile station has to include in the GA-CSR CIPHERING MODE COMPLETE message.

8	7	6	5	4	3	2	1	
Cipher Response IEI								octet 1
Length of Cipher Response contents								octet 2
spare							CR	octet 3
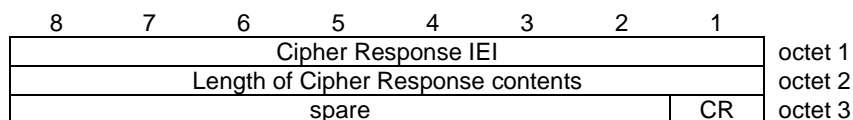
Figure 11.2.45.1: *Cipher Response* information element

Table 11.2.45.1: *Cipher Response* information element

```
CR Cipher Response (octet 3)
Bit
1
0    IMEISV shall not be included
1    IMEISV shall be included
```

11.2.46 Ciphering Command RAND

The Ciphering Command RAND information element contains the random number to be used for computing the MAC by the MS, to authenticate that the MS has the correct key Kc.

Ciphering Command RAND IEI	octet 1
Length of Ciphering Command RAND contents	octet 2
Ciphering Command RAND value part	octet 3
	….
	octet 18

Figure 11.2.46.1: *Ciphering Command RAND* **information element**

The GANC generates the random number using the same pseudo-random function as first cryptographic suite as defined in the profile for IKEv2 in [37].

11.2.47 Ciphering Command MAC

The Ciphering Command MAC information element contains the Message Authentication Code computed by the MS, to authenticate that the MS has the correct key Kc.

8	7	6	5	4	3	2	1	
Ciphering Command MAC IEI								octet 1
Length of Ciphering Command MAC contents								octet 2
Ciphering Command MAC value part								octet 3
								….
								octet 14

Figure 11.2.47.1: *Ciphering Command MAC* **information element**

The MAC is computed as defined in sub-clause 7.9.2.

11.2.48 Ciphering Key Sequence Number

The purpose of the *Ciphering Key Sequence Number* information element is to make it possible for the network to identify the ciphering key Kc which is stored in the mobile station without invoking the authentication procedure.

The ciphering key sequence number is allocated by the network and sent with the AUTHENTICATION REQUEST message to the mobile station where it is stored together with the calculated ciphering key Kc.

8	7	6	5	4	3	2	1	
Ciphering Key Sequence IEI								octet 1
Length of Ciphering Key Sequence IE contents								octet 2
spare					Key sequence			octet 3

Figure 11.2.48.1: *Ciphering Key Sequence Number* **information element**

Table 11.2.48.1: *Ciphering Key Sequence Number* **information element**

Key sequence (octet 3)			
Bits			
3	**2**	**1**	
0	0	0	
	through		Possible values for the ciphering key
1	1	0	sequence number
1	1	1	No key is available (MS to network); Reserved (network to MS)

11.2.49 SAPI ID

The SAPI ID IE is used by the MS to indicate the SAPI value for the upper layer message.

8	7	6	5	4	3	2	1	
SAPI ID IEI								octet 1
Length of SAPI ID IE contents								octet 2
spare					SAPI ID			octet 3
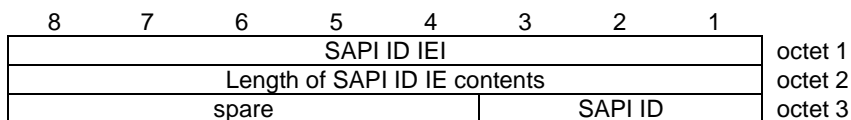
Figure 11.2.49.1: SAPI ID information element

Table 11.2.49.1: SAPI ID information element

```
SAPI ID, SAPI Identifier (octet 3)
Bits
3  2  1
0  0  0   SAPI 0 (all other except SMS)
0  1  1   SAPI 3 (SMS)

All other values are undefined in Release 1.
```

11.2.50 Establishment Cause

The Establishment Cause IE is used by the MS the indicate the type of the transaction being initiated to the network.

8	7	6	5	4	3	2	1	
Establishment Cause IEI								octet 1
Length of Establishment Cause IE contents								octet 2
Establishment Cause								octet 3
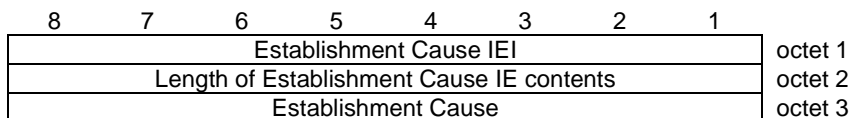
Figure 11.2.50.1: Establishment Cause information element

Table 11.2.50.1: Establishment Cause information element

```
Establishment Cause (octet 3)
Bits 8 … 1
1010 0000 Emergency
1100 0000 Call re-establishment
0000 0000 Location Update
0001 0000 Other SDCCH procedures including IMSI Detach, SMS, SS, paging response
    // note: Paging response for "SDCCH needed" is using codepoint "0001 0000"
0010 0000 Paging response (TCH/F needed)
0011 0000 Paging response (TCH/F or TCH/H needed)
1000 0000 Paging response ("any channel" needed)
0100 0000 Originating speech call from dual-rate mobile station when TCH/H is sufficient
0101 0000 Originating data call from dual-rate mobile station when TCH/H is sufficient
1110 0000 Originating speech call and TCH/F is needed
1111 0000 Originating data call and TCH/F is needed
All other values are undefined in Release 1.
```

11.2.51 Channel Needed

The Channel Needed IE is equivalent to the Channel Needed IE specified in [12] and is coded as per following definition:

8	7	6	5	4	3	2	1	
Channel Needed IEI								octet 1
Length of Channel Needed IE contents								octet 2
spare						CHANNEL (first)		octet 3
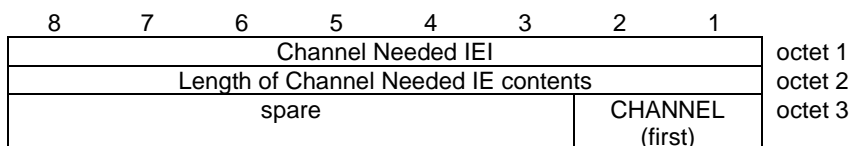
Figure 11.2.51.1: Channel Needed information element

Table 11.2.51.1: Channel Needed information element

```
CHANNEL (octet 3)
Bits
2  1
0  0   Any channel.
0  1   SDCCH.
1  0   TCH/F (Full rate).
1  1   TCH/H or TCH/F (Dual rate).
```

11.2.52 PDU in Error

The PDU in Error IE contains a faulty message returned to the sender of the message.

8	7	6	5	4	3	2	1	
PDU in Error IEI								octet 1
Length of PDU in Error contents								octet 2, 2a
PDU in Error, 1st octet								octet 3
PDU in Error, last octet								octet n
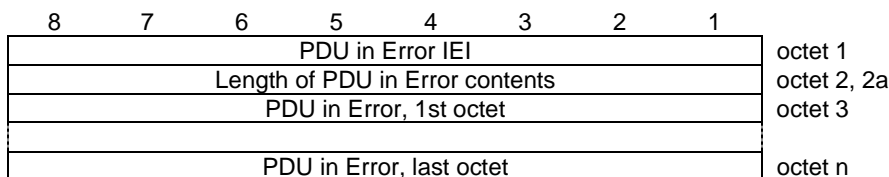
Figure 11.2.52.1: PDU in Error information element

NOTE: If the faulty message included in the *PDU in Error* IE is larger than 255 octets then only the first 255 octets of the message are to be included and the *Length of the PDU in Error* field shall indicate that 255 octets are included.

11.2.53 Sample Size

The Sample Size IE is used by the network to indicate the minimum size of the CS payload frames to be included in each RTP/UDP packet. It is also used by the MS to indicate to the network the sample size used by the MS and to be applied by the network in the downlink.

8	7	6	5	4	3	2	1	
Sample Size IEI								octet 1
Length of Sample Size IE contents								octet 2
Sample Size								octet 3
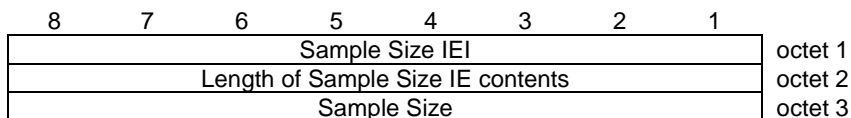
Figure 11.2.53.1: Sample Size information element

Table 11.2.53.1: Sample Size information element

```
Sample Size (octet 3)

   20     20 ms of CS payload included in each RTP/UDP packet
   40     40 ms of CS payload included in each RTP/UDP packet
   60     60 ms of CS payload included in each RTP/UDP packet
   80     80 ms of CS payload included in each RTP/UDP packet

All other values are undefined in Release 1.
```

11.2.54 Payload Type

The Payload Type IE is used to indicate the RTP Payload Type for dynamically assigned Payload Type.

8	7	6	5	4	3	2	1	
Payload Type IEI								octet 1
Length of Payload Type IE contents								octet 2
Payload Type								octet 3
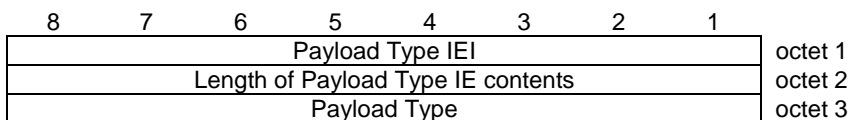
Figure 11.2.54.1: Payload Type information element

Table 11.2.54.1: Payload Type information element

Payload Type (octet 3)
Allowed values are between 96 and 127. All other values are undefined in Release 1.

11.2.55 Multirate Configuration

The *MultiRate configuration* information element gives parameters related to the multi-rate speech codec used in GAN A/Gb mode.

8	7	6	5	4	3	2	1	
Multirate Configuration IEI								octet 1
Length of Multirate Configuration contents								octet 2, 2a
The rest of the IE, except the Threshold and Hysteresis values, is coded as in [12], not including IEI and length, if present. The included Threshold and Hysteresis values shall be coded according to Table 11.2.55.1 and Annex D.1.								octet 3 …. octet n
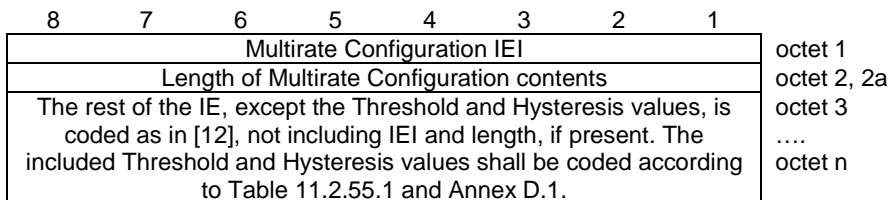
Figure 11.2.55.1: Multirate Configuration information element

Table 11.2.55.1: *MultiRate configuration* information element

Octet 3 - n
Threshold Frame Loss Hysteresis Frame Loss
value Ratio value Ratio
0 = 0 % 0 = 0 %
1 = 0.25 % 1 = 0.25 %
… 2 = 0.5 %
19 = 4.75 % 3 = 0.75 %
20 = 5 % 4 = 1 %
21 = 5.5 % 5 = 1.5 %
… 6 = 2 %
39 = 14.5 % 7 = 2.5 %
40 = 15 % 8 = 3 %
41 = 16 % 9 = 4 %
… 10 = 5 %
50 = 25 % 11 = 6 %
51 = 26 % 12 = 8 %
52 = 28 % 13 = 10 %
… 14 = 13 %
62 = 48 % 15 = 17 %
63 = 50 %
The Frame Loss Ratio (FLR) is the number of missing speech frames at the receiver, divided by the total number of expected speech frames for the speech signal during the actual measurement period. When there are redundant speech frames, these shall also be counted both when missing and as included in the complete speech signal respectively. In missing RTP packets, the number of redundant speech frames shall be assumed to follow the used RTP Redundancy Configuration and the latest Codec Mode Request value, CMR, signalled to the sending part. (For CMR, see annex A.) For example, when RTP sample size is 20 ms, single redundancy is used and two RTP packets are missing during the last second, the frame loss ratio is (2+2)/(2*50) = 4%.
A filter shall be applied to the frame loss ratio before comparing it with the threshold and hysteresis values according to Annex D.1.

11.2.56 Mobile Station Classmark 3

The purpose of the *Mobile Station Classmark 3* information element is to provide the network with information concerning aspects of the mobile station. The contents might affect the manner in which the network handles the operation of the mobile station. The Mobile Station Classmark information indicates general mobile station characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.

8	7	6	5	4	3	2	1	
Mobile station classmark 3 IEI								octet 1
Length of mobile station classmark 3 contents								octet 2, 2a
The rest of the IE is coded as in [8], not including IEI and length, if present.								octet 3 …. octet n
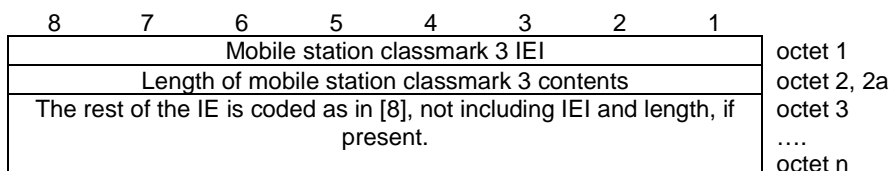
Figure 11.2.56.1: Mobile Station Classmark 3 information element

11.2.57 LLC-PDU

This information element contains an LLC-PDU. The element coding is:

8	7	6	5	4	3	2	1	
LLC-PDU IEI								octet 1
Length of LLC-PDU contents								octet 2, 2a
The rest of the IE is coded as in [19], not including IEI and length, if present.								octet 3 …. octet n
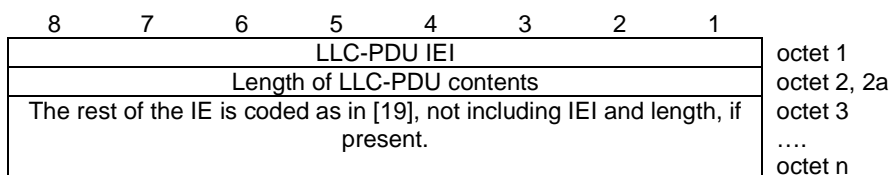
Figure 11.2.57.1: LLC-PDU information element

11.2.58 Location Black List indicator

The Location Black List indicator information element is used to indicate which part of the Location Area Identification is to be added in the Location Black List.

8	7	6	5	4	3	2	1	
Location Black List indicator IEI								octet 1
Length of Location Black List indicator contents								octet 2
spare					LBLI			octet 3
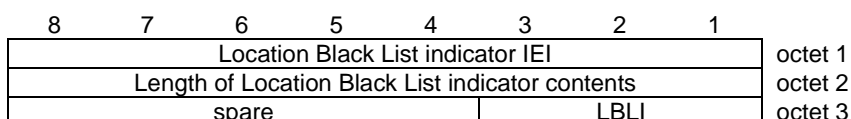
Figure 11.2.58.1: Location Black List indicator information element

Table 11.2.58.1: Location Black List indicator information element

```
LBLI, Location Black List indicator (octet 3)
Bits
3 2 1
0 0 0  MCC
0 0 1  MCC and MNC
0 1 0  MCC, MNC and LAC

All other values are undefined in Release 1.
```

11.2.59 Reset Indicator

The Reset Indicator information element is used to signal to the MS when the flow control procedure is complete and the MS can reset the maximum uplink data rate to normal level.

8	7	6	5	4	3	2	1	
Reset Indicator IEI								octet 1
Length of Reset Indicator contents								octet 2
spare							RI	octet 3
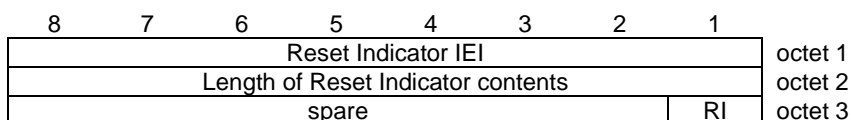
Figure 11.2.59.1 Reset Indicator information element

Table 11.2.59.1: Reset Indicator information element

```
RI, Reset Indicator (octet 3)
Bit
1
0    The flow control condition continues to exist..
1    The flow control condition no longer exists.
```

11.2.60 TU4003 Timer

The purpose of this information element is to indicate to the MS how often it is allowed to send flow control messages. In case of CS traffic channel is activated or released or in case of GA-CSR state transition, MS is allowed to update Flow Control condition by sending GA-PSR-DFC-REQ message while TU4003 is running.

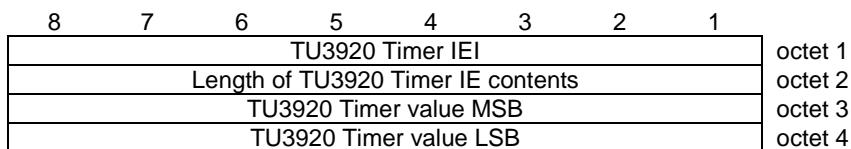| 8	7	6	5	4	3	2	1	
TU4003 Timer IEI								octet 1
Length of TU4003 Timer IE contents								octet 2
TU4003 Timer value MSB								octet 3
TU4003 Timer value LSB								octet 4
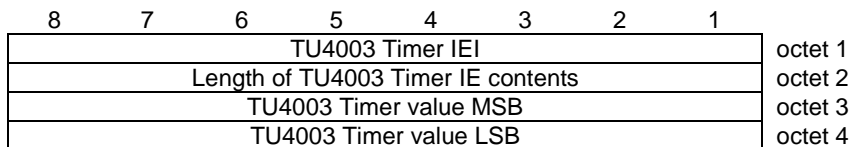
Figure 11.2.60.1: TU4003 Timer information element

Table 11.2.60.1: TU4003 Timer information element

TU4003 Timer value (octet 3 and 4)

In the TU4003 Timer value field bit 8 of octet 3 is the most significant bit and bit 1 of octet 4 the least significant bit.

The value is given in number of seconds.

The TU4003 Timer value consists of 2 octets.

11.2.61 AP Service Name

The AP Service Name element contains either the SSID or the PAN Service Name of the unlicensed AP being used.

8	7	6	5	4	3	2	1	
AP Service Name IEI								octet 1
Length of AP Service Name IE contents								octet 2, 2a
AP Service Name type								octet 3
AP Service Name MSB								octet 4
AP Service Name LSB								octet n
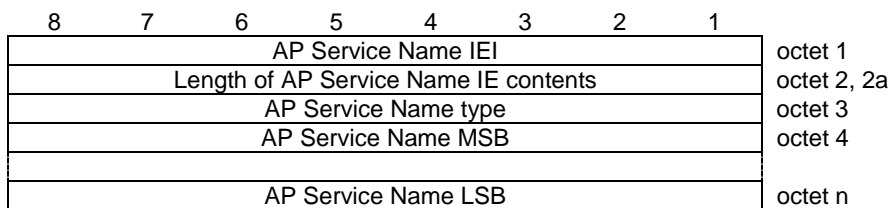
Figure 11.2.61.1: AP Service Name information element

Table 11.2.61.1: AP Service Name information element

AP Service Name type number value (octet 3)
Bits
8 7 6 5 4 3 2 1
0 0 0 0 0 0 0 1 SSID
0 0 0 0 0 0 1 0 PAN Service Name

All other values are undefined in Release 1.

AP Service Name value (octet 4 to octet n)
The AP Service Name is coded as a string according to UTF-8 format defined in RFC 3629 [50]. This means that the 1st octet of the UTF-8 string is coded in octet 4 and the last octet of the UTF-8 string is coded in the last octet of this IE (octet n).

11.2.62 GAN Service Zone Information

The purpose of the *GAN Service Zone Information* information element is to provide the mobile station with GAN Service Zone related information applicable to the current location of the user. It consists of two fields. *GAN Service Zone Name* string can be used by the GANC to indicate textual information related to the location. *GAN Service Zone Icon Indicator* can be used by the GANC to turn on various indicators in the mobile station.

GAN Service Zone Information IEI	octet 1
Length of GAN Service Zone Information value contents	octet 2, 2a
GAN Service Zone Icon Indicator	octet 3
Length of GAN Service Zone string	octet 4
GAN Service Zone string, 1st character	octet 5
⋮	
GAN Service Zone string, last character	octet n

Figure 11.2.62.1: *GAN Service Zone Information* information element

Table 11.2.62.1: *GAN Service Zone Information* information element

GAN Service Zone Icon Indicator, octet 3
Value
1   Unlimited Calls
128-254   Operator specific values
All other values are reserved.

GAN Service Zone Name, octets 4-n
Octet 4 defines the length (i.e. number of octets) of the GAN Service Zone Name string
starting in octet 5. Maximum length of the GAN Service Zone Name string is 32
characters and as each character can be presented using 1 to 4 octets the maximum
number of octets is 128.

The GAN Service Zone Name string (octets 5 to n) is coded as a string according to UTF-8 format defined in RFC 3629 [50]. This means the 1st octet of the UTF-8 string is coded
in octet 5 and the last octet of the UTF-8 string is coded in the last octet of this field (octet
n).

11.2.63 RTP Redundancy Configuration

The *RTP Redundancy configuration* information element provides the parameters related to redundancy policy for the AMR active codec set. For each mode of the AMR codec set, the redundancy level is indicated i.e. no redundancy (window size 1), single redundant frame (window size 2), double redundant frames (window size 3). The mode for encoding redundant frames can be equal to or lower than the mode for the primary encoding.

For each mode of the AMR Active Mode Set, as signaled in the Multi-rate Configuration IE, the window size for including redundant frames is indicated. So if e.g. the Active Mode Set contains four active modes, then the RTP Redundancy Configuration IE consists of six octets, of which four indicate the Codec Mode to Window Size mapping.

8	7	6	5	4	3	2	1	
RTP Redundancy Configuration IEI								octet 1
Length of RTP Redundancy Configuration IE contents								octet 2, 2a
GAN A/Gb Mode Codec Mode		GAN Iu Mode Codec Mode				Window Size		octet 3 …. octet n

Figure 11.2.63.1: Redundancy Configuration information element

Table 11.2.63.1: Redundancy configuration IE

Window Size (octet 3 to octet n) Bits **2 1** 0 0   Window size 1, No redundancy 0 1   Window size 2 (single redundancy) 1 0   Window size 3 (double redundancy) All other values are reserved GAN A/Gb Mode Codec Mode (octet 3 to octet n) Bits **8 7** The GAN A/Gb Mode Codec Mode is coded as in [47] sub-clause 3.4.1
GAN Iu Mode Codec Mode (octet 3 to octet n) Bits **6 5 4 3** 0 0 0 0 Represents the lowest codec mode (lowest bit-rate) of the ACS 0 0 0 1 Represents the second lowest mode, if the ACS includes more than one mode 0 0 1 0 Represents the third lowest mode, if the ACS includes more than two modes 0 0 1 1 Represents the fourth lowest mode, if the ACS includes more than three modes 0 1 0 0 Represents the fifth lowest mode, if the ACS includes more than four modes 0 1 0 1 Represents the sixth lowest mode, if the ACS includes more than five modes 0 1 1 0 Represents the seventh lowest mode, if the ACS includes more than six modes 0 1 1 1 Represents the highest mode, if the ACS includes eight modes

11.2.64 UTRAN Classmark

The *UTRAN Classmark* information element includes the INTER RAT HANDOVER INFO (defined in [40]) which gives UTRAN related information to the network (target system) for the purpose of intersystem handover.

8	7	6	5	4	3	2	1	
UTRAN Classmark IEI								octet 1
Length of UTRAN Classmark contents								octet 2, 2a
The rest of the IE is the INTER RAT HANDOVER INFO coded as in [40], not including IEI and length, if present.								octet 3 …. octet n
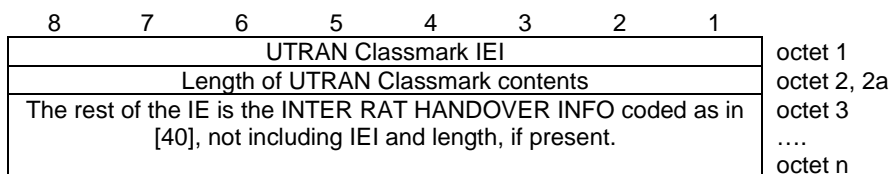
Figure 11.2.64.1: UTRAN Classmark information element

11.2.65 Classmark Enquiry Mask

The Classmark Enquiry mask defines the information to be returned to the network. The bit mask defines the specific information to be returned, such as UTRAN specific information and/or requests the sending of the GA-CSR CLASSMARK CHANGE message.

8	7	6	5	4	3	2	1	
Classmark Enquiry Mask IEI								octet 1
Length of Classmark Enquiry Mask contents								octet 2, 2a
The rest of the IE is the Classmark Enquiry Mask coded as in [12], not including IEI and length, if present.								octet 3 …. octet n
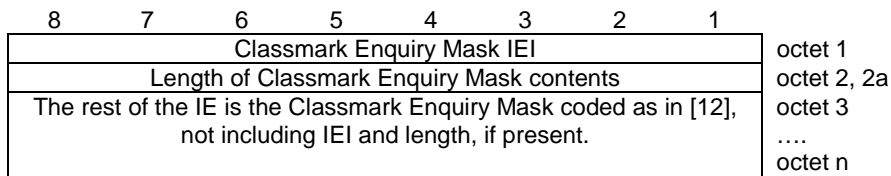
Figure 11.2.65.1: Classmark Enquiry Mask information element

11.2.66 UTRAN Cell Identifier List

The UTRAN Cell Identifier List information element is used to transfer multiple UTRAN target cell identifiers from the MS to the GANC.

8	7	6	5	4	3	2	1	
UTRAN Cell Identifier List IEI								octet 1
Length of UTRAN Cell Identifier List value contents								octet 2, 2a
spare				UTRAN Cell Identification Discriminator				octet 3
UTRAN Cell Identification 1								
UTRAN Cell Identification n								
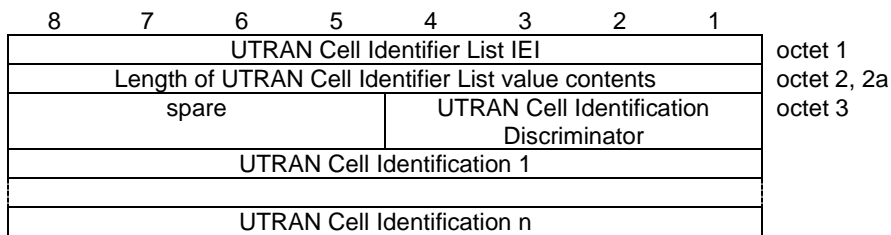
Figure 11.2.66.1: *UTRAN Cell Identifier List* information element

The length of the UTRAN Cell Identifier List information element depends on the UTRAN Cell Identification Discriminator (octet 3).

The "UTRAN Cell Identification Discriminator" is coded as follows:

0000 PLMN-ID, LAC and a 28-bit Cell Id are used to identify the target UTRAN cell.

All other values are reserved.

The coding of the UTRAN Cell Identifications 1 to n depends on the Cell identification discriminator (octet 3). Below the coding is shown for each UTRAN Cell Identification Discriminator:

Coding of UTRAN Cell Identification for UTRAN Cell Identification Discriminator = 0000

Table 11.2.66.1: Coding of UTRAN Cell Identification Discriminator = 0000

8	7	6	5	4	3	2	1	
MCC digit 2				MCC digit 1				octet m
MNC digit 3				MCC digit 3				octet m+1
MNC digit 2				MNC digit 1				octet m+2
LAC								octet m+3
LAC cont.								octet m+4
3G Cell identity								octet m+5
3G Cell identity cont.								octet m+6
3G Cell identity cont.								octet m+7
3G Cell identity cont.				Spare				octet m+8

LAC, Location Area Code (2 octet field)
This field is the binary representation of the Location Area Code, see [3]. The LAC field consists of 16 bits. Bit 8 in octet m+3 is the most significant bit and bit 1 in octet m+4 is the least significant bit.

3G Cell Identity (4 octet field).
The octets (m+5)-(m+8) are coded as octets 3-6 in sub-clause 11.2.73.

11.2.67 Serving GANC table indicator

The purpose of the *Serving GANC table indicator* is to indicate to the mobile station if it is allowed to store information in the stored Serving GANC table after a successful registration.

8	7	6	5	4	3	2	1	
Serving GANC table indicator IEI								octet 1
Length of Serving GANC table indicator value contents								octet 2
spare							SUTI	octet 3
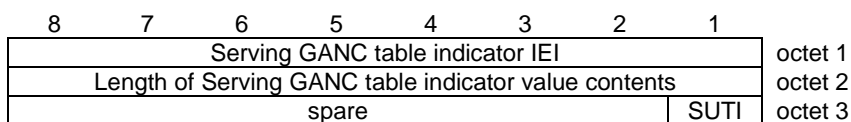
Figure 11.2.67.1 Serving GANC table indicator information element

Table 11.2.67.1: Serving GANC table indicator information element

SUTI, Serving GANC table indicator (octet 3)
Bit
1
0   The MS is not allowed to store information in the stored Serving
GANC table but should still maintain the existing content of the serving
GANC table - "Do Not Store".
1   The MS is allowed to store information in the stored Serving GANC
table"Store".

11.2.68 Registration indicators

The *Registration indicators* information element is used by the mobile station to indicate status information related to the registration request to the network. This information element is included only when attempting to register to the Default GANC.

8	7	6	5	4	3	2	1	
Registration indicators IEI								octet 1
Length of Registration indicators contents								octet 2
spare						MPS		octet 3
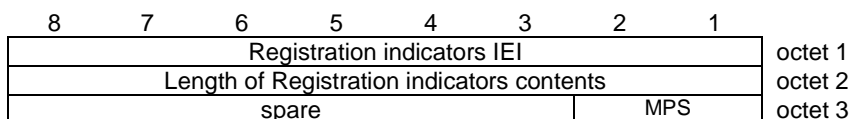
Figure 11.2.68.1 Registration indicators information element

Table 11.2.68.1: Registration indicators information element

MPS, Manual PLMN Selection indicator (octet 3)
Bit
2 1
0 0   The MS is in Automatic PLMN selection mode and user reselection
      was not triggered.
0 1   The MS is in Manual PLMN selection mode and/or user reselection
      was triggered. The MS requests the list of PLMN identities that may
      provide GAN service in the current location.

All other values are reserved for future use.

11.2.69 GAN PLMN List

The GAN PLMN List information element is used by the network to indicate possible PLMNs that may provide GAN service to the MS in its current location. The information element contains the PLMN identifier and the associated GANC and GANC-SEGW address information for each PLMN in the list. It may also contain PLMN specific GAN Service Zone Information.

8	7	6	5	4	3	2	1	
GAN PLMN List IEI								octet 1
Length of GAN PLMN List value contents								octet 2, 2a
Number of PLMNs								octet 3
PLMN information, PLMN 1								
PLMN information, PLMN n								
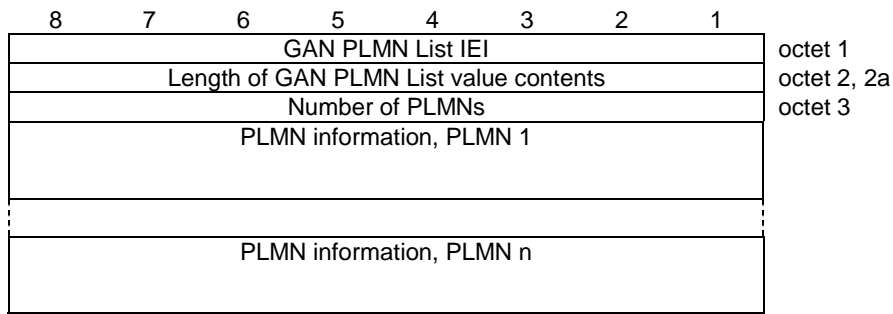
Figure 11.2.69.1: *PLMN List* **information element**

The "Number of PLMNs" (octet 3) contains the number of PLMN information items in the list. Bit 8 of octet 3 is the most significant bit and bit 1 of octet 3 the least significant bit.

Coding of PLMN information for each PLMN is the following:

8	7	6	5	4	3	2	1	
MCC digit 2				MCC digit 1				octet m
MNC digit 3				MCC digit 3				octet m+1
MNC digit 2				MNC digit 1				octet m+2
Spare	GAN Modes		GSZI	GANC-ADDR		SEGW-ADDR		octet m+3
GANC-SEGW Address information								
GANC Address information								
GAN Service Zone information								
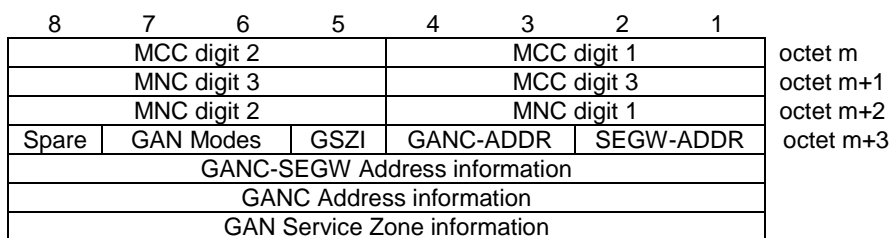
Figure 11.2.69.2: *PLMN information* **part of PLMN List information element**

Table 11.2.69.1: *PLMN information* **part of PLMN List information element**

MCC, Mobile country code (octet m, octet m+1 bits 1 to 4)
The MCC field is coded as in ITU-T Rec. E212, Annex A.

MNC, Mobile network code (octet m+2, octet m+1 bits 5 to 8).
The coding of this field is the responsibility of each administration but BCD coding shall be used. The MNC shall consist of 2 or 3 digits. For PCS 1900 for North America, Federal Regulation mandates that a 3-digit MNC shall be used. However a network operator may decide to use only two digits in the MNC over the radio interface. In this case, bits 5 to 8 of octet m+1 shall be coded as "1111". Mobile equipment shall accept MNC coded in such a way.

SEGW-ADDR, GANC-SEGW address type indicator (octet m+3)
Bits
2 1
0 0 GANC-SEGW Address Information for this PLMN is coded as IP-address. The format is as defined in sub-clause 11.2.9, "IP Address" excluding the IP address IEI, but including Length Indicator, IP Address Type and Address Information.

1 0 GANC-SEGW Address Information for this PLMN is coded as FQDN. The format is as defined in sub-clause 11.2.10, "Fully Qualified Domain/Host Name (FQDN)" excluding the FQDN IEI, but including Length Indicator and FQDN.

GANC-ADDR, GANC address type indicator (octet m+3)
Bits
4 3
0 0 GANC Address Information is coded as IP-address. The format is as defined in sub-clause 11.2.9, "IP Address" excluding the IP address IEI, but including Length Indicator, IP Address Type and Address Information.

1 0 GANC Address Information is coded as FQDN. The format is as defined in sub-clause 11.2.10, "Fully Qualified Domain/Host Name (FQDN)" excluding the FQDN IEI, but including Length Indicator and all characters of FQDN.

GSZI, GAN Service Zone Information Indicator (octet m+3)
Bit
5
0　GAN Service Zone Information is not included for this PLMN.
1　GAN Service Zone Information is included for this PLMN.

GAN Modes
Bit
7 6
0 0　　Unknown
0 1　　The PLMN can only be accessed using GAN A/Gb mode
1 0　　The PLMN can only be accessed using GAN Iu mode
1 1　　The PLMN can be accessed using GAN A/Gb mode or GAN Iu mode

GANC-SEGW Address information and GANC Address information for each PLMN are coded as defined by GANC-SEGW and GANC address type indicators (for each PLMN).

GAN Service Zone Information is of variable length and the format is as defined in the sub-clause 11.2.62, for the octets 3 to n (GAN Service Zone Icon Indicator, length of GAN Service Zone Name and GAN Service Zone Name). The inclusion of this field is optional for each PLMN and is defined by the GSZI bit.

11.2.70　GERAN Received Signal Level List

The GERAN Received Signal Level List information element contains the received signal level for each cell.

8	7	6	5	4	3	2	1	
GERAN Received Signal Level List IEI								octet 1
Length of GERAN Received Signal Level List value contents								octet 2, 2a
spare		RXLEV-NCELL 1						octet 3
spare		RXLEV-NCELL 2						octet 4
spare		RXLEV-NCELL n						octet n+2
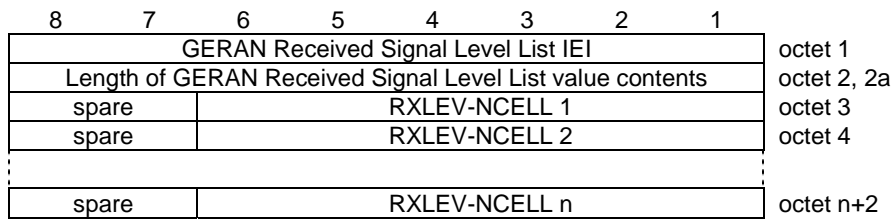
Figure 11.2.70.1: *GERAN Received Signal Level List* **information element**

Table 11.2.70.1: *GERAN Received Signal Level List* **information element**

> **RXLEV-NCELL i**, Result of measurement on the i'th neighbour cell (octet i+2), i ranges from 1 to n.
>
> The RXLEV-NCELL field is coded as the binary representation of a value N. N corresponds according to the mapping defined in 3GPP TS 45.008 to the received signal strength on the i'th neighbouring cell.
>
> Range: 0 to 63.

11.2.70b UTRAN Received Signal Level List

The UTRAN Received Signal Level List information element contains the received signal level CPICH Ec/No and CPICH RSCP [46] value for each cell.

8	7	6	5	4	3	2	1	
UTRAN Received Signal Level List IEI								octet 1
Length of UTRAN Received Signal Level List value contents								octet 2, 2a
spare		Ec/No-NCELL 1						octet 3
spare		RSCP-NCELL 1						octet 4
spare		Ec/No-NCELL 2						octet 5
spare		RSCP-NCELL 2						octet 6
spare		Ec/No-NCELL n						octet 2*n+1
spare		RSCP-NCELL n						octet 2*n+2
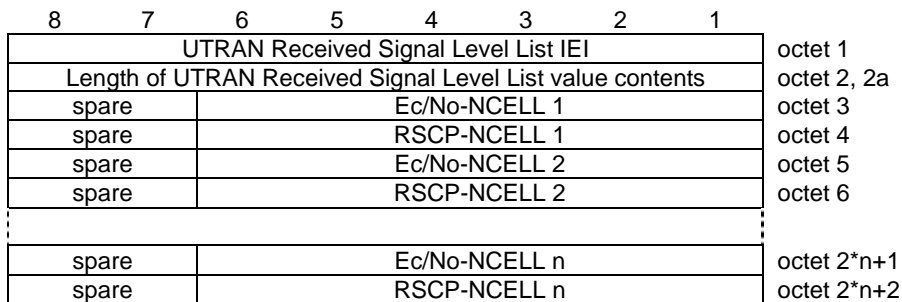
Figure 11.2.70b.1: *UTRAN Received Signal Level List* **information element**

Table 11.2.70b.1: *UTRAN Received Signal Level List* **information element**

> **Ec/No-NCELL i**, Result of Ec/No measurement on the i'th neighbour cell is contained in octet 2*i+1, i ranges from 1 to n.
>
> **RSCP-NCELL i**, Result of RSCP measurement on the i'th neighbour cell is contained in octet 2*i+2, i ranges from 1 to n.
>
> The mapping is defined in [46]. For RSCP the range from "-116 dBm ≤ CPICH RSCP < -115 dBm" (reported as 0) to "-53 dBm ≤ CPICH RSCP < -52 dBm" (reported as 63) is used. RSCP values below -116 dBm shall be reported as 0 and values -52 dBm and above shall be reported as 63. For Ec/No the range from "-24 dB ≤ CPICH Ec/Io < -23.5 dB" (reported as 1) to "-0.5 ≤ CPICH Ec/Io < 0" (reported as 48) is used. Ec/Io values below -24 dB shall be reported as 0 and values 0 dB and above shall be reported as 49.

11.2.71 Required GAN Services

The purpose of the *Required GAN Services* information element is to indicate to the GANC that the mobile station requires a GAN specific service and which of the GAN services the mobile station requires.

8	7	6	5	4	3	2	1	
Required GAN Services IEI								octet 1
Length of Required GAN Services contents								octet 2
spare							CBS	octet 3
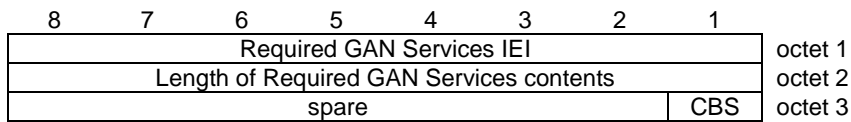
Figure 11.2.71.1: Required GAN Services information element

Table 11.2.71.1: Required GAN Services information element

CBS Cell Broadcast Service (octet 3)
Bit
1
0   CBS is not required by the mobile station
1   CBS is required by the mobile station.

11.2.72   Broadcast Container

The Broadcast Container information element is used by the network to encapsulate Cell Broadcast information being passed to a mobile station.

8	7	6	5	4	3	2	1	
Broadcast Container IEI								octet 1
Length of Broadcast Container value contents								octet 2, 2a
Number of CBS Frames								octet 3
CBS Frames 1								octet 4-91
CBS Frames n								octet m-(m+87)
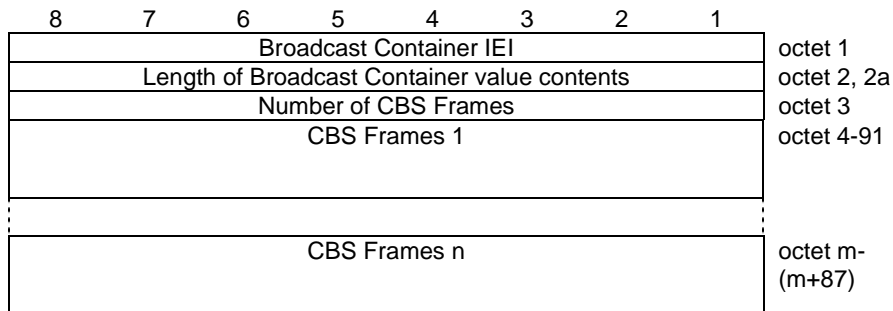
Figure 11.2.72.1: *Broadcast Container* information element

The "Number of CBS Frames" (octet 3) contains the number of CBS Frames in the list. Bit 8 of octet 3 is the most significant bit and bit 1 of octet 3 the least significant bit.

Coding of CBS Frame is the following:

8	7	6	5	4	3	2	1	
Page from a CBS Message MSB								octet
								x...octet
Page from a CBS Message LSB								x+87
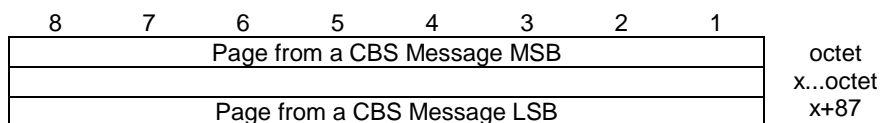
Figure 11.2.72.2: CBS Frame part of Broadcast Container information element

The coding of the page of the CBS message is defined in sub-clause 9.4.1 in TS 23.041.

11.2.73   3G Cell Identity

The purpose of the 3G *Cell Identity* information element is to identify a cell within a PLMN.

8	7	6	5	4	3	2	1	
3G Cell Identity IEI								octet 1
Length of 3G Cell Identity IE contents								octet 2, 2a
See Annex F for coding								octet 3 …. octet 6
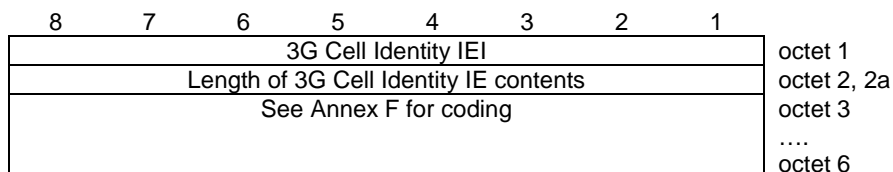
Figure 11.2.73.1 *3G Cell Identity* information element

11.2.74 PS Handover to GERAN Command

The purpose of the PS Handover to GERAN Command information element is to provide the MS with Radio Resource and Non-Access Stratum information required for performing PS handover to a GERAN cell. The PS Handover to GERAN Command information element and either the PS Handover to GERAN PSI or the PS Handover to GERAN SI information element together contain all of the information needed by the MS to perform PS handover to a GERAN cell.

8	7	6	5	4	3	2	1	
PS Handover to GERAN Command IEI								octet 1
Length of PS Handover to GERAN Command value contents								octet 2, 2a
The rest of the IE is coded as the PS HANDOVER COMMAND message defined in [45].								octet 3 …. octet n
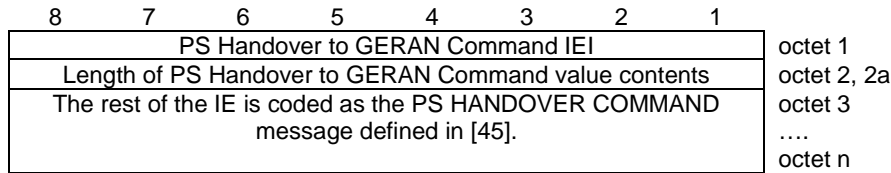
Figure 11.2.74.1: PS Handover to GERAN Command information element

11.2.75 PS Handover to UTRAN Command

The purpose of the PS Handover to UTRAN Command information element is to provide the MS with information required for performing PS handover to a UTRAN cell. The PS Handover to UTRAN Command information element contains all information needed by the MS for performing PS handover to a UTRAN cell.

8	7	6	5	4	3	2	1	
PS Handover to UTRAN Command IEI								octet 1
Length of PS Handover to UTRAN Command value contents								octet 2, 2a
The rest of the IE is coded as the INTERSYSTEM HANDOVER TO UTRAN COMMAND message defined in [40].								octet 3 …. octet n
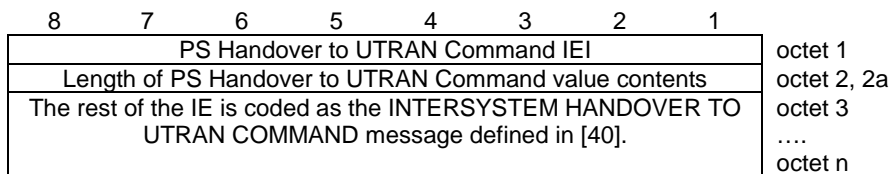
Figure 11.2.75.1: PS Handover to UTRAN Command information element

11.2.76 PS Handover to GERAN PSI

The purpose of the PS Handover to GERAN PSI information element is to provide the MS with packet system information (corresponding to the target GERAN cell) required for performing PS handover to a GERAN cell where PBCCH is present. The PS Handover to GERAN Command information element and the PS Handover to GERAN PSI information element together contain all of the information needed by the MS for performing PS handover to a GERAN cell where PBCCH is present.

8	7	6	5	4	3	2	1	
PS Handover to GERAN PSI IEI								octet 1
Length of PS Handover to GERAN PSI value contents								octet 2, 2a
Length of PS1 payload								octet 3
The same system information sent using a PSI1 on a PBCCH (see 3GPP TS 44.060 [45]).								octet 4 …. octet n
Length of PSI2 payload								octet n+1
The same system information sent using one or more instances of the PSI2 message on a PBCCH (see 3GPP TS 44.060 [45]).								octet n+2 …. octet k
Length of PSI14 payload								octet k+1
The same system information sent using a PSI14 message on a PBCCH (see 3GPP TS 44.060 [45]).								octet k+2 …. octet p
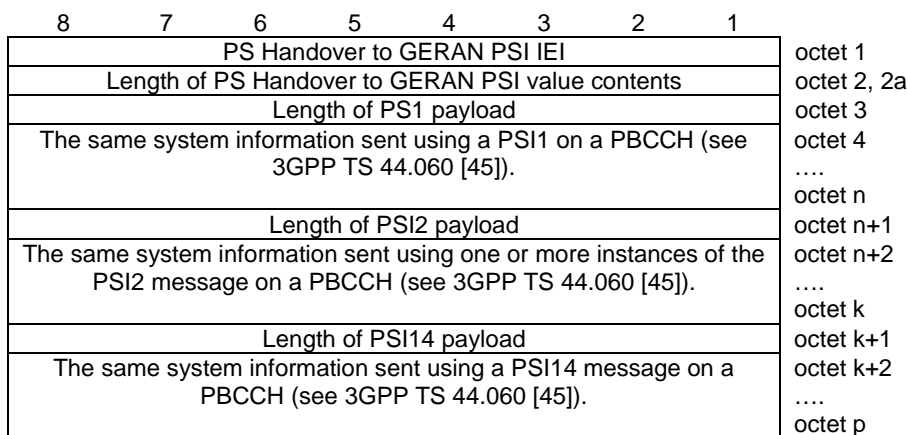
Figure 11.2.76.1: PS Handover to GERAN PSI information element

11.2.77   PS Handover to GERAN SI

The purpose of the PS Handover to GERAN SI information element is to provide the MS with system information (corresponding to the target GERAN cell) required for performing PS handover to a GERAN cell where PBCCH is not present. The PS Handover to GERAN Command information element and the PS Handover to GERAN SI information element together contain all of the information needed by the MS for performing PS handover to a GERAN cell where PBCCH is not present.

8	7	6	5	4	3	2	1	
PS Handover to GERAN SI IEI								octet 1
Length of PS Handover to GERAN SI value contents								octet 2, 2a
Length of S1 payload								octet 3
The same system information sent using an SI1 on a BCCH (see 3GPP TS 44.018 [12]).								octet 4 …. octet n
Length of SI3 payload								octet n+1
The same system information sent using an SI3 message on a BCCH (see 3GPP TS 44.018 [12]).								octet n+2 …. octet k
Length of SI13 payload								octet k+1
The same system information sent using an SI13 message on a BCCH (see 3GPP TS 44.018 [12]).								octet k+2 …. octet p
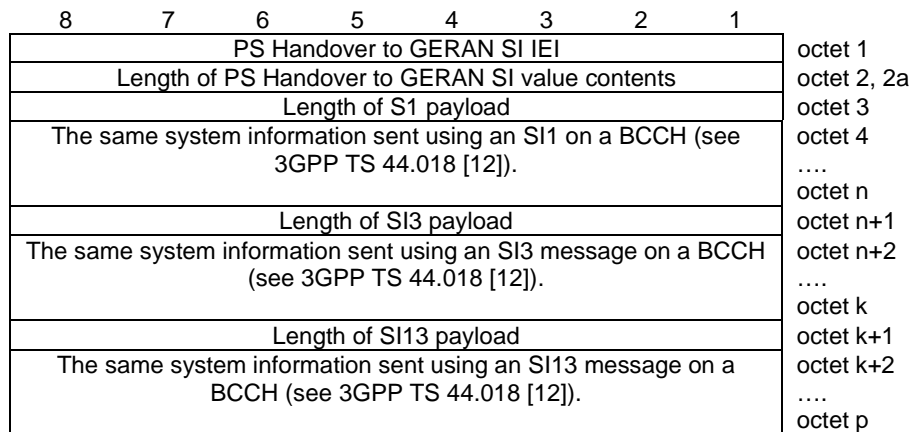
Figure 11.2.77.1: PS Handover to GERAN SI information element

11.2.78   TU4004 Timer

The purpose of this information element is to indicate to the MS how long it should wait for a GA-PSR HANDOVER COMMAND message after sending a GA-PSR HANDOVER INFORMATION message to the network or receiving a GA-PSR HANDOVER CONTINUE message from the network.

8	7	6	5	4	3	2	1	
TU4004 Timer IEI								octet 1
Length of TU4004 Timer IE contents								octet 2
TU4004 Timer value								octet 3
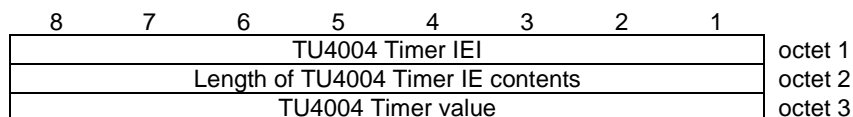
Figure 11.2.78.1: TU4004 Timer information element

Table 11.2.78.1: TU4004 Timer information element

TU4004 Timer value (octet 3)
The value is given in number of seconds.

11.2.79   GAN Mode Indicator

The GAN Mode Indicator information element indicates the GAN mode that the MS shall operate in for the current registration.

8	7	6	5	4	3	2	1	
GAN Mode Indicator IEI								octet 1
Length of GAN Mode Indicator value contents								octet 2
GMI								octet 3
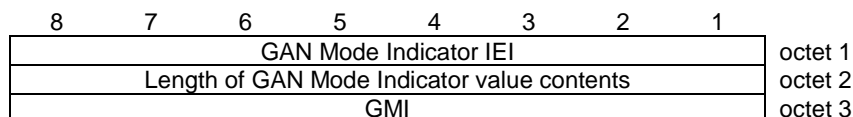
Figure 11.2.79.1: GAN Mode Indicator information element

Table 11.2.79.1: GAN Mode Indicator information element

```
GMI, GAN Mode Indicator (octet 3)
   0      Reserved
   1      The MS shall operate in GAN A/Gb mode
   2      The MS shall operate in GAN Iu mode
3 to 255  Reserved
```

11.2.80 CN Domain Identity

The CN Domain Identity information element indicates the type of core network domain (CS or PS) to which the message applies.

8	7	6	5	4	3	2	1	
CN Domain Identity IEI								octet 1
Length of CN Domain Identity value contents								octet 2
CNDI								octet 3
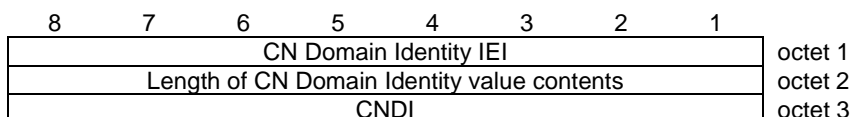
Figure 11.2.80.1: CN Domain Identity information element

Table 11.2.80.1: CN Domain Identity information element

```
CNDI, CN Domain Identity (octet 3)
   0      Reserved
   1      CS domain
   2      PS domain
3 to 255  Reserved
```

11.2.81 GAN Iu Mode Cell Description

The GAN Iu Mode Cell Description information element provides a minimum description of a GAN Iu mode cell, e.g. to identify the GAN Iu mode cell in order to perform handover from GERAN/UTRAN.

8	7	6	5	4	3	2	1	
GAN Iu Mode Cell Description IEI								octet 1
Length of GAN Iu Mode Cell Description value contents								octet 2
UARFCN								octet 3
UARFCN								octet 4
PSC								octet 5
PSC								octet 6
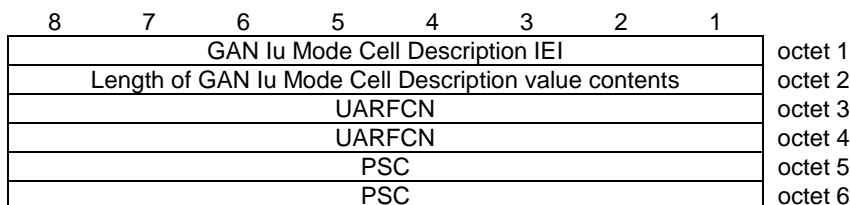
Figure 11.2.81.1: GAN Iu Mode Cell Description information element

Table 11.2.81.1: GAN Iu Mode Cell Description information element

```
UARFCN, UTRA Absolute RF Channel Number (octet 3, 4)
Allowed values are between 0 and 16383. This is a 14-bit quantity with the first bit (most
significant bit) in octet 3 bit 6 and the last bit (least significant bit) in octet 4 bit 1. Octet 3
bits 7-8 are filled by '00'

PSC, Primary Scrambling Code (octet 5, 6)
Allowed values are between 0 and 511. This is a 9-bit quantity with the first bit (most
significant bit) in octet 5 bit 1 and the last bit (least significant bit) in octet 6 bit 1. Octet 5
bits 2-8 are filled by '0000000'.
```

11.2.82 3G UARFCN

The 3G UARFCN information element indicates the UARFCN value of the current UTRAN serving cell, if the current serving cell is a UTRAN cell.

8	7	6	5	4	3	2	1	
3G UARFCN IEI								octet 1
Length of 3G UARFCN value contents								octet 2
UARFCN								octet 3
UARFCN								octet 4
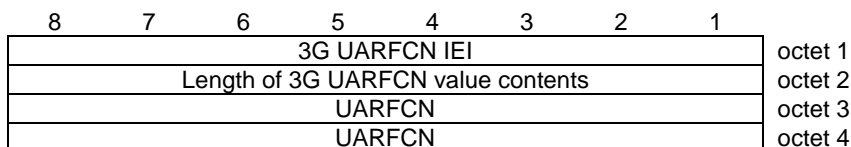
Figure 11.2.82.1: 3G UARFCN information element

Table 11.2.82.1: 3G UARFCN information element

UARFCN, UTRA Absolute RF Channel Number (octet 3, 4)
Allowed values are between 0 and 16383. This is a 14-bit quantity with the first bit (most significant bit) in octet 3 bit 6 and the last bit (least significant bit) in octet 4 bit 1. Octet 3 bits 7-8 are filled by '00'

11.2.83 RAB ID

The RAB ID information element is used by the GANC to identify a circuit transport channel or packet transport channel.

8	7	6	5	4	3	2	1	
RAB ID IEI								octet 1
Length of RAB ID value contents								octet 2
RABID								octet 3
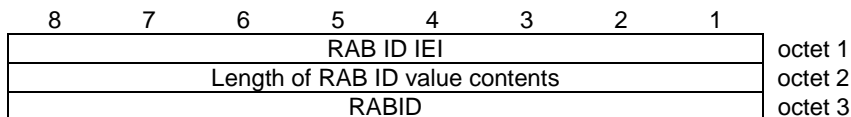
Figure 11.2.83.1: RAB ID information element

Table 11.2.83.1: RAB ID information element

RABID, RAB ID (octet 3)
Allowed values are between 0 and 255.

11.2.84 RAB ID List

The RAB ID List information element is used by the GANC to identify a set of circuit transport channel(s) or packet transport channel(s).

8	7	6	5	4	3	2	1	
RAB ID List IEI								octet 1
Length of RAB ID List value contents								octet 2, 2a
Number of RAB IDs								octet 3
RAB ID 1								
RAB ID n								
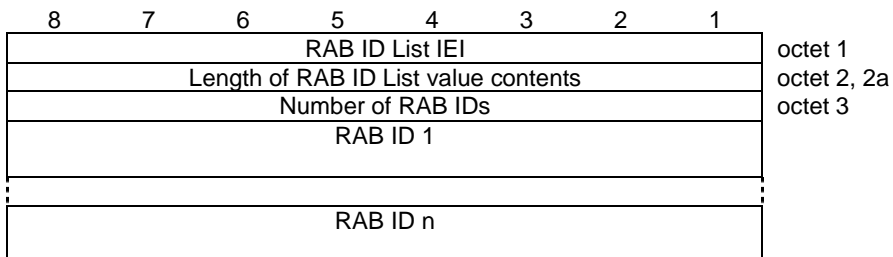
Figure 11.2.84.1: RAB ID List information element

Table 11.2.84.1: RAB ID List information element

Number of RAB IDs (octet 3) The number of RAB IDs in the IE. Bit 8 of octet 3 is the most significant bit and bit 1 is the least significant bit. **RAB ID 1..n** The format is as defined in sub-clause 11.2.83, "RAB ID" but without the RAB ID IEI and length fields.

11.2.85 GA-RRC Establishment Cause

The GA-RRC Establishment Cause information element indicates the cause for the GA-RRC connection establishment request.

8	7	6	5	4	3	2	1	
GA-RRC Establishment Cause IEI								octet 1
Length of GA-RRC Establishment Cause value contents								octet 2
Cause								octet 3
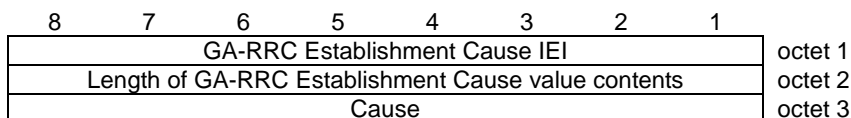
Figure 11.2.85.1: GA-RRC Establishment Cause information element

Table 11.2.85.1: GA-RRC Establishment Cause information element

Cause (octet 3) The GA-RRC Establishment Cause IE is aligned with the "Establishment cause" IE defined in section 10.3.3.11 of [TS 25.331]. A Cause value of 1 is assigned to the first value in the RRC "Establishment cause" enumerated list (i.e., 'Originating Conversational Call') and the Cause value is incremented by one for each subsequent "Establishment cause" value.

11.2.86 GA-RRC Cause

The GA-RRC Cause information element indicates the cause associated with the GA-RRC procedure (e.g., release, reject, etc.).

8	7	6	5	4	3	2	1	
GA-RRC Cause IEI								octet 1
Length of GA-RRC Cause value contents								octet 2
Cause MSB								octet 3
Cause LSB								octet 4
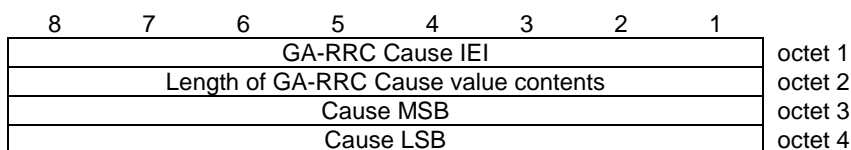
Figure 11.2.86.1: GA-RRC Cause information element

Table 11.2.86.1: GA-RRC Cause information element

Cause (octet 3) The GA-RRC Cause IE is aligned with the "Cause" IE defined in section 9.2.1.4 of 3GPP TS 25.413 [52]. The Cause value is coded per the values defined in section 9.2.1.4 of [52]. In addition, a value of 0 (zero) is considered a normal event or indicating success.

11.2.87 GA-RRC Paging Cause

The GA-RRC Paging Cause information element indicates the cause for paging.

8	7	6	5	4	3	2	1	
GA-RRC Paging Cause IEI								octet 1
Length of GA-RRC Paging Cause value contents								octet 2
Paging Cause								octet 3
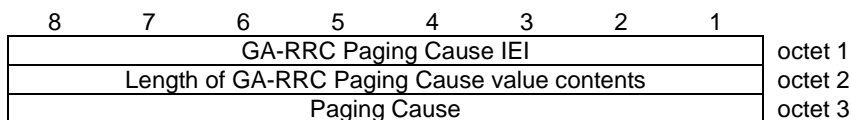
Figure 11.2.87.1: GA-RRC Paging Cause information element

Table 11.2.87.1: GA-RRC Paging Cause information element

Paging Cause (octet 3)
0 Terminating Conversational Call
1 Terminating Streaming Call
2 Terminating Interactive Call
3 Terminating Background Call
4 Terminating Low Priority Signalling
5 Terminating High Priority Signalling
6 to 255 Reserved for future use

11.2.88 Intra Domain NAS Node Selector

The Intra Domain NAS Node Selector information element carries information to be used to route the establishment of a signalling connection to a CN node within a CN domain.

8	7	6	5	4	3	2	1	
Intra Domain NAS Node Selector IEI								octet 1
Length of Intra Domain NAS Node Selector value contents								octet 2
IDNNS Type								octet 3
Routing Parameter								octet 4
Routing Parameter								octet 5
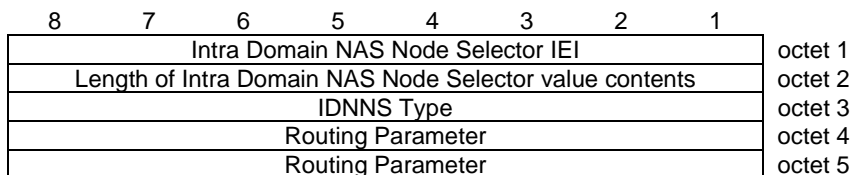
Figure 11.2.88.1: Intra Domain NAS Node Selector information element

Table 11.2.88.1: Intra Domain NAS Node Selector information element

IDNSS Type (octet 3)
Value
0 Reserved
1 Local (P)TMSI
2 (P)TMSI of same PLMN, different (RA)LA
3 (P)TMSI of different PLMN
4 IMSI (response to IMSI paging)
5 IMSI (cause UE initiated event)
6 IMEI
7-255 Reserved
All other values are reserved.
Routing Parameter (octet 4, 5)
This is a 10-bit quantity with the first bit (most significant bit) in octet 4 bit 2 and the last bit (least significant bit) in octet 5 bit 1. Octet 4 bits 3-8 are filled by '000000'.
Refer to the Intra Domain NAS Node Selector information element definition in sub-clause 10.3.1.6 of [40] for a description of the above IDNSS Type and Routing Parameter values.

11.2.89 CTC Activation List

The CTC Activation List information element is used by the GANC to describe the circuit transport channel(s) that shall be activated between the GANC and MS.

8	7	6	5	4	3	2	1	
CTC Activation List IEI								octet 1
Length of CTC Activation List value contents								octet 2, 2a
Number of CTCs								octet 3
CTC Description, CTC 1								
CTC Description, CTC n								

Figure 11.2.89.1: CTC Activation List information element

Table 11.2.89.1: CTC Activation List information element

> **Number of CTCs**
> The number of CTC Descriptions in the IE. Bit 8 of octet 3 is the most significant bit and bit 1 is the least significant bit.
>
> **CTC Description**
> The format is as defined in sub-clause 11.2.90, "CTC Description".

11.2.90 CTC Description

The CTC Description information element is used by the GANC to describe the circuit transport channel that shall be activated or modified between the GANC and MS.

8	7	6	5	4	3	2	1	
CTC Description IEI								octet 1
Length of CTC Description value contents								octet 2, 2a
RAB ID								
RAB Configuration								
Sample Size								
RTP UDP Port								
GANC IP Address								
Payload Type								
Multi-rate Configuration 2								
RTP Redundancy Configuration								
RTCP UDP Port								
NAS Synchronisation Indicator								

Figure 11.2.90.1: CTC Description information element

Table 11.2.90.1: CTC Description information element

RAB ID The format is as defined in sub-clause 11.2.83, "RAB ID". This field shall be included. **RAB Configuration** The format is as defined in sub-clause 11.2.103, "RAB Configuration". This field shall be included in the case of CTC activation. It shall only be included in the case of CTC modification if modification of this parameter is requested. **Sample Size** The format is as defined in sub-clause 11.2.53, "Sample Size". This field shall be included in the case of CTC activation. It shall only be included in the case of CTC modification if modification of this parameter is requested. **RTP UDP Port** The format is as defined in sub-clause 11.2.25, "Communication Port Identity" but with IEI as specified in Table 11.2.1 for "RTP UDP Port". This field shall be included in the case of CTC activation. It shall only be included in the case of CTC modification if modification of this parameter is requested. **GANC IP Address** The format is as defined in sub-clause 11.2.9, "IP Address" but with IEI as specified in Table 11.2.1 for "GANC IP Address". This field shall be included in the case of CTC activation. It shall only be included in the case of CTC modification if modification of this parameter is requested. **Payload Type** The format is as defined in sub-clause 11.2.54, "Payload Type". This field shall be included in the case of CTC activation. It shall not be included in the case of CTC modification. **Multi-rate Configuration 2** The format is as defined in sub-clause 11.2.104, "Multi-rate Configuration 2". This field shall be included in the case of CTC activation if the RAB Configuration specifies speech. It shall only be included in the case of CTC modification if modification of this parameter is requested. **RTP Redundancy Configuration** The format is as defined in sub-clause 11.2.63, "RTP Redundancy Configuration". This field shall be included in the case of CTC activation if the RAB Configuration specifies speech and the MS has indicated support for RTP redundancy in the GAN Classmark IE. It shall only be included in the case of CTC modification if modification of this parameter is requested. **RTCP UDP Port** The format is as defined in sub-clause 11.2.25, "Communication Port Identity" but with IEI as specified in Table 11.2.1 for "RTCP UDP Port". This field may be included in the case of CTC activation. It shall only be included in the case of CTC modification if modification of this parameter is requested. **NAS Synchronisation Indicator** The format is as defined in sub-clause 11.2.109, "NAS Synchronisation Indicator". This field shall be included in the case of CTC activation if received by the GANC from the CN. It shall only be included in the case of CTC modification if modification of this parameter is requested.

11.2.91 CTC Activation Ack List

The CTC Activation Ack List information element is used by the MS to describe certain parameters of the circuit transport channel(s) that shall be activated between the GANC and MS.

8	7	6	5	4	3	2	1	
CTC Activation Ack List IEI								octet 1
Length of CTC Activation Ack List value contents								octet 2, 2a
Number of CTCs								octet 3
CTC Activation Ack Description, CTC 1								
CTC Activation Ack Description, CTC n								

Figure 11.2.91.1: CTC Activation Ack List information element

Table 11.2.91.1: CTC Activation Ack List information element

Number of CTCs
The number of CTC Activation Ack Descriptions in the IE. Bit 8 of octet 3 is the most significant bit and bit 1 is the least significant bit.

CTC Activation Ack Description
The format is as defined in sub-clause 11.2.92, "CTC Activation Ack Description".

11.2.92 CTC Activation Ack Description

The CTC Activation Ack Description information element is used by the MS to indicate CTC activation success or failure and, in the successful case, to describe certain parameters of the circuit transport channel that shall be activated between the GANC and MS.

8	7	6	5	4	3	2	1	
CTC Activation Ack Description IEI								octet 1
Length of CTC Activation Ack Description value contents								octet 2, 2a
RAB ID								
GA-RRC Cause								
RTP UDP Port								
Sample Size								
Payload Type								
RTCP UDP Port								

Figure 11.2.92.1: CTC Activation Ack Description information element

Table 11.2.92.1: CTC Activation Ack Description information element

RAB ID
The format is as defined in sub-clause 11.2.83, "RAB ID". This field shall be included.

GA-RRC Cause
The format is as defined in sub-clause 11.2.86, "GA-RRC Cause". This field shall be included. If the GA-RRC Cause value is other than 'success' (i.e., value '0') then the following fields shall not be present in the CTC Activation Ack Description IE.

RTP UDP Port
The format is as defined in sub-clause 11.2.25, "Communication Port Identity" but with IEI as specified in Table 11.2.1 for "RTP UDP Port". This field shall be included if the GA-RRC Cause value is '0'.

Sample Size
The format is as defined in sub-clause 11.2.53, "Sample Size". This field shall be included if the GA-RRC Cause value is '0' and shall indicate what sample size the MS is using and what the network shall use in the downlink. The MS shall follow the minimum sample size for the channel sent by the network in the GA-RRC ACTIVATE CHANNEL message.

Payload Type
The format is as defined in sub-clause 11.2.54, "Payload Type". This field shall be included if the GA-RRC Cause value is '0'. It shall be set to the same value as the Payload Type for the channel in the GA-RRC ACTIVATE CHANNEL message.

RTCP UDP Port
The format is as defined in sub-clause 11.2.25, "Communication Port Identity" but with IEI as specified in Table 11.2.1 for "RTCP UDP Port". This field shall be included if the GA-RRC Cause value is '0' and RTCP shall be used towards the MS. It is used to indicate the UDP port for RTCP sent to the MS.

11.2.93 CTC Modification List

The CTC Modification List information element is used by the GANC to describe the circuit transport channel(s) that shall be modified between the GANC and MS.

8	7	6	5	4	3	2	1	
CTC Modification List IEI								octet 1
Length of CTC Modification List value contents								octet 2, 2a
Number of CTCs								octet 3
CTC Description, CTC 1								
CTC Description, CTC n								

Figure 11.2.93.1: CTC Modification List information element

Table 11.2.93.1: CTC Modification List information element

Number of CTCs
The number of CTC Descriptions in the IE. Bit 8 of octet 3 is the most significant bit and bit 1 is the least significant bit.

CTC Description
The format is as defined in sub-clause 11.2.90, "CTC Description".

11.2.94 CTC Modification Ack List

The CTC Modification Ack List information element is used by the MS to describe certain parameters of the circuit transport channel(s) that shall be activated between the GANC and MS.

8	7	6	5	4	3	2	1	
CTC Modification Ack List IEI								octet 1
Length of CTC Modification Ack List value contents								octet 2, 2a
Number of CTCs								octet 3
CTC Modification Ack Description, CTC 1								
CTC Modification Ack Description, CTC n								

Figure 11.2.94.1: CTC Modification Ack List information element

Table 11.2.94.1: CTC Modification Ack List information element

Number of CTCs
The number of CTC Modification Ack Descriptions in the IE. Bit 8 of octet 3 is the most significant bit and bit 1 is the least significant bit.

CTC Modification Ack Description
The format is as defined in sub-clause 11.2.95, "CTC Modification Ack Description".

11.2.95 CTC Modification Ack Description

The CTC Modification Ack Description information element is used by the MS to describe certain parameters of the circuit transport channel that shall be activated between the GANC and MS.

8	7	6	5	4	3	2	1	
CTC Modification Ack Description IEI								octet 1
Length of CTC Modification Ack Description value contents								octet 2, 2a
RAB ID								
GA-RRC Cause								
Sample Size								

Figure 11.2.95.1: CTC Modification Ack Description information element

Table 11.2.95.1: CTC Modification Ack Description information element

RAB ID
The format is as defined in sub-clause 11.2.83, "RAB ID". This field shall be included.

GA-RRC Cause
The format is as defined in sub-clause 11.2.86, "GA-RRC Cause". This field shall be included. If the GA-RRC Cause value is other than 'success' (i.e., value '0') then the following fields shall not be present in the CTC Modification Ack Description IE.

Sample Size
The format is as defined in sub-clause 11.2.53, "Sample Size". This field shall be included if the GA-RRC Cause value is '0' and this parameter has been modified.

11.2.96 PTC Activation List

The PTC Activation List information element is used by the GANC to describe the packet transport channel(s) that shall be activated between the GANC and MS.
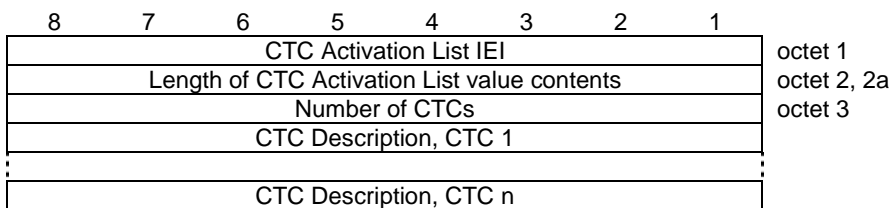
8	7	6	5	4	3	2	1	
PTC Activation List IEI								octet 1
Length of PTC Activation List value contents								octet 2, 2a
Number of PTCs								octet 3
PTC Description, PTC 1								
PTC Description, PTC n								
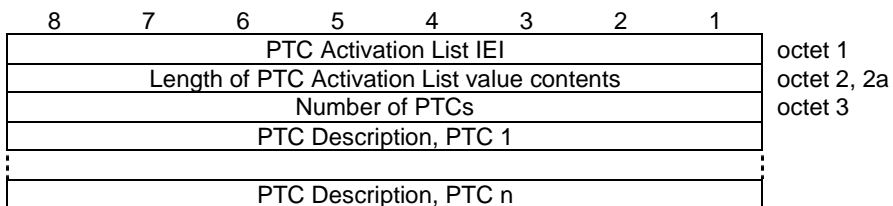
Figure 11.2.96.1: PTC Activation List information element

Table 11.2.96.1: PTC Activation List information element

Number of PTCs
The number of PTC Descriptions in the IE. Bit 8 of octet 3 is the most significant bit and bit 1 is the least significant bit.
PTC Description
The format is as defined in sub-clause 11.2.97, "PTC Description".

11.2.97 PTC Description

The PTC Description information element is used by the GANC to describe the packet transport channel that shall be activated or modified between the GANC and MS.
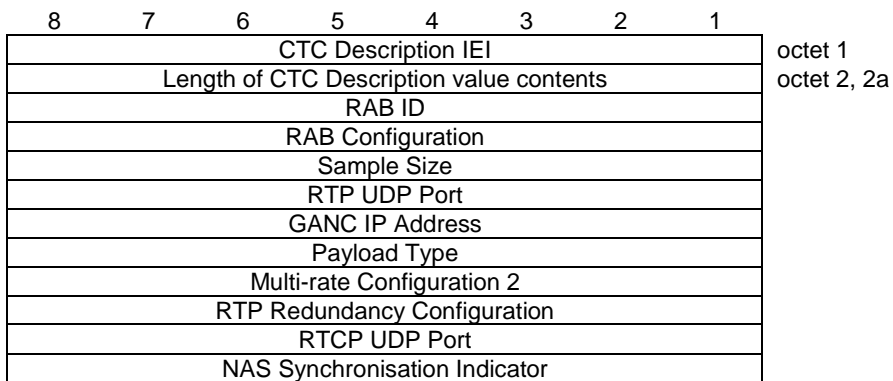
8	7	6	5	4	3	2	1	
PTC Description IEI								octet 1
Length of PTC Description value contents								octet 2, 2a
RAB ID								
RAB Configuration								
GANC TEID								
MS TEID								
GANC UDP Port								
GANC IP Address								
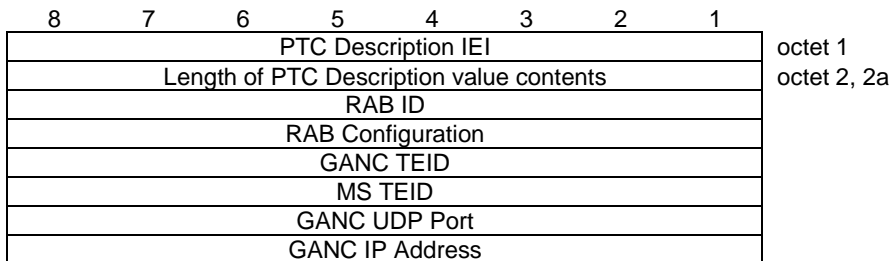
Figure 11.2.97.1: PTC Description information element

RAB ID The format is as defined in sub-clause 11.2.83, "RAB ID". This field shall be included. **RAB Configuration** The format is as defined in sub-clause 11.2.103, "RAB Configuration". This field shall be included. **GANC TEID** The format is as defined in sub-clause 11.2.110, "TEID" but with IEI as specified in Table 11.2.1 for "GANC TEID". This field shall be included. **MS TEID** The format is as defined in sub-clause 11.2.110, "TEID" but with IEI as specified in Table 11.2.1 for "MS TEID". This field shall be included. **GANC UDP Port** The format is as defined in sub-clause 11.2.25, "Communication Port Identity" but with IEI as specified in Table 11.2.1 for "UDP Port for GPRS user data transport". This field shall be included. **GANC IP Address** The format is as defined in sub-clause 11.2.9, "IP Address" but with IEI as specified in Table 11.2.1 for "IP Address for GPRS user data transport". This field shall be included.

11.2.98 PTC Activation Ack List

The PTC Activation Ack List information element is used by the MS to describe certain parameters of the packet transport channel(s) that shall be activated between the GANC and MS.

8	7	6	5	4	3	2	1	
PTC Activation Ack List IEI								octet 1
Length of PTC Activation Ack List value contents								octet 2, 2a
Number of PTCs								octet 3
PTC Activation Ack Description, PTC 1								
PTC Activation Ack Description, PTC n								

Figure 11.2.98.1: PTC Activation Ack List information element

Table 11.2.98.1: PTC Activation Ack List information element

Number of PTCs The number of PTC Activation Ack Descriptions in the IE. Bit 8 of octet 3 is the most significant bit and bit 1 is the least significant bit. **PTC Activation Ack Description** The format is as defined in sub-clause 11.2.99, "PTC Activation Ack Description".

11.2.99 PTC Activation Ack Description

The PTC Activation Ack Description information element is used by the MS to describe certain parameters of the packet transport channel that shall be activated between the GANC and MS.
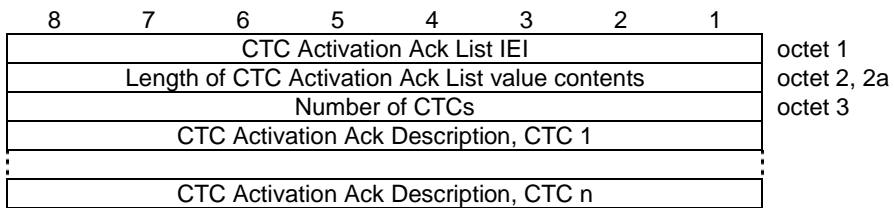
8	7	6	5	4	3	2	1	
PTC Activation Ack Description IEI								octet 1
Length of PTC Activation Ack Description value contents								octet 2, 2a
RAB ID								
GA-RRC Cause								
MS UDP Port								
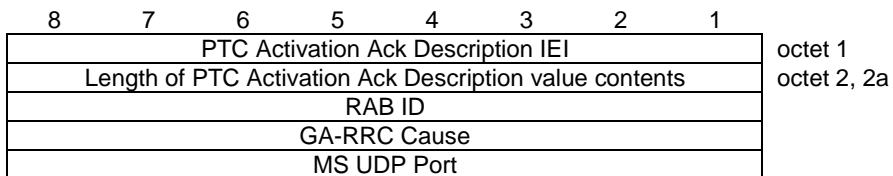
Figure 11.2.99.1: PTC Activation Ack Description information element

Table 11.2.99.1: PTC Activation Ack Description information element

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RAB ID
The format is as defined in sub-clause 11.2.83, "RAB ID". This field shall be included.

GA-RRC Cause
The format is as defined in sub-clause 11.2.86, "GA-RRC Cause". This field shall be included. If the GA-RRC Cause value is other than 'success' (i.e., value '0') then the following fields shall not be present in the PTC Activation Ack Description IE.

MS UDP Port
The format is as defined in sub-clause 11.2.25, "Communication Port Identity" but with IEI as specified in Table 11.2.1 for "UDP Port for GPRS user data transport". This field shall be included if the GA-RRC Cause value is '0'.

11.2.100 PTC Modification List

The PTC Modification List information element is used by the GANC to describe the circuit transport channel(s) that shall be modified between the GANC and MS.

8	7	6	5	4	3	2	1	
PTC Modification List IEI								octet 1
Length of PTC Modification List value contents								octet 2, 2a
Number of PTCs								octet 3
PTC Description, PTC 1								
PTC Description, PTC n								

Figure 11.2.100.1: PTC Modification List information element

Table 11.2.100.1: PTC Modification List information element

Number of PTCs
The number of PTC Descriptions in the IE. Bit 8 of octet 3 is the most significant bit and bit 1 is the least significant bit.

PTC Description
The format is as defined in sub-clause 11.2.97, "PTC Description".

11.2.101 PTC Modification Ack List

The PTC Modification Ack List information element is used by the MS to describe certain parameters of the packet transport channel(s) that shall be activated between the GANC and MS.

8	7	6	5	4	3	2	1	
PTC Modification Ack List IEI								octet 1
Length of PTC Modification Ack List value contents								octet 2, 2a
Number of PTCs								octet 3
PTC Modification Ack Description, PTC 1								
PTC Modification Ack Description, PTC n								
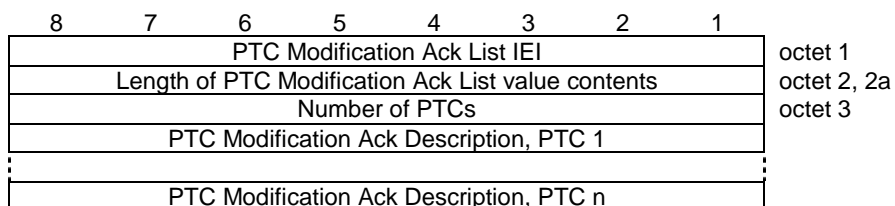
Figure 11.2.101.1: PTC Modification Ack List information element

Table 11.2.101.1: PTC Modification Ack List information element

Number of PTCs
The number of PTC Modification Ack Descriptions in the IE. Bit 8 of octet 3 is the most significant bit and bit 1 is the least significant bit.

PTC Modification Ack Description
The format is as defined in sub-clause 11.2.102, "PTC Modification Ack Description".

11.2.102 PTC Modification Ack Description

The PTC Modification Ack Description information element is used by the MS to describe certain parameters of the packet transport channel that shall be activated between the GANC and MS.
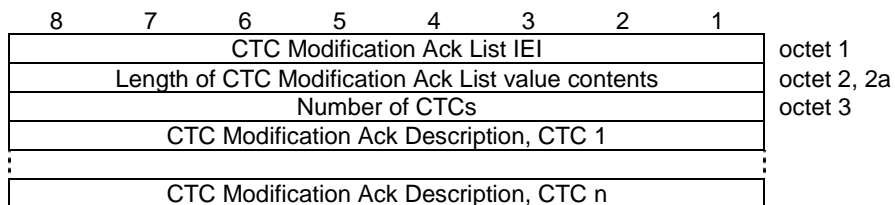
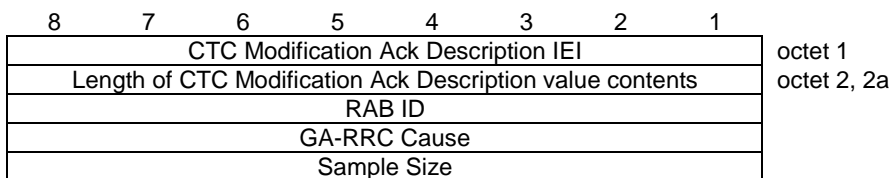| 8	7	6	5	4	3	2	1	
PTC Modification Ack Description IEI								octet 1
Length of PTC Modification Ack Description value contents								octet 2, 2a
RAB ID								
GA-RRC Cause								
RAB Configuration								
GANC UDP Port								
GANC IP Address								
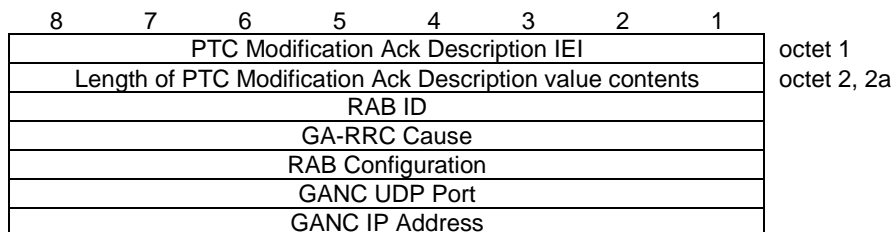
Figure 11.2.102.1: PTC Modification Ack Description information element

Table 11.2.102.1: PTC Modification Ack Description information element

RAB ID
The format is as defined in sub-clause 11.2.83, "RAB ID". This field shall be included.

GA-RRC Cause
The format is as defined in sub-clause 11.2.86, "GA-RRC Cause". This field shall be included. If the GA-RRC Cause value is other than 'success' (i.e., value '0') then the following fields shall not be present in the PTC Activation Ack Description IE.

RAB Configuration
The format is as defined in sub-clause 11.2.103, "RAB Configuration". This field shall be included if the GA-RRC Cause value is '0' and this parameter has been modified.

GANC UDP Port
The format is as defined in sub-clause 11.2.25, "Communication Port Identity" but with IEI as specified in Table 11.2.1 for "UDP Port for GPRS user data transport". This field shall be included if the GA-RRC Cause value is '0' and this parameter has been modified.

GANC IP Address
The format is as defined in sub-clause 11.2.9, "IP Address" but with IEI as specified in Table 11.2.1 for "IP Address for GPRS user data transport". This field shall be included if the GA-RRC Cause value is '0' and this parameter has been modified.

11.2.103 RAB Configuration

The purpose of the RAB Configuration information element is to specify the UMTS RAB parameter values that are associated with a circuit transport channel or packet transport channel and that are applicable in the GAN Iu mode context.

8	7	6	5	4	3	2	1	
RAB Configuration IEI								octet 1
Length of RAB Configuration value contents								octet 2
spare	SI	SSD	DO	AI		Traffic Class		octet 3
spare	Traffic Handling Priority				spare			octet 4
Maximum DL Bit Rate								octet 5 - octet 8
Maximum UL Bit Rate								octet 9 - octet 12
Guaranteed DL Bit Rate (if present)								octet 13 - octet 16
Guaranteed UL Bit Rate (if present)								octet 17 - octet 20

Figure 11.2.103.1: RAB Configuration information element

Table 11.2.103.1: RAB Configuration information element

Traffic Class (octet 3)
Bits
2 1
0 0 conversational
0 1 streaming
1 0 interactive
1 1 background
Note: The value 'conversational' shall be used for AMR/AMR-WB CS domain speech.
The values 'conversational' or 'streaming' shall be used for CS domain data.

AI, Asymmetry Indicator (octet 3)
Bits
4 3
0 0 symmetric bi-directional
0 1 asymmetric uni-directional downlink
1 0 asymmetric uni-directional uplink
1 1 asymmetric bi-directional
Note: The value 'symmetric bi-directional' shall be used for AMR/AMR-WB CS domain speech.

DO, Delivery Order (octet 3)
Bit
5
0 delivery order requested
1 delivery order not requested
Note: The value 'delivery order requested' shall be used for AMR/AMR-WB CS domain speech.

SSD, Source Statistics Descriptor (octet 3)
Bit
6
0 speech
1 unknown
Note: The value 'speech' shall be used for AMR/AMR-WB speech.

SI, Signalling Indication (octet 3)
Bit
7
0 signalling Indication is set
1 signalling Indication is not set
Note: The value 'signalling Indication is not set' shall be used for AMR/AMR-WB speech.

Traffic Handling Priority (octet 4)
Bits
7 6 5 4   Bit 7 is the most significant bit and bit 4 the least significant bit.
0 0 0 0   spare
0 0 0 1   highest
..
..
1 1 1 0   lowest
1 1 1 1   no priority
Values between 1 and 14 are ordered in decreasing order of priority.

Maximum DL Bit Rate, (octets 5-8)
The MSB is octet 5 and the LSB is octet 8. Unit is bits/s.

Maximum UL Bit Rate, (octets 9-12)
The MSB is octet 9 and the LSB is octet 12. If Asymmetry Indicator indicates "Symmetric bi-directional" then this value shall be the same as Maximum DL Bit Rate value. Unit is bits/s.

Guaranteed DL Bit Rate, (octets 13-16)
The MSB is octet 13 and the LSB is octet 16.
Included only if the Traffic Class indicates conversational or streaming. Unit is bits/s.

Guaranteed UL Bit Rate, (octets 17-20)
The MSB is octet 17 and the LSB is octet 20.
Included only if the Traffic Class indicates conversational or streaming. If included and the Asymmetry Indicator indicates "Symmetric bi-directional" then this value shall be the same as Guaranteed DL Bit Rate value. Unit is bits/s.

11.2.104 Multi-rate Configuration 2

The Multi-rate Configuration 2 information element gives parameters related to the multi-rate speech codec used in GAN Iu mode.

8	7	6	5	4	3	2	1	
Multi-rate Configuration 2 IEI								octet 1
Length of Multi-rate Configuration 2 contents								octet 2, 2a
If no more than four modes are present in the active codec set, the rest of the IE is coded the same as the Multi-rate Configuration IE in sub-clause 11.2.55, not including IEI and length. If five, six, seven or eight modes are present in the active codec set, the rest of the IE is coded as shown in Figure 11.2.104.2. The included Threshold and Hysteresis values shall be coded according to Table 11.2.55.1 and Annex D.1.								octet 3 …. octet n

Figure 11.2.104.1: Multi-rate Configuration 2 information element

8	7	6	5	4	3	2	1	
Set of AMR codec modes								octet 4
Spare 0 0		Threshold 1						octet 5
Hysteresis 1				Threshold 2				octet 6
Threshold 2 (cont.)		Hysteresis 2				Threshold 3		octet 7
Threshold 3 (cont.)				Hysteresis 3				octet 8
Spare 0 0		Threshold 4						octet 9
Hysteresis 4				Spare 0 0 0 0				octet 10
Spare 0 0		Threshold 5						octet 11
Hysteresis 5				Spare 0 0 0 0				octet 12
Spare 0 0		Threshold 6						octet 13
Hysteresis 6				Spare 0 0 0 0				octet 14
Spare 0 0		Threshold 7						octet 15
Hysteresis 7				Spare 0 0 0 0				octet 16

Figure 11.2.104.2: Parameters for multirate speech field
for the Multi-rate speech versions 1 & 2 when more than four modes is chosen

Table 11.2.104.1: Multi-rate Configuration 2 information element

Set of AMR codec modes This field is coded the same as in the Multi-rate Configuration IE in sub-clause 11.2.55. **Threshold n, Hysteresis n** (n = 1, 2 or 3) These fields are included based on the rules for the Multi-rate Configuration IE in sub-clause 11.2.55. **Threshold 4, Hysteresis 4** Included when five, six, seven or eight modes are present in the active codec set. **Threshold 5, Hysteresis 5** Included when six, seven or eight modes are present in the active codec set. **Threshold 6, Hysteresis 6** Included when seven or eight modes are present in the active codec set. **Threshold 7, Hysteresis 7** Included when eight modes are present in the active codec set.

11.2.105 Selected Integrity Protection Algorithm

The Selected Integrity Protection Algorithm information element specifies the integrity protection algorithm selected by the GANC.

8	7	6	5	4	3	2	1	
Selected Integrity Protection Algorithm IEI								octet 1
Length of Selected Integrity Protection Algorithm value contents								octet 2
Selected Integrity Protection Algorithm								octet 3
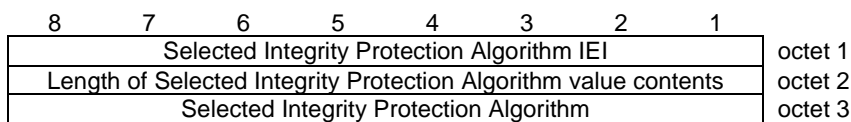
Figure 11.2.105.1: Selected Integrity Protection Algorithm information element

Table 11.2.105.1: Selected Integrity Protection Algorithm information element

Selected Integrity Protection Algorithm The Selected Integrity Protection Algorithm field consists of one octet with allowed values from 0 to 15. The values are as defined for the "Integrity Protection Algorithm" in [52].

11.2.106 Selected Encryption Algorithm

The Selected Encryption Protection Algorithm information element specifies the encryption algorithm selected by the GANC.

8	7	6	5	4	3	2	1	
Selected Encryption Algorithm IEI								octet 1
Length of Selected Encryption Algorithm value contents								octet 2
Selected Encryption Algorithm								octet 3
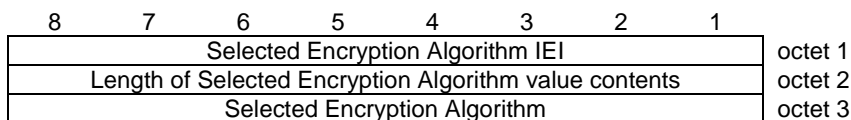
Figure 11.2.106.1: Selected Encryption Algorithm information element

Table 11.2.106.1: Selected Encryption Algorithm information element

Selected Encryption Algorithm The Selected Encryption Algorithm field consists of one octet with allowed values from 0 to 15. The values are as defined for the "Encryption Algorithm" in [52].

11.2.107 CN Domains to Handover

The CN Domains to Handover information element indicates the core network domains (CS, PS or both CS and PS) that need to be handed over.

8	7	6	5	4	3	2	1	
CN Domains to Handover IEI								octet 1
Length of CN Domains to Handover value contents								octet 2
spare						CNDH		octet 3
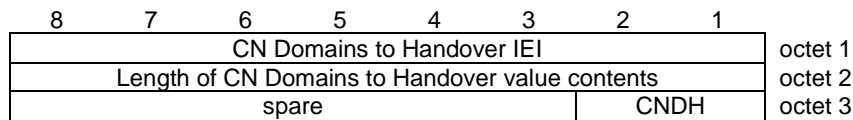
Figure 11.2.107.1: CN Domains to Handover information element

Table 11.2.107.1: CN Domains to Handover information element

CNDH, CN Domains to Handover (octet 3)
Bits
2 1
0 0 Reserved
0 1 CS domain only
1 0 PS domain only
1 1 Both CS and PS domains

11.2.108 3G Security Capability

The 3G Security Capability information element indicates the 3G integrity protection and encryption algorithms that are supported by the MS.

8	7	6	5	4	3	2	1	
3G Security Capability IEI								octet 1
Length of 3G Security Capability value contents								octet 2
Ciphering Algorithm Capability								octets 3, 4
Integrity Protection Algorithm Capability								octets 5, 6
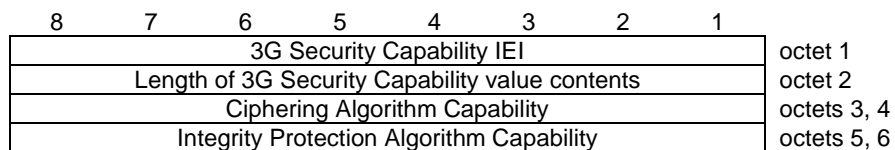
Figure 11.2.108.1: 3G Security Capability information element

Table 11.2.108.1: 3G Security Capability information element

Ciphering Algorithm Capability
The coding of this field is as specified for the Ciphering Algorithm Capability in sub-clause 10.3.3.37 in [40]. For example, octet 3 bit 1 indicates support for the UEA0 algorithm, octet 3 bit 2 indicates support for the UEA1 algorithm, etc.

Integrity Protection Algorithm Capability
The coding of this field is as specified for the Integrity Protection Algorithm Capability in sub-clause 10.3.3.37 in [40]. For example, octet 3 bit 1 indicates support for the UIA1 algorithm, octet 3 bit 2 indicates support for the UIA2 algorithm, etc.

11.2.109 NAS Synchronisation Indicator

The purpose of NAS Synchronisation Indicator IE is to provide the 'Speech Codec Selection' information, as described in [8], to the MS. This information element contains transparent NAS information that is transferred from the CN to the MS without interpretation in the GANC.

8	7	6	5	4	3	2	1	
NAS Synchronisation Indicator IEI								octet 1
Length of NAS Synchronisation Indicator value contents								octet 2
spare				NSI				octet 3
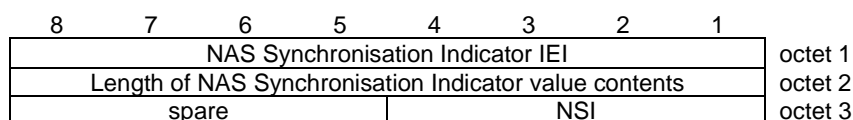
Figure 11.2.109.1: NAS Synchronisation Indicator information element

Table 11.2.109.1: NAS Synchronisation Indicator information element

NSI, NAS Synchronisation Indicator Value (octet 3) The coding of this field is as specified in the sub-clause 'Speech Codec Selection' in [8]. The most significant bit is octet 3, bit 4. The least significant bit is octet 3, bit 1.

11.2.110 TEID

The TEID information element identifies a GA-RRC packet transport channel tunnel endpoint.

8	7	6	5	4	3	2	1	
			TEID IEI					octet 1
		Length of TEID value contents						octet 2
			TEID					octet 3-6
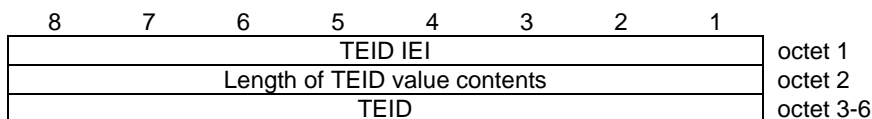
Figure 11.2.110.1: TEID information element

Table 11.2.110.1: TEID information element

TEID, (octets 3-6) The MSB is octet 3 and the LSB is octet 6.

11.2.111 UTRAN RRC Message

The UTRAN RRC Message information element contains a UTRAN RRC message to be transported using the GA-RRC protocol between the MS and the GANC.

8	7	6	5	4	3	2	1	
			UTRAN RRC Message IEI					octet 1
		Length of UTRAN RRC Message IE contents						octet 2, 2a
		UTRAN RRC Message contents, 1st octet						octet 3
		UTRAN RRC Message contents, last octet						octet n
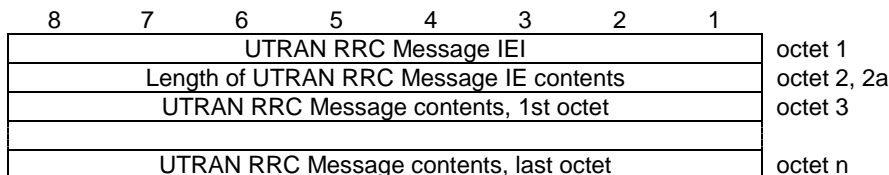
Figure 11.2.111.1: UTRAN RRC Message information element

11.2.112 MS Radio Access Capability

The MS Radio Access Capability information element provides the GANC with information concerning radio aspects of the mobile station.

8	7	6	5	4	3	2	1	
		MS Radio Access Capability IEI						octet 1, 1a
	Length of MS Radio Access Capability value contents							octet 2
			MS RAC					octet 3-n
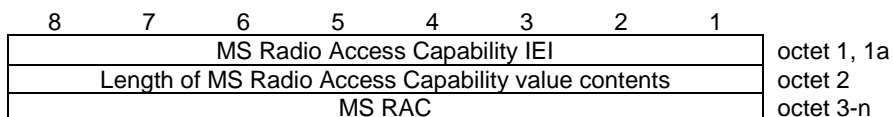
Figure 11.2.112.1: MS Radio Access Capability information element

Table 11.2.112.1: MS Radio Access Capability information element

MS RAC, (octets 3-n) The value is coded in the same way as the value part in the *MS Radio Access Capability* information element in TS 24.008 [8].

11.2.113 Handover Reporting Control

The Handover Reporting Control information element provides the MS with information concerning which cells/RATs may be reported during handover initiation..

8	7	6	5	4	3	2	1	
Handover Reporting Control IEI								octet 1, 1a
Length of Handover Reporting Control value contents								octet 2
spare						HO_3G	HO_2G	octet 3
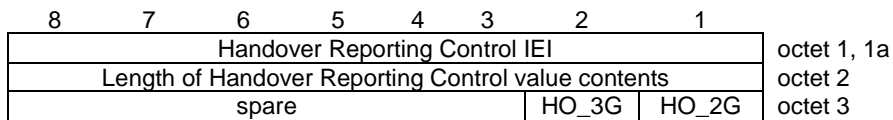
Figure 11.2.113.1: Handover Reporting Control information element

The HO_2G and HO_3G indications specify whether a mobile may indicate a 2G (respectively 3G) cell as part of a handover initiation procedure (see sub-clauses 7.8.1, 8.14.1). If both of these bits are set to '1' the mobile station shall treat these bits as set to '0'.

Table 11.2.113.2: HO_2G, HO_3G

HO_2G, HO_3G (octet 3, bits 1,2)
0   MS may report cells
1   MS shall not report cells

11.2.114 Tracking Area Identity

The Tracking Area Identity (TAI) information element consists of a TAC, MNC and MCC (see [54]).

8	7	6	5	4	3	2	1	
Tracking Area Identity IEI								octet 1, 1a
Length of Tracking Area Identity IE contents								octet 2
MCC dig 2				MCC dig 1				octet 3
MNC dig 3				MCC dig 3				octet 4
MNC dig 2				MNC dig 1				octet 5
Tracking Area Code								octet 6-7
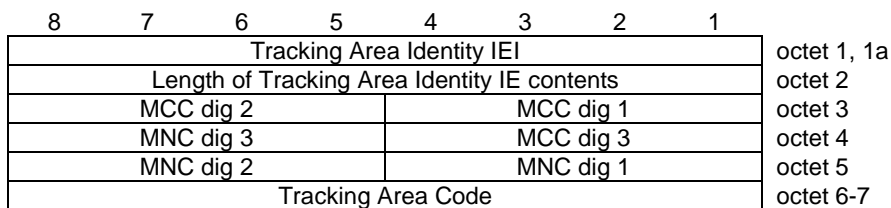
Figure 11.2.114.1: Tracking Area Identity information element

Table 11.2.114.1: Tracking Area Identity information element

Tracking Area Code, (octets 6-7)
This is a 16-bit value, with the most significant bit is octet 7 bit 8 and the least significant bit is octet 8 bit 1.

11.2.115 E-UTRAN Cell Identity

The E-UTRAN Cell Identity information element consists of a 28-bit Cell ID (see [55]).

8	7	6	5	4	3	2	1	
E-UTRAN Cell Identity IEI								octet 1, 1a
Length of E-UTRAN Cell Identity IE contents								octet 2
E-UTRAN Cell ID								octet 3-6
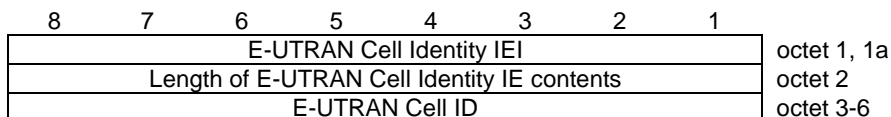
Figure 11.2.115.1: E-UTRAN Cell Identity information element

Table 11.2.115.1: E-UTRAN Cell Identity information element

E-UTRAN Cell ID, (octets 3-6)
This is a 28-bit value, with the most significant bit in octet 4 bit 8 and the least significant bit in octet 7 bit 5. Octet 7 bits 1-4 are spare.

11.2.116 E-UTRAN Camping Indicator

The E-UTRAN Camping Indicator information element is used to indicate that the MS is camped on a E-UTRAN cell.

8	7	6	5	4	3	2	1	
E-UTRAN Camping Indicator IEI								octet 1, 1a
Length of E-UTRAN Camping Indicator IE contents								octet 2
ECI								octet 3
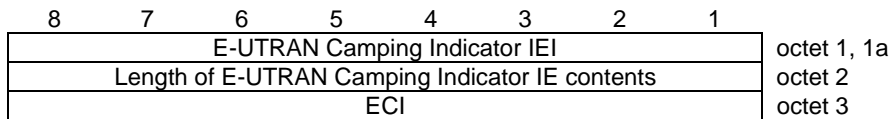
Figure 11.2.116.1: E-UTRAN Camping Indicator information element

Table 11.2.116.1: E-UTRAN Camping Indicator information element

ECI, (octet 3)
0   MS is camped on a E-UTRAN cell in Normal Service state
1   MS is camped on a E-UTRAN cell in Limited Service state
2   MS is camped on a E-UTRAN cell in unknown service state
3-255 All other values are reserved.

11.2.117 Bandwidth-efficient Mode Indicator

The Bandwidth-efficient Mode Indicator information element indicates that RFC 4867 [11] bandwidth-efficient mode shall be used for the GA-CSR traffic channel.

8	7	6	5	4	3	2	1	
Bandwidth-efficient Mode Indicator IEI								octet 1, 1a
Length of Bandwidth-efficient Mode Indicator value contents								octet 2
BMI								octet 3
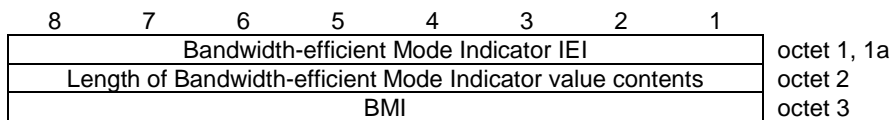
Figure 11.2.117.1: Bandwidth-efficient Mode Indicator information element

Table 11.2.117.1: Bandwidth-efficient Mode Indicator information element

BMI, Bandwidth-efficient Mode Indicator (octet 3)
    0   Reserved
    1   Use RFC 4867 [11] bandwidth-efficient mode
2 to 255   Reserved

12   List of system parameters

The information provided in sub-clauses 12.1 and 12.2 shall be treated as informative. The normative text is specified in the relevant sub-clauses and shall prevail.

12.1   Timers and counters

12.1.1   Timers on the mobile station side

All the timers listed below except TU3910 and TU3906 shall be stopped when the MS exits GAN mode.

Table 12.1.1.1: Timer on the mobile station side

Timer	Start	Stop	At expiry	Value Setting
TU3901	Sending of GA-RC DISCOVERY REQUEST	Reception of GA-RC DISCOVERY ACCEPT or GA-RC DISCOVERY REJECT or Lower layer failure as defined in section 5.6.2.	See sub-clause 5.6.1.	30 seconds.
TU3902	Reception of GA-RC DISCOVERY REJECT with Reject Cause value 'network congestion'	-.	See sub-clause 5.6.3.	Received from the GANC as TU3902 Timer IE. Value in TU3902 Timer IE + a random value between 0 and the value in TU3902 Timer IE
TU3903	TU3901 expiry or Lower layer failure as defined in section 5.6.2.	-.	See sub-clause 5.6.4.	Initial value is 1 minute. Maximum value is 32 minutes.
TU3904	Sending of GA-RC REGISTER REQUEST	Reception of GA-RC REGISTER ACCEPT or GA-RC REGISTER REJECT or GA-RC REGISTER REDIRECT or Lower layer failure as defined in section 6.2.4.2.	See sub-clause 6.2.4.1.	30 seconds.
TU3905	TU3904 expiry or Lower layer failure as defined in sections 6.2.4.2 and 9.5 or reception of GA-RC DEREGISTER	-.	See sub-clause 6.2.4.3.	10 seconds.
TU3906	Reception of GA-RC REGISTER ACCEPT and at TU3906 expiry	See sub-clauses 6.5 and 9.5.	Send GA-RC KEEP ALIVE and restart TU3906	Received from the GANC as TU3906 Timer IE.
TU3907	Reception of GA-RC REGISTER REJECT or GA-RC DEREGISTER with Reject Cause value 'network congestion'	Lower layer failure as defined in section 6.2.4.2.	See sub-clause 6.2.4.4.	Received from the GANC as TU3907 Timer IE. Value in TU3907 Timer IE + a random value between 0 and value in TU3907 Timer IE
TU3908	Sending of GA-CSR REQUEST	Reception of GA-CSR REQUEST ACCEPT or GA-CSR REQUEST REJECT	See sub-clause 7.1.4.1.	5 seconds.
TU3909	Sending of GA-CSR CLEAR REQUEST	Reception of GA-CSR RELEASE	See sub-clause 7.5.5.	5 seconds.
TU3910	At rove out or at reception of GA-RC REGISTER UPDATE DOWNLINK	When MS detects loss of GERAN coverage or reception of GA-RC REGISTER UPDATE DOWNLINK or GA-RC REGISTER REDIRECT	The MS is allowed to rove-in	Received from the GANC as TU3910 Timer IE.
TU3911	Sending of GA-CSR ACTIVATE CHANNEL ACK	Reception of GA-CSR ACTIVATE CHANNEL COMPLETE	See sub-clause 7.4.5.	5 seconds.
TU3920	GAN A/Gb mode: Sending of GA-CSR HANDOVER ACCESS GAN Iu mode: Sending of GA-RRC RELOCATION ACCESS	GAN A/Gb mode: Reception of GA-CSR ACTIVATE CHANNEL COMPLETE GAN Iu mode: Reception of GA-RRC ACTIVATE CHANNEL COMPLETE	GAN A/Gb mode: See sub-clause 7.7.5. GAN Iu mode: See sub-clause 8a.10.5.	Received from the GANC as TU3920 Timer IE.

Timer	Start	Stop	At expiry	Value Setting
TU4001	GAN A/Gb mode: Reception of GA-PSR- ACTIVATE-UTC- ACK or at sending or receiving of GA-PSR-UNITDATA GAN Iu mode: Reception of GA-RRC ACTIVATE CHANNEL COMPLETE (for PS domain) or at sending or receiving of GA-RRC PDU for a particular PTC	GAN A/Gb mode: Sending or receiving of GA-PSR-UNITDATA (and restart the timer) GAN Iu mode: Sending or receiving of GA-RRC PDU for the same PTC (and restart the timer)	GAN A/Gb mode: See sub-clause 8.4.1. GAN Iu mode: See sub-clause 8a.9.	Received from the GANC as TU4001 Timer IE.
TU4002	Sending of GA-PSR-ACTIVATE-UTC-REQ or sending GA-PSR-DEACTIVATE-UTC-REQ	Reception of GA-PSR-ACTIVATE-UTC-ACK or reception of GA-PSR-DEACTIVATE-UTC-ACK	See sub-clause 8.2.4.2 and sub-clause 8.4.4.1	5 seconds.
TU4003	Sending of GA-PSR-DFC-REQ	-.	See sub-clause 8.11.3	Received from the GANC as TU4003 Timer IE.
TU4004	Sending of GA-PSR HANDOVER INFORMATION message to the network or receiving a GA-PSR HANDOVER CONTINUE message from the network	Reception of a GA-PSR HANDOVER COMMAND message.	Rove-out to GERAN/UTRAN mode or remain in GAN mode.	Received from the GANC as TU4004 Timer IE.
TU5002	Sending of GA-RRC DEACTIVATE CHANNEL REQUEST for a particular domain (CS or PS)	Reception of GA-RRC RELEASE or GA-RRC DEACTIVATE CHANNEL for the same domain	See sub-clause 8a.8.	5 seconds.
TU5908	Sending of GA-RRC REQUEST	Reception of GA-RRC REQUEST ACCEPT or GA-RRC REQUEST REJECT	See sub-clause 8a.1.	5 seconds.
TU5909	Sending of GA-RRC RELEASE REQUEST	Reception of GA-RRC RELEASE	See sub-clause 8a.5.	5 seconds.
TU5911	Sending of GA-RRC ACTIVATE CHANNEL ACK	Reception of GA-RRC ACTIVATE CHANNEL COMPLETE	See sub-clause 8a.4.	5 seconds.

12.1.2   Timers on the network side

No timers are defined on the network side in this version of this specification.

12.2   Other system parameters

12.2.1   TCP related parameters and system parameters

TCP port for Discovery is port number 14001.

TCP port for Registration is port number 14001.

The MS should ensure that the small packets containing each signalling message are sent immediately. For example, this can be done by using the standard TCP socket options (e.g., TCP_NODELAY to disable Nagle's algorithm).

The MS shall not normally release the TCP connection to the GANC, while it is registered with a GANC.

Once the TCP connection is released, the IPsec tunnel can also be released unless this tunnel will be used for subsequent registration.

12.2.2   (void)

12.2.3   MS system parameters

Parameter Name	Value
Up Register Max Retries	3
Up Connect Attempt Count	3
AP Black list size minimum	1
Location Black List size minimum	1

Parameter Name	Initial Value
Serving GANC Table indicator	"Do Not Store"

Annex A (informative):
RTP Framing for CS-domain Services

A.1   RFC 4867 Framing

RFC 4867 [48] defines the RTP payload format for AMR and AMR-WB codecs. There are two operation modes for the payload format referred to as: bandwidth-efficient mode and octet-aligned mode. Only octet-aligned mode is applicable to GAN.

A.1.1   (void)

A.1.1a   Codec and Redundancy Mode Example
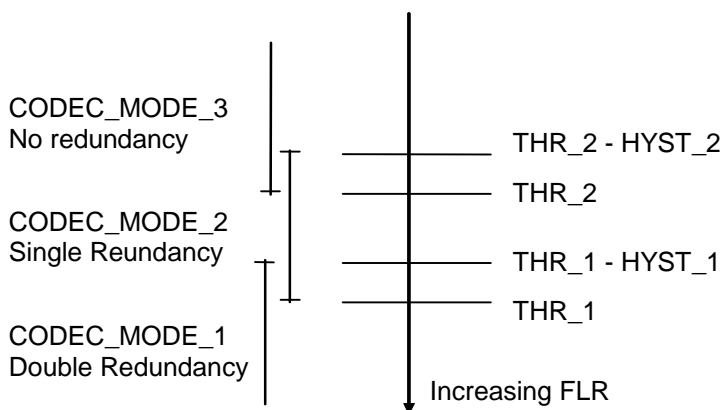
Figure A1.1a.1: *Codec and Redundancy Mode example*

The receiver is currently using Codec Mode 3 with no redundancy.

If the frame loss rate increases over Threshold 2, then the receiver indicates this to the sender by requesting an AMR mode for which single redundancy is used (as signaled in the Redundancy Configuration IE). This configuration is kept until frame loss rate is again lower than Threshold 2 - Hysteresis 2. The receiver indicates this by again requesting a higher AMR mode. By this redundancy mode is also implicitly requested to be no redundancy.

If instead network conditions degrade even more and frame loss rate increases over Threshold 1, the receiver indicates this to sender by requesting an AMR mode for which double redundancy is used (as signaled in the Redundancy Configuration IE). The sender then switches to double redundancy and the requested AMR mode. This configuration is kept until frame success rate is again better than Threshold 1 - Hysteresis 1. The receiver indicates this by again requesting a higher AMR mode. By this redundancy mode is also implicitly requested to be single redundancy.

A.1.2   RFC 4867 Octet-aligned Frame Examples

With RFC 4867 the RTP payload begins with a Codec Mode Request (CMR) field, followed by a number of Table of Content (ToC) entries, and speech data representing one or more speech frame-blocks. In octet-aligned mode, the CMR and ToC fields are padded to an octet. The following diagram shows the general payload format layout:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  CMR  |R|R|R|R|F|  FT   |Q|P|P|F|  FT   |Q|P|P| speech data  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                    ToC             ToC
                 |<------------>|<------------>|
```
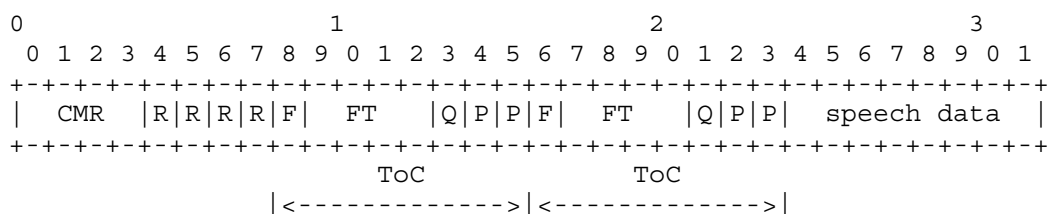
CMR (Codec Mode Request): is used for rate adaptation. The value of the CMR field is set to the frame type index of the corresponding speech mode being requested. The frame type index may be 0-7 for AMR, or 0-8 for AMR-WB, as defined in [48]. CMR value 15 indicates that no mode request is present, and other values are for future use.

FT (Frame Type index): indicates either the AMR or AMR-WB speech coding mode or comfort noise (SID) mode of the corresponding frame carried in this payload. E.g. in case of AMR speech, a value of FT=7 indicates that this frame carries AMR 12.2 sample(s).

Q (frame Quality indicator): if set to 0, indicates that the corresponding frame is severely damaged.

The **F** bit indicates whether another speech frame follows in the same payload (F=1) or if this frame is the last frame in the payload (F=0).

R and **P** stand for reserved and padding bits, respectively.

The following diagram shows an octet-aligned AMR payload carrying one AMR 12.2 speech frame-block:

```
0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| CMR=15|R|R|R|R|0| FT=7  |Q|P|P|   f1(0..7)    |   f1(8..15)   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   f1(16..23)  |                 ....                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                 ....                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                 ....                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                 ....                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                 ....                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                 ....                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                 ....          | f1(232..239)  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|f1(243)|P|P|P|P|
+-+-+-+-+-+-+-+-+
```

The following diagram shows an octet-aligned AMR payload carrying two AMR 12.2 speech frame-blocks:

```
0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| CMR=15|R|R|R|R|1| FT=7  |Q|P|P|0| FT=7  |Q|P|P|   f1(0..7)    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   f1(8..15)   |   f1(16..23)  |    ....                       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                              ....                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                              ....                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                              ....                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                              ....                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                              ....                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                              ....                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| f1(232..239)  |f1(243)|P|P|P|P|   f2(0..7)    |   f2(8..15)   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                              ....                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                              ....                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                              ....                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                              ....                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                              ....                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                              ....              | f1(232..239) |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|f2(243)|P|P|P|P|
+-+-+-+-+-+-+-+-+
```

NOTE: The last octet in both speech frames is padded with four 0s to make it octet-aligned.
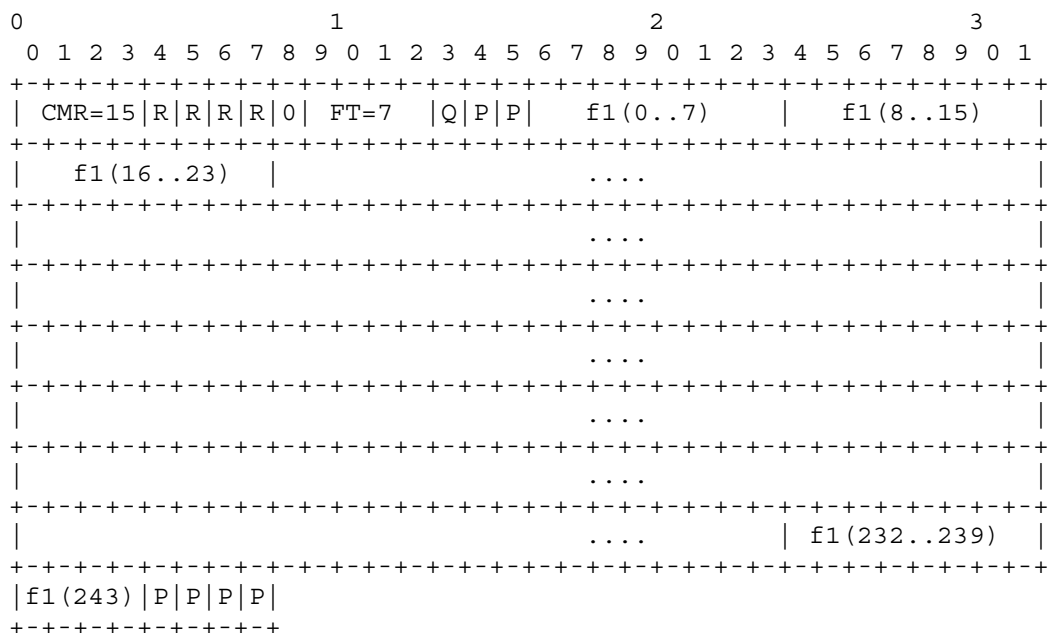
The following diagram shows an octet-aligned AMR payload carrying one AMR 12.2 speech frame-block (FT=7) and one AMR SID frame (FT=8; 39 bits):

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| CMR=15|R|R|R|R|1| FT=7  |Q|P|P|0| FT=8  |Q|P|P|   f1(0..7)    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   f1(8..15)   |   f1(16..23)  |   ....                        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                             ....                              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                             ....                              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                             ....                              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                             ....                              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                             ....                              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                             ....                              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| f1(232..239)  |f1(243)|P|P|P|P|   f2(0..7)    |   f2(8..15)   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   f2(16..23)  |   f2(24..31)  |   f2(32..38) |P|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
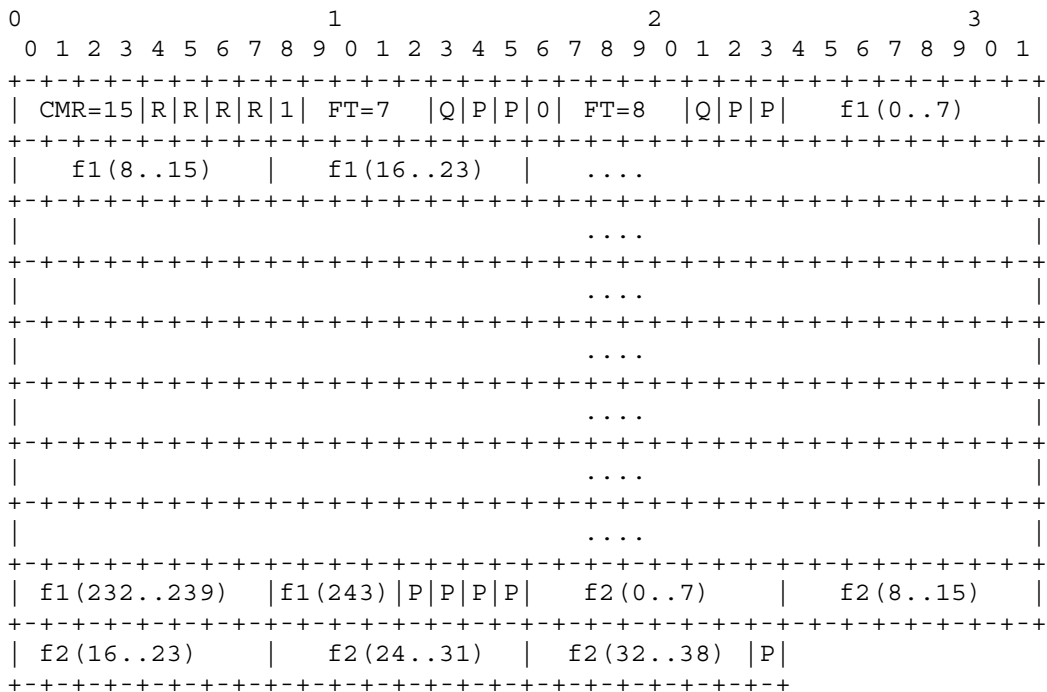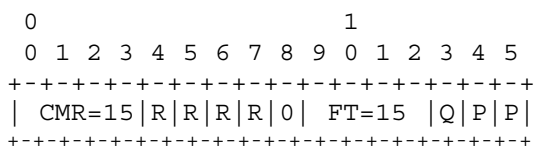
The following diagram shows an octet-aligned AMR payload carrying one AMR SID frame (FT=8; 39 bits) as defined in Sections 7.4.3 and 7.4.4 of the main body of this specification for Discontinuous Transmission (DTX):

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| CMR=15|R|R|R|R|0| FT=8  |Q|P|P|   f1(0..7)    |   f2(8..15)   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   f2(16..23)  |   f2(24..31)  |   f2(32..38) |P|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
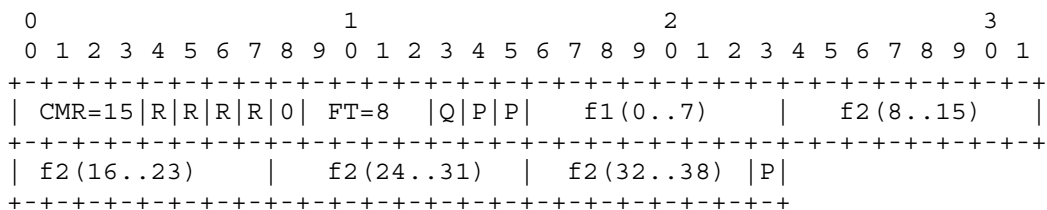
The following diagram shows an octet-aligned AMR payload carrying one AMR NO_DATA frame (FT=15; 0 bits) as defined in Sections 7.4.3 and 7.4.4 of the main body of this specification when no speech or SID frame is available for a period of 480 ms:

```
 0                   1
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| CMR=15|R|R|R|R|0| FT=15 |Q|P|P|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Note that the preceding format shown above that results when no speech or SID frame is received for 480 ms is necessary per Section 7.4.3 and Section 7.4.4. But this formatting is an intentional deviation from Section 4.3.2 of RFC 3267, which says a packet containing only NO_DATA frames should not be transmitted.

A.2   (HS)CSD Framing over RTP

For radio interface rate of 3.6 kbps, the Terminal Adaptation Function (TAF) in the MS produces a 72-bit frame every 20 ms. For transmission in RTP [35], this 72-bit frame is packed into a 9 octet payload. The format of this 72-bit frame is defined in [13].

For radio interface rate of 6 kbps, the Terminal Adaptation Function (TAF) in the MS produces a 120-bit frame every 20 ms. For transmission in RTP [35], this 120-bit frame is packed into a 15 octet payload. The format of this 120-bit frame is defined in [13].

For radio interface rate of 12 kbps, the Terminal Adaptation Function (TAF) in the MS produces a 240-bit frame every 20 ms. For transmission in RTP [35], this 240-bit frame is packed into a 30 octet payload. The format of this 240-bit frame is defined in [13].

For radio interface rate of 14.5 kbps, the Terminal Adaptation Function (TAF) in the MS produces a 290-bit frame every 20 ms. For transmission in RTP [35], this 290-bit frame is packed into a 37 octet payload beginning with a 6-bit signature (binary 001100),. The format of this 290-bit frame is defined in [13].

For radio interface rate of 29 kbps, the Terminal Adaptation Function (TAF) in the MS produces a 580-bit frame every 20 ms. For transmission in RTP [35], this 580-bit frame is packed into a 73 octet payload beginning with a 4-bit signature (binary 1100),. The format of this 580-bit frame is defined in [13].

For radio interface rate of 43.5 kbps, the Terminal Adaptation Function (TAF) in the MS produces a 870-bit frame every 20 ms. For transmission in RTP [35], this 870-bit frame is packed into a 109 octet payload beginning with a 2-bit signature (binary 01),. The format of this 870-bit frame is defined in [13].

Radio interface rate of 32kbps is FFS.

The IETF has defined RFC 4040 ("RTP Payload Format for a 64 kbit/s Transparent Call") [51]. This RFC shall be used for the 64 kbps circuit switched bearer required (for example) for a CS video call supported in GAN mode.

Annex B (normative): Network QoS

B.1 Introduction

The GAN-MS shall check DSCP/ToS information in incoming IP packets from the GANC and if different from what currently used, copy received DSCP/ToS and use it for outgoing IP packets.

For a tunnel mode SA, there is an "outer" IP header that specifies the IPsec processing destination, plus an "inner" IP header that specifies the ultimate destination for the packet.

B.2 Network behaviour

When the GANC-SEGW receives an IP packet from the GANC, it shall make sure that the DSCP (DiffServ Code Point) values from the 'inner' IP header are mapped to the 'outer' IP header (according to operator configuration) before forwarding the packet to the MS using the established SA. When several flows are using the same IPsec tunnel and have a different QoS, e.g. a PS streaming class flow and a PS background flow, the GANC may decide to assign a specific DSCP value for each flow identified by its Packet Flow Identifier.

B.3 MS behaviour

B.3.1 Receiving of data

B.3.1.1 Outer IP packet

When the MS receives an encrypted IP packet, it shall store the DSCP value from the 'outer' IP header in the context of this IPSec SA for this inner DSCP value.

B.3.1.2 Inner IP packet

Furthermore, the MS shall perform the following actions when handling the received IP packet and UDP datagram or TCP data in the application layer (i.e. GA-RC, GA-CSR or GA-PSR layers):

-   For a received RTP/UDP packet, read the DSCP value from the 'inner' IP header (i.e. using the UDP socket for the traffic channel). If this value is different from what is currently being used for this RTP/UDP stream, then save the received DSCP value and use it for all outgoing RTP/UDP packets for this traffic channel (one way to achieve this is to set the DSCP value for the UDP socket).

-   For a received GA-PSR-UNITDATA message, read the DSCP value from the 'inner' IP header. If this value is different from what is currently being used for this flow within the GA-PSR TC, then save the received DSCP value and use it for all outgoing GA-PSR-UNITDATA messages on this flow within the GA-PSR TC.

-   For a received GA-RC message, GA-CSR message or GA-PSR message containing signalling or SMS, read the DSCP value from the 'inner' IP header (i.e. using the TCP socket for the TCP connection to the GANC). If this value is different from what is currently being used for this TCP connection, then save the received DSCP value and use it for all outgoing GA-RC messages, GA-CSR messages and GA-PSR messages containing signalling or SMS (one way to achieve this is to set the DSCP value for the TCP socket).

B.3.2 Sending of data

When the MS is sending an IP packet to the GANC, it shall make sure that the DSCP (DiffServ Code Point) values for the 'inner' IP header are computed from the received IP packets, as described in B.3.1.2 above. Further, the DSCP value for the 'outer' IP header is obtained from the stored value in the IPSec SA context for this inner DSCP value, as described in B.3.1.1 above, before forwarding the packet to the GANC-SEGW using the established SA.

Annex C (normative):
(Source-RAT) Measurement Report for Handover and Cell Change Order to GAN

C.1   Measurement Report for Handover and Cell Change Order to GAN A/Gb mode

The MS uses the (Source-RAT) measurement report procedure to "request" handover to GANA/Gb mode for voice call or signalling session. It also uses it to "request" a Cell Change Order to GAN A/Gb mode for packet data session.

The procedure is initiated after the MS has successfully registered with the GANC, provided the following conditions are met:

-   the MS stays registered with GANC;

-   the GANC directs the MS to operate in GAN A/Gb mode;

-   the GANC includes the IE "GAN Cell Description" in the GA-RC REGISTER ACCEPT message;

-   if the source RAT is GERAN/UTRAN, and the MS is in dedicated mode (signalling only or speech mode), network has requested reports according to NETWORK_CONTROL_ORDER or in DTM mode (simultaneous dedicated mode and packet transfer mode) or UTRA RRC Connected Mode for CS domain services;

-   the ARFCN provided by the GANC (i.e. the GAN-ARFCN) is within the cell info list used for measurement reporting in the source RAT;

-   no GSM neighbour cell matching the {GAN-ARFCN, GAN-BSIC} couple has been detected by the MS.

The MS shall not be connected to more than one GANC at any one time, and therefore shall not report more than one {GAN-ARFCN, GAN-BSIC} couple during the period of the connection to the GANC.

The RR entity in the source RAT shall report that the cell associated with the {GAN-ARFCN, GAN-BSIC} couple has the best possible receiving level (i.e., RxLev = 63).

C.2   Measurement Report for Handover and Cell Change Order to GAN Iu mode

The MS uses the (Source-RAT) measurement report procedure to "request" handover to GAN Iu mode for CS, PS or both CS and PS sessions. It also uses it to "request" a Cell Change Order from GERAN to GAN Iu mode for PS sessions.

The procedure is initiated after the MS has successfully registered with GANC, provided the following conditions are met:

-   the MS stays registered with GANC;

-   the GANC directs the MS to operate in GAN Iu mode;

-   the GANC includes the IE "GAN Iu Mode Cell Description" in the GA-RC REGISTER ACCEPT message;

-   if the source RAT is GERAN, the MS is in dedicated mode and the network has requested reports according to NETWORK_CONTROL_ORDER or in DTM mode (simultaneous dedicated mode and packet transfer mode);

-   if the source RAT is UTRAN, the MS is in UTRA RRC Connected Mode (i.e., for CS domain, PS domain or both CS and PS domain services);

- the UARFCN and Primary Scrambling Code provided by GANC in the IE "GAN Iu Mode Cell Description" (i.e. the GAN-UARFCN and GAN-PSC) are within the cell info list used for measurement reporting in the source RAT;

- no UTRAN neighbour cell matching the {GAN-UARFCN, GAN-PSC} couple has been detected by the MS.

The MS shall not be connected to more than one GANC at any one time, and therefore shall not report more than one {GAN-UARFCN, GAN-PSC} couple during the period of the connection to the GANC.

The RR entity in the source RAT shall report that the cell associated with the {GAN-UARFCN, GAN-PSC} couple has the best possible receiving level (i.e., RSCP = 91 or Ec/No=63).

Annex D (normative):
RFC 4867 Framing Parameters for GAN

D.1 RFC 4867 Framing Parameters for GAN

When carrying AMR or AMR-WB voice in GAN, the following RTP framing parameters shall be used:

- Octet-aligned

- No frame CRCs

- No robust sorting

- No frame interleaving

- Single channel per session

- Mode-change-period = 2 i.e. mode can change every 2nd speech frame

- Mode-change-neighbor = 1 i.e. mode can only change to neighbouring mode in the active mode set

- Mode-set: signalled in *Multirate Configuration* IE

- Forward error correction: single or double retransmission of the previously transmitted frame (s) (i.e. window size of 2 or 3). To request a concurrent AMR and redundancy mode adaptation, the decoder (speech receiver) signals the encoder (speech sender) the new AMR mode it prefers in Codec Mode Request (CMR). The redundancy mode for each mode of the Active Codec Set is signaled in the Redundancy Configuration IE. This way the preferred redundancy mode is also implicitly requested with the CMR. (Triple redundancy is not used, as it would add too much network load. When the third redundant frame has to be used, there would also be too long delays.)

The frame loss rate for the received speech data is continuously monitored by the MS and the network. If the sender is currently using codec mode N where increasing N means a codec mode with higher bitrate, the following applies.

- When the frame loss rate goes above Threshold N-1, the receiver signals the sender to change to codec mode N-1 and thereby also to the redundancy mode associated with codec mode N-1.

- When the frame loss rate goes below Threshold N - Hysteresis N, the receiver signals the sender to change to codec mode N+1 and thereby also to the redundancy mode associated with codec mode N+1.

The frame loss rate threshold and hysteresis values used for triggering a switch in AMR mode shall be given by the network in a consistent order, i.e. such that:

- $THR\_1 \geq THR\_2 \geq THR\_3$, and

- $THR\_1 - HYST\_1 \geq THR\_2 - HYST\_2 \geq THR\_3 - HYST\_3$.

The initial codec mode, and associated redundancy mode, to use, is signaled in Multirate Configuration IE, at channel activation or at channel mode modify.

Annex E (normative): GAN Specific Requirements for Interworking with UTRAN

E.1 GAN A/Gb Mode Specific Requirements for Interworking with UTRAN

The UE shall include the *Support of Handover to GAN* indication in the UE Radio Access Capabilities provided to the RNC.

> NOTE: The RNC support of functionality for UTRAN to GAN Handover is implied by the inclusion of the ARFCN for GAN in the neighbour cell list of the UE.

The GAN and GERAN capable UE shall conform to all the requirements for Inter-RAT events as defined in TS 25.331 for reporting GERAN cells.

W.r.t. reporting GAN cells, the UE can be in one of two modes:

GAN preferred: the UE prefers to stay in GAN rather than GERAN or UTRAN.

GERAN/UTRAN preferred: the UE prefers to stay in GERAN/UTRAN rather than GAN;

Reporting of GAN cells is only performed with event 3A; GAN cells are never reported by events 3B, 3C, 3D or periodic reporting.

The GAN capable UE shall conform to all the requirements for Inter-RAT measurement reporting as defined in TS 25.331 for reporting of GAN cells, except when stated below:

- For the reporting of a GAN cell in case of configured event 3A, the UE shall act on the information originally received in the Measurement Control message as follows:

    - Treat the value of the "Hysteresis" parameter as 0.

    - Ignore the "Threshold other system" parameter.

    - Treat the value of the "Time to trigger" parameter as 0ms.

- When the UE is in GAN preferred mode and an event 3A has been configured, the UE shall in addition act on the information originally received in the Measurement Control message, as follows:

    - Treat the value of the "Threshold own system" parameter as 0.

As a result, the UE can report a GAN cell whenever it has successfully registered on a GANC;

- When the UE is in GERAN/UTRAN preferred mode and an event 3A has been configured, the UE shall only send a measurement about the GAN cell to trigger handover when no GERAN cells from the Inter-RAT measurement object list satisfy the triggering condition of the configured Event (as described in TS 25.331).

- When the UE is in GAN preferred mode and an event 3A has been configured, the UE may send a measurement about the GAN cell to trigger handover immediately following successful registration on the GANC.

- When the UE is sending an event 3A related measurement report about a GAN cell in order to trigger handover, the UE shall report that the GAN cell has the best possible receiving level (i.e., GSM carrier RSSI = 63) and therefore complies with the "threshold other system" signalled in the information originally received in the Measurement Control message.

> NOTE: If the UE is in GAN preferred mode and an event 3A has been configured, it does not need to make inter-RAT measurements prior to including GAN cell information in the Measurement Report message sent to the UTRAN to trigger handover to GAN.

- The UE shall not include GAN cells in other Inter-RAT measurement reporting than when triggered by event 3A.

- If an event 3A is configured only with Inter-RAT cells not within any of the GERAN bands supported by the UE (as specified by the IE "Inter-RAT measurements object list" and taking into account any restriction configured by the IE "cell for measurement") this event shall not be counted as an Inter-RAT reporting criterion with respect to the UE capability for the Inter-RAT measurement category.

- If the UE fails to complete the handover to GAN as requested by the Handover From UTRAN Command message (e.g. UE loses connection to GAN), it shall act as in the handover failure case specified in TS 25.331.

The selection of the RF channel number (ARFCN) used for the UTRAN to GAN handover procedure should not correspond to a channel from any frequency band defined in TS 45.005, to avoid UEs not requiring compressed mode for GSM measurements from unnecessarily powering up their GSM receivers.

E.2 GAN Iu Mode Specific Requirements for Interworking with UTRAN

When operating in GAN Iu mode, the GANC emulates a UTRAN RNC to the rest of the network. Therefore, the UTRAN to GAN and GAN to UTRAN handovers are considered to be intra-system (UTRAN-to-UTRAN) handovers. This differs from the GAN A/Gb mode case where UTRAN to GAN and GAN to UTRAN handovers are considered to be inter-system (i.e., inter-RAT) handovers.

In addition to the procedures described in sub-clauses 8a.10 and 8a.11, the following procedures shall be followed with respect to GAN Iu mode handover to and from UTRAN:

1. When a UTRAN to GAN Iu mode to UTRAN handover sequence occurs:

    - The GANC shall retain the Chosen Integrity Protection Algorithm (CIPA), Chosen Encryption Algorithm (CEA), Integrity Key (IK), Ciphering Key (CK) and COUNT parameters received from the source RNC. The GAN shall relay these parameters to the target RNC.

    - The MS shall store the START values that are in effect when entering GAN Iu mode. The MS shall provide the START values to the GANC (i.e., in the GA-RRC RELOCATION INFORMATION message) and the GANC shall forward the START values with the other parameters (described above) to the target RNC.

2. When a UTRAN to GAN Iu mode handover occurs (i.e., other than described in bullet 1 above):

    - The MS shall store the START values that are in effect when entering GAN Iu mode. When the MS transitions to the idle state (i.e., GA-RRC IDLE state for both CS and PS domains) while in GAN Iu mode, then the MS shall compare the START values with THRESHOLD and set the START values and key status as described in TS 25.331 [40] (i.e., behave as if the connection was released in UTRAN).

3. When a GAN Iu mode to UTRAN handover occurs (i.e., other than described in bullet 1 above):

    - The GANC relays the RRC message (e.g., Physical Channel Reconfiguration) provided by the target RNC in the Relocation Request Ack message to the MS in the GA-RRC RELOCATION COMMAND. This message includes the Integrity Protection Activation Info which includes the FRESH value.

    - The GANC shall include the current settings for the security algorithms and keys (e.g., CIPA, IK, CEA, and CK parameters) in the Source RNC to Target RNC Transparent Container.

    - The GANC shall obtain the START value(s) from the MS (i.e., in the GA-RRC RELOCATION INFORMATION message) and include them in the RRC Container sent to the target RNC in the Source RNC to Target RNC Transparent Container parameter.

    - The GANC shall initialize the relevant COUNT value(s) to zero and include them in the RRC Container sent to the target RNC in the Source RNC to Target RNC Transparent Container parameter.

Annex F (normative):
3G Cell Identity coding

F.1   3G Cell Identity coding – 28 bitstring

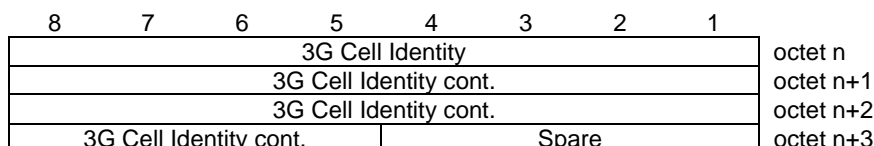| 8	7	6	5	4	3	2	1	
3G Cell Identity								octet n
3G Cell Identity cont.								octet n+1
3G Cell Identity cont.								octet n+2
3G Cell Identity cont.				Spare				octet n+3

Figure F1.1.1: *3G Cell Identity* information element

The 3G Cell Identity is defined in 3GPP TS 25.331 and further clarified in 3GPP TS 25.401 as a 28 bit variable, which in the Up protocol has to be included in 4 octets. Consequently 4 spare bits have to be placed within these 4 octets. Bit 8 in octet n is the most significant bit and bit 5 in octet n+3 is the least significant bit.
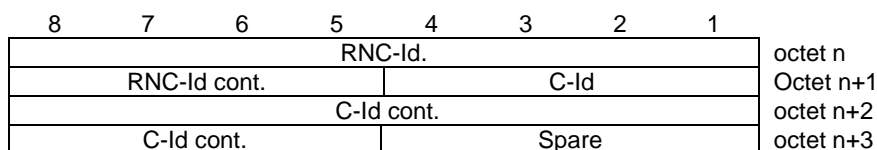
F.2   3G Cell Identity coding – RNC-Id + C-Id

8	7	6	5	4	3	2	1	
RNC-Id.								octet n
RNC-Id cont.				C-Id				Octet n+1
C-Id cont.								octet n+2
C-Id cont.				Spare				octet n+3

Figure F1.2.1: *3G Cell Identity* information element

3GPP TS 25.401 indicates that the 28 bit 3G Cell Identity consist of a RNC-Id. (12 bit) and a C-Id (16 bit).
Bit 8 in octet n is the most significant bit and bit 5 in octet n+1 is the least significant bit of the RNC-Id.
Bit 4 in octet n +1is the most significant bit and bit 5 in octet n+3 is the least significant bit of the C-Id.

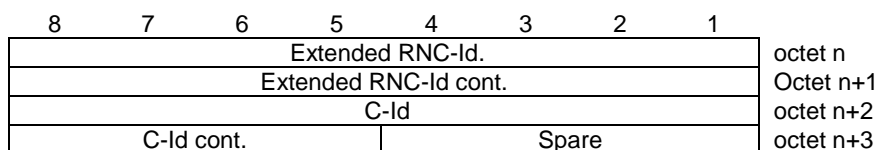## F.3   3G ell Identity coding – Extended RNC-Id + C-Id

8	7	6	5	4	3	2	1	
Extended RNC-Id.								octet n
Extended RNC-Id cont.								Octet n+1
C-Id								octet n+2
C-Id cont.				Spare				octet n+3

Figure F1.2.1: *3G Cell Identity* information element

With introduction of the Extended RNC-Id the 28 bit 3G Cell Identity consist of a Extended RNC-Id. (16 bit) and a C-Id (12 bit).
Bit 8 in octet n is the most significant bit and bit 1 in octet n+1 is the least significant bit of the Extended RNC-Id.
Bit 8 in octet n +2 is the most significant bit and bit 5 in octet n+3 is the least significant bit of the C-Id.

Annex G (informative): Change History

Date / Meeting	Doc.	CR	Rev	Subject/Comment	New
GP-48	-	-	-	Release 10 version based on version 9.2.0	10.0.0
GP-48	GP-101983	0124	3	Changes for LTE	10.0.0
GP-48	GP-101984	0125	3	Changes for RFC 4867 BE mode	10.0.0

History

Document history		
V10.0.0	May 2011	Publication