LTE;
Evolved Universal Terrestrial Radio Access (E-UTRA);
Radio Resource Control (RRC);
Protocol specification
(3GPP TS 36.331 version 9.6.0 Release 9)
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Foreword

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Foreword

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

Version x.y.z

where:

x  the first digit:
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y  the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z  the third digit is incremented when editorial only changes have been incorporated in the document.
1 Scope

The present document specifies the Radio Resource Control protocol for the UE-E-UTRAN radio interface.

The scope of the present document also includes:

- the radio related information transported in a transparent container between source eNB and target eNB upon inter eNB handover;
- the radio related information transported in a transparent container between a source or target eNB and another system upon inter RAT handover.

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.

[3] 3GPP TS 36.302: “Evolved Universal Terrestrial Radio Access (E-UTRA); Services provided by the physical layer”.
[10] 3GPP TS 22.011: "Service accessibility".


3GPP TS 36.133: "Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management".

3GPP TS 25.101: "Universal Terrestrial Radio Access (UTRA); User Equipment (UE) radio transmission and reception (FDD)".

3GPP TS 25.102: "Universal Terrestrial Radio Access (UTRA); User Equipment (UE) radio transmission and reception (TDD)".

3GPP TS 25.331: "Universal Terrestrial Radio Access (UTRA); Radio Resource Control (RRC); Protocol specification".

3GPP TS 45.005: "Radio transmission and reception".

3GPP TS 36.211: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation".

3GPP TS 36.212: "Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding".

3GPP TS 36.213: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures".


3GPP2 C.S0024-A v3.0: "cdma2000 High Rate Packet Data Air Interface Specification".

3GPP TS 23.003: "Numbering, addressing and identification".

3GPP TS 45.008: "Radio subsystem link control".

3GPP TS 25.133: "Requirements for Support of Radio Resource Management (FDD)".

3GPP TS 25.123: "Requirements for Support of Radio Resource Management (TDD)".

3GPP TS 36.401: "Evolved Universal Terrestrial Radio Access (E-UTRA); Architecture description".

3GPP TS 33.401: "3GPP System Architecture Evolution (SAE); Security architecture".

3GPP2 A.S0008-C v2.0: "Interoperability Specification (IOS) for High Rate Packet Data (HRPD) Radio Access Network Interfaces with Session Control in the Access Network".


3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3".

3GPP TS 44.060: "General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control/Medium Access Control (RLC/MAC) protocol".

3GPP TS 23.041: "Technical realization of Cell Broadcast Service (CBS)".

3GPP TS 23.038: "Alphabets and Language".
3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

**Information element:** A structural element containing a single or multiple fields is referred as information element.

**Field:** The individual contents of an information element are referred as fields.

**Floor:** Mathematical function used to 'round down' i.e. to the nearest integer having a lower value.
3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

1xRTT CDMA2000 1x Radio Transmission Technology
AM Acknowledged Mode
ASN.1 Abstract Syntax Notation One
ARQ Automatic Repeat Request
AS Access Stratum
BCCH Broadcast Control Channel
BCH Broadcast Channel
CCCH Common Control Channel
CCO Cell Change Order
CMAS Commercial Mobile Alert Service
CP Control Plane
C-RNTI Cell RNTI
CSG Closed Subscriber Group
DCCH Dedicated Control Channel
DRB (user) Data Radio Bearer
DRX Discontinuous Reception
DTCH Dedicated Traffic Channel
DL Downlink
DL-SCH Downlink Shared Channel
ETWS Earthquake and Tsunami Warning System
E-UTRA Evolved Universal Terrestrial Radio Access
E-UTRAN Evolved Universal Terrestrial Radio Access Network
ENB Evolved Node B
EPC Enhanced Packet Core
EPS Enhanced Packet System
FDD Frequency Division Duplex
FFS For Further Study
GERAN GSM/EDGE Radio Access Network
GSM Global System for Mobile Communications
HARQ Hybrid Automatic Repeat Request
HRPD CDMA2000 High Rate Packet Data
IE Information element
IMEI International Mobile Equipment Identity
IMSI International Mobile Subscriber Identity
kB Kilobyte (1000 bytes)
L1 Layer 1
L2 Layer 2
L3 Layer 3
MAC Medium Access Control
MBMS Multimedia Broadcast Multicast Service
MBSFN Multimedia Broadcast multicast service Single Frequency Network
MIB Master Information Block
MRB MBMS Point to Multipoint Radio Bearer
MSI MCH Scheduling Information
N/A Not Applicable
NACC Network Assisted Cell Change
NAS Non Access Stratum
PCCH Paging Control Channel
PDU Protocol Data Unit
PDCP Packet Data Convergence Protocol
PLMN Public Land Mobile Network
QoS Quality of Service
RACH Random Access CHannel
RAT Radio Access Technology
RB Radio Bearer
4 General

4.1 Introduction

This specification is organised as follows:

- sub-clause 4.2 describes the RRC protocol model;
- sub-clause 4.3 specifies the services provided to upper layers as well as the services expected from lower layers;
- sub-clause 4.4 lists the RRC functions;
- clause 5 specifies RRC procedures, including UE state transitions;
- clause 6 specifies the RRC message in a mixed format (i.e. tabular & ASN.1 together);
- clause 7 specifies the variables (including protocol timers and constants) and counters to be used by the UE;
- clause 8 specifies the encoding of the RRC messages;
- clause 9 specifies the specified and default radio configurations;
- clause 10 specifies the RRC messages transferred across network nodes;
- clause 11 specifies the UE capability related constraints and performance requirements.
4.2 Architecture

4.2.1 UE states and state transitions including inter RAT

A UE is in RRC_CONNECTED when an RRC connection has been established. If this is not the case, i.e. no RRC connection is established, the UE is in RRC_IDLE state. The RRC states can further be characterised as follows:

- **RRC_IDLE:**
  - A UE specific DRX may be configured by upper layers.
  - UE controlled mobility;
  - The UE:
    - Monitors a Paging channel to detect incoming calls, system information change, for ETWS capable UEs, ETWS notification, and for CMAS capable UEs, CMAS notification;
    - Performs neighbouring cell measurements and cell (re-)selection;
    - Acquires system information.

- **RRC_CONNECTED:**
  - Transfer of unicast data to/from UE.
  - At lower layers, the UE may be configured with a UE specific DRX.
  - Network controlled mobility, i.e. handover and cell change order with optional network assistance (NACC) to GERAN;
  - The UE:
    - Monitors a Paging channel and/ or System Information Block Type 1 contents to detect system information change, for ETWS capable UEs, ETWS notification, and for CMAS capable UEs, CMAS notification;
    - Monitors control channels associated with the shared data channel to determine if data is scheduled for it;
    - Provides channel quality and feedback information;
    - Performs neighbouring cell measurements and measurement reporting;
    - Acquires system information.

The following figure not only provides an overview of the RRC states in E-UTRA, but also illustrates the mobility support between E-UTRAN, UTRAN and GERAN.
Figure 4.2.1-1: E-UTRA states and inter RAT mobility procedures, 3GPP

The following figure illustrates the mobility support between E-UTRAN, CDMA2000 1xRTT and CDMA2000 HRPD. The details of the CDMA2000 state models are out of the scope of this specification.

Figure 4.2.1-2: Mobility procedures between E-UTRA and CDMA2000

The inter-RAT handover procedure(s) supports the case of signalling, conversational services, non-conversational services and combinations of these.

In addition to the state transitions shown in Figure 4.2.1-1 and Figure 4.2.1-2, there is support for connection release with redirection information from E-UTRA RRC_CONNECTED to GERAN, UTRAN and CDMA2000 (HRPD Idle/1xRTT Dormant mode).

4.2.2 Signalling radio bearers

"Signalling Radio Bearers" (SRBs) are defined as Radio Bearers (RB) that are used only for the transmission of RRC and NAS messages. More specifically, the following three SRBs are defined:
- SRB0 is for RRC messages using the CCCH logical channel;
- SRB1 is for RRC messages (which may include a piggybacked NAS message) as well as for NAS messages prior to the establishment of SRB2, all using DCCH logical channel;
- SRB2 is for NAS messages, using DCCH logical channel. SRB2 has a lower-priority than SRB1 and is always configured by E-UTRAN after security activation.

In downlink piggybacking of NAS messages is used only for one dependant (i.e. with joint success/failure) procedure: bearer establishment/modification/release. In uplink NAS message piggybacking is used only for transferring the initial NAS message during connection setup.

NOTE: The NAS messages transferred via SRB2 are also contained in RRC messages, which however do not include any RRC protocol control information.

Once security is activated, all RRC messages on SRB1 and SRB2, including those containing NAS or non-3GPP messages, are integrity protected and ciphered by PDCP. NAS independently applies integrity protection and ciphering to the NAS messages.

### 4.3 Services

#### 4.3.1 Services provided to upper layers

The RRC protocol offers the following services to upper layers:

- Broadcast of common control information;
- Notification of UEs in RRC_IDLE, e.g. about a terminating call, for ETWS, for CMAS;
- Transfer of dedicated control information, i.e. information for one specific UE.

#### 4.3.2 Services expected from lower layers

In brief, the following are the main services that RRC expects from lower layers:

- PDCP: integrity protection and ciphering;
- RLC: reliable and in-sequence transfer of information, without introducing duplicates and with support for segmentation and concatenation.

Further details about the services provided by Packet Data Convergence Protocol layer (e.g. integrity and ciphering) are provided in TS 36.323 [8]. The services provided by Radio Link Control layer (e.g. the RLC modes) are specified in TS 36.322 [7]. Further details about the services provided by Medium Access Control layer (e.g. the logical channels) are provided in TS 36.321 [6]. The services provided by physical layer (e.g. the transport channels) are specified in TS 36.302 [3].

### 4.4 Functions

The RRC protocol includes the following main functions:

- Broadcast of system information:
  - Including NAS common information;
  - Information applicable for UEs in RRC_IDLE, e.g. cell (re-)selection parameters, neighbouring cell information and information (also) applicable for UEs in RRC_CONNECTED, e.g. common channel configuration information.
  - Including ETWS notification, CMAS notification;
  - RRC connection control:
- Paging;
- Establishment/ modification/ release of RRC connection, including e.g. assignment/ modification of UE identity (C-RNTI), establishment/ modification/ release of SRB1 and SRB2, access class barring;
- Initial security activation, i.e. initial configuration of AS integrity protection (SRBs) and AS ciphering (SRBs, DRBs);
- RRC connection mobility including e.g. intra-frequency and inter-frequency handover, associated security handling, i.e. key/ algorithm change, specification of RRC context information transferred between network nodes;
- Establishment/ modification/ release of RBs carrying user data (DRBs);
- Radio configuration control including e.g. assignment/ modification of ARQ configuration, HARQ configuration, DRX configuration;
- QoS control including assignment/ modification of semi-persistent scheduling (SPS) configuration information for DL and UL, assignment/ modification of parameters for UL rate control in the UE, i.e. allocation of a priority and a prioritised bit rate (PBR) for each RB;
- Recovery from radio link failure;
- Inter-RAT mobility including e.g. security activation, transfer of RRC context information;
- Measurement configuration and reporting:
  - Establishment/ modification/ release of measurements (e.g. intra-frequency, inter-frequency and inter-RAT measurements);
  - Setup and release of measurement gaps;
  - Measurement reporting;
- Other functions including e.g. transfer of dedicated NAS information and non-3GPP dedicated information, transfer of UE radio access capability information, support for E-UTRAN sharing (multiple PLMN identities);
- Generic protocol error handling;
- Support of self-configuration and self-optimisation;

NOTE: Random access is specified entirely in the MAC including initial transmission power estimation.

5 Procedures

5.1 General

5.1.1 Introduction

The procedural requirements are structured according to the main functional areas: system information (5.2), connection control (5.3), inter-RAT mobility (5.4) and measurements (5.5). In addition there is a sub-clause other (5.6) that covers e.g. NAS dedicated information transfer, UE capability transfer. Finally, sub-clause 5.7 specifies the generic error handling.

5.1.2 General requirements

The UE shall:

1> process the received messages in order of reception by RRC, i.e. the processing of a message shall be completed before starting the processing of a subsequent message;
NOTE 1: E-UTRAN may initiate a subsequent procedure prior to receiving the UE's response of a previously initiated procedure.

1> within a sub-clause execute the steps according to the order specified in the procedural description;
1> consider the term 'radio bearer' (RB) to cover SRBs and DRBs but not MRBs unless explicitly stated otherwise;
1> set the `rrc-TransactionIdentifier` in the response message, if included, to the same value as included in the message received from E-UTRAN that triggered the response message;
1> upon receiving a choice value set to 'setup':
2> apply the corresponding received configuration and start using the associated resources, unless explicitly specified otherwise;
1> upon receiving a choice value set to 'release':
2> clear the corresponding configuration and stop using the associated resources;
1> upon handover to E-UTRA; or
1> upon receiving an `RRCConnectionReconfiguration` message including the `fullConfig`:
2> apply the Conditions in the ASN.1 for inclusion of the fields for the DRB/PDCP/RLC setup during the reconfiguration of the DRBs included in the `drb-ToAddModList`;

NOTE 2: At each point in time, the UE keeps a single value for each field except for during handover when the UE temporarily stores the previous configuration so it can revert back upon handover failure. In other words: when the UE reconfigures a field, the existing value is released except for during handover.

NOTE 3: Although not explicitly stated, the UE initially considers all functionality to be deactivated/released until it is explicitly stated that the functionality is setup/activated. Correspondingly, the UE initially considers lists to be empty e.g. the list of radio bearers, the list of measurements.

5.2 System information

5.2.1 Introduction

5.2.1.1 General

System information is divided into the `MasterInformationBlock` (MIB) and a number of `SystemInformationBlocks` (SIBs). The MIB includes a limited number of most essential and most frequently transmitted parameters that are needed to acquire other information from the cell, and is transmitted on BCH. SIBs other than `SystemInformationBlockType1` are carried in `SystemInformation` (SI) messages and mapping of SIBs to SI messages is flexibly configurable by `schedulingInfoList` included in `SystemInformationBlockType1`, with restrictions that: each SIB is contained only in a single SI message, only SIBs having the same scheduling requirement (periodicity) can be mapped to the same SI message, and `SystemInformationBlockType2` is always mapped to the SI message that corresponds to the first entry in the list of SI messages in `schedulingInfoList`. There may be multiple SI messages transmitted with the same periodicity. `SystemInformationBlockType1` and all SI messages are transmitted on DL-SCH.

5.2.1.2 Scheduling

The MIB uses a fixed schedule with a periodicity of 40 ms and repetitions made within 40 ms. The first transmission of the MIB is scheduled in subframe #0 of radio frames for which the SFN mod 4 = 0, and repetitions are scheduled in subframe #0 of all other radio frames.

The `SystemInformationBlockType1` uses a fixed schedule with a periodicity of 80 ms and repetitions made within 80 ms. The first transmission of `SystemInformationBlockType1` is scheduled in subframe #5 of radio frames for which the SFN mod 8 = 0, and repetitions are scheduled in subframe #5 of all other radio frames for which SFN mod 2 = 0.

The SI messages are transmitted within periodically occurring time domain windows (referred to as SI-windows) using dynamic scheduling. Each SI message is associated with a SI-window and the SI-windows of different SI messages do
not overlap. That is, within one SI-window only the corresponding SI is transmitted. The length of the SI-window is common for all SI messages, and is configurable. Within the SI-window, the corresponding SI message can be transmitted a number of times in any subframe other than MBSFN subframes, uplink subframes in TDD, and subframe #5 of radio frames for which SFN mod 2 = 0. The UE acquires the detailed time-domain scheduling (and other information, e.g. frequency-domain scheduling, used transport format) from decoding SI-RNTI on PDCCH (see TS 36.321 [6]).

A single SI-RNTI is used to address SystemInformationBlockType1 as well as all SI messages. SystemInformationBlockType1 configures the SI-window length and the transmission periodicity for the SI messages.

5.2.1.3 System information validity and notification of changes

Change of system information (other than for ETWS and CMAS) only occurs at specific radio frames, i.e. the concept of a modification period is used. System information may be transmitted a number of times with the same content within a modification period, as defined by its scheduling. The modification period boundaries are defined by SFN values for which SFN mod \( m \) = 0, where \( m \) is the number of radio frames comprising the modification period. The modification period is configured by system information.

When the network changes (some of the) system information, it first notifies the UEs about this change, i.e. this may be done throughout a modification period. In the next modification period, the network transmits the updated system information. These general principles are illustrated in figure 5.2.1.3-1, in which different colours indicate different system information. Upon receiving a change notification, the UE acquires the new system information immediately from the start of the next modification period. The UE applies the previously acquired system information until the UE acquires the new system information.

![Figure 5.2.1.3-1: Change of system Information](image)

The Paging message is used to inform UEs in RRC_IDLE and UEs in RRC_CONNECTED about a system information change. If the UE receives a Paging message including the systemInfoModification, it knows that the system information will change at the next modification period boundary. Although the UE may be informed about changes in system information, no further details are provided e.g. regarding which system information will change.

SystemInformationBlockType1 includes a value tag, systemInfoValueTag, that indicates if a change has occurred in the SI messages. UEs may use systemInfoValueTag, e.g. upon return from out of coverage, to verify if the previously stored SI messages are still valid. Additionally, the UE considers stored system information to be invalid after 3 hours from the moment it was successfully confirmed as valid, unless specified otherwise.

E-UTRAN may not update systemInfoValueTag upon change of some system information e.g. ETWS information, CMAS information, regularly changing parameters like CDMA2000 system time (see 6.3). Similarly, E-UTRAN may not include the systemInfoModification within the Paging message upon change of some system information.

The UE verifies that stored system information remains valid by either checking systemInfoValueTag in SystemInformationBlockType1 after the modification period boundary, or attempting to find the systemInfoModification indication at least modificationPeriodCoeff times during the modification period in case no paging is received, in every modification period. If no paging message is received by the UE during a modification period, the UE may assume that no change of system information will occur at the next modification period boundary. If UE in RRC_CONNECTED, during a modification period, receives one paging message, it may deduce from the presence/absence of systemInfoModification whether a change of system information other than ETWS and CMAS information will occur in the next modification period or not.

ETWS and/or CMAS capable UEs in RRC_CONNECTED shall attempt to read paging at least once every defaultPagingCycle to check whether ETWS and/or CMAS notification is present or not.
5.2.1.4 Indication of ETWS notification

ETWS primary notification and/or ETWS secondary notification can occur at any point in time. The Paging message is used to inform ETWS capable UEs in RRC_IDLE and UEs in RRC_CONNECTED about presence of an ETWS primary notification and/or ETWS secondary notification. If the UE receives a Paging message including the etws-Indication, it shall start receiving the ETWS primary notification and/or ETWS secondary notification according to schedulingInfoList contained in SystemInformationBlockType1.

ETWS primary notification is contained in SystemInformationBlockType10 and ETWS secondary notification is contained in SystemInformationBlockType11. Segmentation can be applied for the delivery of a secondary notification. The segmentation is fixed for transmission of a given secondary notification within a cell (i.e. the same segment size for a given segment with the same messageIdentifier, serialNumber and warningMessageSegmentNumber). An ETWS secondary notification corresponds to a single CB data IE as defined according to TS 23.041 [37].

5.2.1.5 Indication of CMAS notification

CMAS notification can occur at any point in time. The Paging message is used to inform CMAS capable UEs in RRC_IDLE and UEs in RRC_CONNECTED about presence of one or more CMAS notifications. If the UE receives a Paging message including the cmas-Indication, it shall start receiving the CMAS notifications according to schedulingInfoList contained in SystemInformationBlockType1.

CMAS notification is contained in SystemInformationBlockType12. Segmentation can be applied for the delivery of a CMAS notification. The segmentation is fixed for transmission of a given CMAS notification within a cell (i.e. the same segment size for a given segment with the same messageIdentifier, serialNumber and warningMessageSegmentNumber). E-UTRAN does not interleave transmissions of CMAS notifications, i.e. all segments of a given CMAS notification transmission are transmitted prior to those of another CMAS notification. A CMAS notification corresponds to a single CB data IE as defined according to TS 23.041 [37].

5.2.2 System information acquisition

5.2.2.1 General

The UE applies the system information acquisition procedure to acquire the AS- and NAS- system information that is broadcasted by the E-UTRAN. The procedure applies to UEs in RRC_IDLE and UEs in RRC_CONNECTED.
5.2.2.2  Initiation

The UE shall apply the system information acquisition procedure upon selecting (e.g. upon power on) and upon re-selecting a cell, after handover completion, after entering E-UTRA from another RAT, upon return from out of coverage, upon receiving a notification that the system information has changed, upon receiving an indication about the presence of an ETWS notification, upon receiving an indication about the presence of a CMAS notification, upon receiving a request from CDMA2000 upper layers and upon exceeding the maximum validity duration. Unless explicitly stated otherwise in the procedural specification, the system information acquisition procedure overwrites any stored system information, i.e. delta configuration is not applicable for system information and the UE discontinues using a field if it is absent in system information unless explicitly specified otherwise.

5.2.2.3  System information required by the UE

The UE shall:

1> ensure having a valid version, as defined below, of (at least) the following system information, also referred to as the 'required' system information:

2> if in RRC_IDLE:

3> the MasterInformationBlock and SystemInformationBlockType1 as well as SystemInformationBlockType2 through SystemInformationBlockType8, depending on support of the concerned RATs;

2> if in RRC_CONNECTED:

3> the MasterInformationBlock, SystemInformationBlockType1 and SystemInformationBlockType2 as well as SystemInformationBlockType8, depending on support of CDMA2000;

1> delete any stored system information after 3 hours from the moment it was confirmed to be valid as defined in 5.2.1.3, unless specified otherwise;

1> consider any stored system information except SystemInformationBlockType10, SystemInformationBlockType11 and SystemInformationBlockType12 to be invalid if systemInfoValueTag included in the SystemInformationBlockType1 is different from the one of the stored system information;

5.2.2.4  System information acquisition by the UE

The UE shall:

1> apply the specified BCCH configuration defined in 9.1.1.1;

1> if the procedure is triggered by a system information change notification:

2> start acquiring the required system information, as defined in 5.2.2.3, from the beginning of the modification period following the one in which the change notification was received;

NOTE 1: The UE continues using the previously received system information until the new system information has been acquired.

1> if the UE is in RRC_IDLE and enters a cell for which the UE does not have stored a valid version of the system information required in RRC_IDLE, as defined in 5.2.2.3:

2> acquire, using the system information acquisition procedure as defined in 5.2.3, the system information required in RRC_IDLE, as defined in 5.2.2.3;

1> following successful handover completion to a cell for which the UE does not have stored a valid version of the system information required in RRC_CONNECTED, as defined in 5.2.2.3:

2> acquire, using the system information acquisition procedure as defined in 5.2.3, the system information required in RRC_CONNECTED, as defined in 5.2.2.3;

2> upon acquiring the concerned system information:

3> discard the corresponding radio resource configuration information included in the radioResourceConfigCommon previously received in a dedicated message, if any;
1> following a request from CDMA2000 upper layers:

2> acquire \textit{SystemInformationBlockType8}, as defined in 5.2.3;

1> neither initiate the RRC connection establishment procedure nor initiate transmission of the \textit{RRCConnectionReestablishmentRequest} message until the UE has a valid version of the \textit{MasterInformationBlock} and \textit{SystemInformationBlockType1} messages as well as \textit{SystemInformationBlockType2} ;

1> if the UE is ETWS capable:

2> upon entering a cell during RRC\_IDLE, following successful handover or upon connection re-establishment:

3> discard any previously buffered \textit{warningMessageSegment};

3> clear, if any, the current values of \textit{messageIdentifier} and \textit{serialNumber} for \textit{SystemInformationBlockType11};

2> when the UE acquires \textit{SystemInformationBlockType1} following ETWS indication, upon entering a cell during RRC\_IDLE, following successful handover or upon connection re-establishment:

3> if \textit{schedulingInfoList} indicates that \textit{SystemInformationBlockType10} is present:

4> start acquiring \textit{SystemInformationBlockType10} immediately;

3> if \textit{schedulingInfoList} indicates that \textit{SystemInformationBlockType11} is present:

4> start acquiring \textit{SystemInformationBlockType11} immediately;

\textbf{NOTE 2}: UEs shall start acquiring \textit{SystemInformationBlockType10} and \textit{SystemInformationBlockType11} as described above even when \textit{systemInfoValueTag} in \textit{SystemInformationBlockType1} has not changed.

1> if the UE is CMAS capable:

2> upon entering a cell during RRC\_IDLE, following successful handover or upon connection re-establishment:

3> discard any previously buffered \textit{warningMessageSegment};

3> clear, if any, stored values of \textit{messageIdentifier} and \textit{serialNumber} for \textit{SystemInformationBlockType12} associated with the discarded \textit{warningMessageSegment} ;

2> when the UE acquires \textit{SystemInformationBlockType1} following CMAS indication, upon entering a cell during RRC\_IDLE, following successful handover and upon connection re-establishment:

3> if \textit{schedulingInfoList} indicates that \textit{SystemInformationBlockType12} is present:

4> acquire \textit{SystemInformationBlockType12};

\textbf{NOTE 3}: UEs shall start acquiring \textit{SystemInformationBlockType12} as described above even when \textit{systemInfoValueTag} in \textit{SystemInformationBlockType1} has not changed.

1> if the UE is interested to receive MBMS services; and

1> if \textit{schedulingInfoList} indicates that \textit{SystemInformationBlockType13} is present and the UE does not have stored a valid version of this system information block:

2> acquire \textit{SystemInformationBlockType13};

The UE may apply the received SIBs immediately, i.e. the UE does not need to delay using a SIB until all SI messages have been received. The UE may delay applying the received SIBs until completing lower layer procedures associated with a received or a UE originated RRC message, e.g. an ongoing random access procedure.

\textbf{NOTE 4}: While attempting to acquire a particular SIB, if the UE detects from \textit{schedulingInfoList} that it is no longer present, the UE should stop trying to acquire the particular SIB.

\textbf{5.2.2.5 Essential system information missing}

The UE shall
1> if in RRC_IDLE or in RRC_CONNECTED while T311 is running:
   2> if the UE is unable to acquire the MasterInformationBlock or the SystemInformationBlockType1:
      3> consider the cell as barred in accordance with TS 36.304 [4] and;
      3> perform barring as if intraFREQReselection is set to 'allowed', and as if the csg-Indication is set to 'FALSE';
   2> else if the UE is unable to acquire the SystemInformationBlockType2:
      3> treat the cell as barred in accordance with TS 36.304 [4];

5.2.2.6 Actions upon reception of the MasterInformationBlock message

Upon receiving the MasterInformationBlock message the UE shall:
   1> apply the radio resource configuration included in the phich-Config;
   1> if the UE is in RRC_IDLE or if the UE is in RRC_CONNECTED while T311 is running:
      2> if the UE has no valid system information stored according to 5.2.2.3 for the concerned cell:
         3> apply the received value of dl-Bandwidth to the ul-Bandwidth until SystemInformationBlockType2 is received;

5.2.2.7 Actions upon reception of the SystemInformationBlockType1 message

Upon receiving the SystemInformationBlockType1 message the UE shall:
   1> if the frequency band indicated in the freqBandIndicator is not part of the frequency bands supported by the UE:
      2> consider the cell as barred in accordance with TS 36.304 [4] and;
      2> perform barring as if intraFreqReselection is set to 'notAllowed', and as if the csg-Indication is set to 'FALSE';
   1> else:
      2> forward the cellIdentity to upper layers;
      2> forward the trackingAreaCode to upper layers;

5.2.2.8 Actions upon reception of SystemInformation messages

No UE requirements related to the contents of the SystemInformation messages apply other than those specified elsewhere e.g. within procedures using the concerned system information, and/ or within the corresponding field descriptions.

5.2.2.9 Actions upon reception of SystemInformationBlockType2

Upon receiving SystemInformationBlockType2, the UE shall:
   1> if upper layers indicate that a (UE specific) paging cycle is configured:
      2> Apply the shortest of the (UE specific) paging cycle and the defaultPagingCycle included in the radioResourceConfigCommon;
   1> else:
      2> Apply the defaultPagingCycle included in the radioResourceConfigCommon;
   1> if the mbsfn-SubframeConfigList is included:
2> consider that no other DL assignments occur in the MBSFN subframes indicated in the mbsfn-SubframeConfigList:

1> apply the configuration included in the radioResourceConfigCommon;

1> apply the specified PCCH configuration defined in 9.1.1.3;

1> not apply the timeAlignmentTimerCommon;

1> if in RRC_CONNECTED and UE has previously received rlf-TimersAndConstants:

2> The UE shall not update its values of the timers and constants in UE-TimersAndConstants except for the value of timer T300.

5.2.2.10 Actions upon reception of SystemInformationBlockType3

No UE requirements related to the contents of this SystemInformationBlock apply other than those specified elsewhere e.g. within procedures using the concerned system information, and/or within the corresponding field descriptions.

5.2.2.11 Actions upon reception of SystemInformationBlockType4

No UE requirements related to the contents of this SystemInformationBlock apply other than those specified elsewhere e.g. within procedures using the concerned system information, and/or within the corresponding field descriptions.

5.2.2.12 Actions upon reception of SystemInformationBlockType5

No UE requirements related to the contents of this SystemInformationBlock apply other than those specified elsewhere e.g. within procedures using the concerned system information, and/or within the corresponding field descriptions.

5.2.2.13 Actions upon reception of SystemInformationBlockType6

No UE requirements related to the contents of this SystemInformationBlock apply other than those specified elsewhere e.g. within procedures using the concerned system information, and/or within the corresponding field descriptions.

5.2.2.14 Actions upon reception of SystemInformationBlockType7

No UE requirements related to the contents of this SystemInformationBlock apply other than those specified elsewhere e.g. within procedures using the concerned system information, and/or within the corresponding field descriptions.

5.2.2.15 Actions upon reception of SystemInformationBlockType8

Upon receiving SystemInformationBlockType8, the UE shall:

1> if the systemTimeInfo is included:

2> forward the systemTimeInfo to CDMA2000 upper layers;

1> if the UE is in RRC_IDLE and if searchWindowSize is included:

2> forward the searchWindowSize to CDMA2000 upper layers;

1> if parametersHRPD is included:

2> forward the preRegistrationInfoHRPD to CDMA2000 upper layers only if the UE has not received the preRegistrationInfoHRPD within an RRCConnectionReconfiguration message after entering this cell;

2> if the cellReselectionParametersHRPD is included:

3> forward the neighCellList to the CDMA2000 upper layers;

1> if the parameters1XRTT is included:

2> if the csfb-RegistrationParam1XRTT is included:
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5.2.2.16 Actions upon reception of SystemInformationBlockType9

Upon receiving SystemInformationBlockType9, the UE shall:

1> if hnb-Name is included, forward the hnb-Name to upper layers;

5.2.2.17 Actions upon reception of SystemInformationBlockType10

Upon receiving SystemInformationBlockType10, the UE shall:

1> forward the received warningType, warningSecurityInfo (if present), messageIdentifier and serialNumber to upper layers;

5.2.2.18 Actions upon reception of SystemInformationBlockType11

Upon receiving SystemInformationBlockType11, the UE shall:

1> if there is no current value for messageIdentifier and serialNumber for SystemInformationBlockType11; or

1> if either the received value of messageIdentifier or of serialNumber or of both are different from the current values of messageIdentifier and serialNumber for SystemInformationBlockType11:

2> use the received values of messageIdentifier and serialNumber for SystemInformationBlockType11 as the current values of messageIdentifier and serialNumber for SystemInformationBlockType11;

2> discard any previously buffered warningMessageSegment;

2> if all segments of a warning message have been received:

3> assemble the warning message from the received warningMessageSegment;

3> forward the received warning message, messageIdentifier, serialNumber and dataCodingScheme to upper layers;

3> stop reception of SystemInformationBlockType11;

3> discard the current values of messageIdentifier and serialNumber for SystemInformationBlockType11;

2> else:

3> store the received warningMessageSegment;
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3.2.2.19 Actions upon reception of SystemInformationBlockType11

Upon receiving SystemInformationBlockType11, the UE shall:

1> if the SystemInformationBlockType11 contains a complete warning message:

2> forward the received warning message, messageIdentifier, serialNumber and dataCodingScheme to upper layers;

2> continue reception of SystemInformationBlockType11;

1> else:

2> store the received warningMessageSegment;

2> continue reception of SystemInformationBlockType11;

The UE should discard any stored warningMessageSegment and the current value of messageIdentifier and serialNumber for SystemInformationBlockType11 if the complete warning message has not been assembled within a period of 3 hours.

5.2.2.19 Actions upon reception of SystemInformationBlockType12

Upon receiving SystemInformationBlockType12, the UE shall:

1> if the SystemInformationBlockType12 contains a complete warning message:

2> forward the received warning message, messageIdentifier, serialNumber and dataCodingScheme to upper layers;

2> continue reception of SystemInformationBlockType12;

1> else:

2> if the received values of messageIdentifier and serialNumber are the same (each value is the same) as a pair for which a warning message is currently being assembled:

3> store the received warningMessageSegment;

3> if all segments of a warning message have been received:

4> assemble the warning message from the received warningMessageSegment;

4> forward the received warning message, messageIdentifier, serialNumber and dataCodingScheme to upper layers;

4> stop assembling a warning message for this messageIdentifier and serialNumber and delete all stored information held for it;

3> continue reception of SystemInformationBlockType12;

2> else if the received values of messageIdentifier and/or serialNumber are not the same as any of the pairs for which a warning message is currently being assembled:

3> start assembling a warning message for this messageIdentifier and serialNumber pair;

3> store the received warningMessageSegment;

3> continue reception of SystemInformationBlockType12;

The UE should discard warningMessageSegment and the associated values of messageIdentifier and serialNumber for SystemInformationBlockType12 if the complete warning message has not been assembled within a period of 3 hours.

NOTE: The number of warning messages that a UE can re-assemble simultaneously is a function of UE implementation.
5.2.2.20 Actions upon reception of SystemInformationBlockType13

No UE requirements related to the contents of this SystemInformationBlock apply other than those specified elsewhere e.g. within procedures using the concerned system information, and/ or within the corresponding field descriptions.

5.2.3 Acquisition of an SI message

When acquiring an SI message, the UE shall:

1. determine the start of the SI-window for the concerned SI message as follows:
   2. for the concerned SI message, determine the number \( n \) which corresponds to the order of entry in the list of SI messages configured by schedulingInfoList in SystemInformationBlockType1;
   2. determine the integer value \( x = (n - 1) \times w \), where \( w \) is the si-WindowLength;
   2. the SI-window starts at the subframe \( a \), where \( a = x \mod 10 \), in the radio frame for which SFN mod \( T = \text{FLOOR}(x/10) \), where \( T \) is the si-Periodicity of the concerned SI message;

NOTE: E-UTRAN should configure an SI-window of 1 ms only if all SIs are scheduled before subframe #5 in radio frames for which SFN mod 2 = 0.

1. receive DL-SCH using the SI-RNTI from the start of the SI-window and continue until the end of the SI-window whose absolute length in time is given by si-WindowLength, or until the SI message was received, excluding the following subframes:
   2. subframe #5 in radio frames for which SFN mod 2 = 0;
   2. any MBSFN subframes;
   2. any uplink subframes in TDD;

1. if the SI message was not received by the end of the SI-window, repeat reception at the next SI-window occasion for the concerned SI message;

5.3 Connection control

5.3.1 Introduction

5.3.1.1 RRC connection control

RRC connection establishment involves the establishment of SRB1. E-UTRAN completes RRC connection establishment prior to completing the establishment of the S1 connection, i.e. prior to receiving the UE context information from the EPC. Consequently, AS security is not activated during the initial phase of the RRC connection. During this initial phase of the RRC connection, the E-UTRAN may configure the UE to perform measurement reporting. However, the UE only accepts a handover message when security has been activated.

Upon receiving the UE context from the EPC, E-UTRAN activates security (both ciphering and integrity protection) using the initial security activation procedure. The RRC messages to activate security (command and successful response) are integrity protected, while ciphering is started only after completion of the procedure. That is, the response to the message used to activate security is not ciphered, while the subsequent messages (e.g. used to establish SRB2 and DRBs) are both integrity protected and ciphered.

After having initiated the initial security activation procedure, E-UTRAN initiates the establishment of SRB2 and DRBs, i.e. E-UTRAN may do this prior to receiving the confirmation of the initial security activation from the UE. In any case, E-UTRAN will apply both ciphering and integrity protection for the RRC connection reconfiguration messages used to establish SRB2 and DRBs. E-UTRAN should release the RRC connection if the initial security activation and/ or the radio bearer establishment fails (i.e. security activation and DRB establishment are triggered by a joint S1-procedure, which does not support partial success).

For SRB2 and DRBs, security is always activated from the start, i.e. the E-UTRAN does not establish these bearers prior to activating security.
The release of the RRC connection is initiated by E-UTRAN. The procedure may be used to re-direct the UE to an E-UTRA frequency or an inter-RAT carrier frequency. In exceptional cases the UE may abort the RRC connection, i.e. move to RRC_IDLE without notifying E-UTRAN.

5.3.1.2 Security

AS security comprises of the integrity protection of RRC signalling (SRBs) as well as the ciphering of RRC signalling (SRBs) and user data (DRBs).

RRC handles the configuration of the security parameters which are part of the AS configuration: the integrity protection algorithm, the ciphering algorithm and two parameters, namely the keyChangeIndicator and the nextHopChainingCount, which are used by the UE to determine the AS security keys upon handover and/or connection re-establishment.

The integrity protection algorithm is common for signalling radio bearers SRB1 and SRB2. The ciphering algorithm is common for all radio bearers (i.e. SRB1, SRB2 and DRBs). Neither integrity protection nor ciphering applies for SRB0.

RRC integrity and ciphering are always activated together, i.e. in one message/procedure. RRC integrity and ciphering are never de-activated. However, it is possible to switch to a 'NULL' ciphering algorithm (eea0).

The 'NULL' integrity protection algorithm (eia0) is used only for the UE in limited service mode [32, TS33.401]. In case the 'NULL' integrity protection algorithm is used, 'NULL' ciphering algorithm is also used.

NOTE 1: Lower layers discard RRC messages for which the integrity check has failed and indicate the integrity verification check failure to RRC.

The AS applies three different security keys: one for the integrity protection of RRC signalling (K_{RRCint}), one for the ciphering of RRC signalling (K_{RRCenc}) and one for the ciphering of user data (K_{UPenc}). All three AS keys are derived from the K_{eNB} key. The K_{eNB} is based on the K_{ASME} key, which is handled by upper layers.

Upon connection establishment new AS keys are derived. No AS-parameters are exchanged to serve as inputs for the derivation of the new AS keys at connection establishment.

The integrity and ciphering of the RRC message used to perform handover is based on the security configuration used prior to the handover and is performed by the source eNB.

The integrity and ciphering algorithms can only be changed upon handover. The four AS keys (K_{eNB}, K_{RRCint}, K_{RRCenc} and K_{UPenc}) change upon every handover and connection re-establishment. The keyChangeIndicator is used upon handover and indicates whether the UE should use the keys associated with the latest available K_{ASME} key. The nextHopChainingCount parameter is used upon handover and connection re-establishment by the UE when deriving the new K_{eNB} that is used to generate K_{RRCint}, K_{RRCenc} and K_{UPenc} (see TS 33.401 [32]). An intra cell handover procedure may be used to change the keys in RRC_CONNECTED.

For each radio bearer an independent counter (COUNT, as specified in TS 36.323 [8]) is maintained for each direction. For each DRB, the COUNT is used as input for ciphering. For each SRB, the COUNT is used as input for both ciphering and integrity protection. It is not allowed to use the same COUNT value more than once for a given security key. In order to limit the signalling overhead, individual messages/packets include a short sequence number (PDCP SN, as specified in TS 36.323 [8]). In addition, an overflow counter mechanism is used: the hyper frame number (TX_HFN and RX_HFN, as specified in TS 36.323 [8]). The HFN needs to be synchronized between the UE and the eNB. The eNB is responsible for avoiding reuse of the COUNT with the same RB identity and with the same K_{eNB}, e.g. due to the transfer of large volumes of data, release and establishment of new RBs. In order to avoid such re-use, the eNB may e.g. use different RB identities for successive RB establishments, trigger an intra cell handover or an RRC_CONNECTED to RRC_IDLE to RRC_CONNECTED transition.

For each SRB, the value provided by RRC to lower layers to derive the 5-bit BEARER parameter used as input for ciphering and for integrity protection is the value of the corresponding srb-Identity with the MSBs padded with zeroes.

5.3.1.3 Connected mode mobility

In RRC_CONNECTED, the network controls UE mobility, i.e. the network decides when the UE shall move to which cell (which may be on another frequency or RAT). For network controlled mobility in RRC_CONNECTED, handover is the only procedure that is defined. The network triggers the handover procedure e.g. based on radio conditions, load.

To facilitate this, the network may configure the UE to perform measurement reporting (possibly including the
configuration of measurement gaps). The network may also initiate handover blindly, i.e. without having received measurement reports from the UE.

Before sending the handover message to the UE, the source eNB prepares one or more target cells. The target eNB generates the message used to perform the handover, i.e. the message including the AS-configuration to be used in the target cell. The source eNB transparently (i.e. does not alter values/ content) forwards the handover message/ information received from the target to the UE. When appropriate, the source eNB may initiate data forwarding for (a subset of) the DRBs.

After receiving the handover message, the UE attempts to access the target cell at the first available RACH occasion according to Random Access resource selection defined in TS 36.321 [6], i.e. the handover is asynchronous. Consequently, when allocating a dedicated preamble for the random access in the target cell, E-UTRA shall ensure it is available from the first RACH occasion the UE may use. Upon successful completion of the handover, the UE sends a message used to confirm the handover.

If the target eNB does not support the release of RRC protocol which the source eNB used to configure the UE, the target eNB may be unable to comprehend the UE configuration provided by the source eNB. In this case, the target eNB should use the full configuration option to reconfigure the UE for Handover and Re-establishment. Full configuration option includes an initialization of the radio configuration, which makes the procedure independent of the configuration used in the source cell with the exception that the security algorithms are continued for the RRC re-establishment.

After the successful completion of handover, PDCP SDUs may be re-transmitted in the target cell. This only applies for DRBs using RLC-AM mode and for handovers not involving full configuration option. The further details are specified in TS 36.323 [8]. After the successful completion of handover not involving full configuration option, the SN and the HFN are reset except for the DRBs using RLC-AM mode (for which both SN and HFN continue). For reconfigurations involving the full configuration option, the PDCP entities are newly established (SN and HFN do not continue) for all DRBs irrespective of the RLC mode. The further details are specified in TS 36.323 [8].

One UE behaviour to be performed upon handover is specified, i.e. this is regardless of the handover procedures used within the network (e.g. whether the handover includes X2 or S1 signalling procedures).

The source eNB should, for some time, maintain a context to enable the UE to return in case of handover failure. After having detected handover failure, the UE attempts to resume the RRC connection either in the source or in another cell using the RRC re-establishment procedure. This connection resumption succeeds only if the accessed cell is prepared, i.e. concerns a cell of the source eNB or of another eNB towards which handover preparation has been performed.

Normal measurement and mobility procedures are used to support handover to cells broadcasting a CSG identity. In addition, E-UTRAN may configure the UE to report that it is entering or leaving the proximity of cell(s) included in its CSG whitelist. Furthermore, E-UTRAN may request the UE to provide additional information broadcast by the handover candidate cell e.g. cell global identity, CSG identity, CSG membership status.

NOTE E-UTRAN may use the ‘proximity report’ to configure measurements as well as to decide whether or not to request additional information broadcast by the handover candidate cell. The additional information is used to verify whether or not the UE is authorised to access the target cell and may also be needed to identify handover candidate cell (PCI confusion i.e. when the physical layer identity that is included in the measurement report does not uniquely identify the cell).

5.3.2 Paging

5.3.2.1 General

![Figure 5.3.2.1-1: Paging](image)
The purpose of this procedure is:

- to transmit paging information to a UE in RRC_IDLE and/ or;
- to inform UEs in RRC_IDLE and UEs in RRC_CONNECTED about a system information change and/ or;
- to inform about an ETWS primary notification and/ or ETWS secondary notification and/ or;
- to inform about a CMAS notification.

The paging information is provided to upper layers, which in response may initiate RRC connection establishment, e.g. to receive an incoming call.

5.3.2.2 Initiation

E-UTRAN initiates the paging procedure by transmitting the Paging message at the UE’s paging occasion as specified in TS 36.304 [4]. E-UTRAN may address multiple UEs within a Paging message by including one PagingRecord for each UE. E-UTRAN may also indicate a change of system information, and/ or provide an ETWS notification or a CMAS notification in the Paging message.

5.3.2.3 Reception of the Paging message by the UE

Upon receiving the Paging message, the UE shall:

1> if in RRC_IDLE, for each of the PagingRecord, if any, included in the Paging message:
   2> if the ue-Identity included in the PagingRecord matches one of the UE identities allocated by upper layers:
      3> forward the ue-Identity and the cn-Domain to the upper layers;
1> if the systemInfoModification is included:
   2> re-acquire the required system information using the system information acquisition procedure as specified in 5.2.2.
1> if the etws-Indication is included and the UE is ETWS capable:
   2> re-acquire SystemInformationBlockType1 immediately, i.e., without waiting until the next system information modification period boundary;
   2> if the schedulingInfoList indicates that SystemInformationBlockType10 is present:
      3> acquire SystemInformationBlockType10;
   2> if the schedulingInfoList indicates that SystemInformationBlockType11 is present:
      3> acquire SystemInformationBlockType11;
1> if the cmas-Indication is included and the UE is CMAS capable:
   2> re-acquire SystemInformationBlockType1 immediately, i.e., without waiting until the next system information modification period boundary as specified in 5.2.1.5;
   2> if the schedulingInfoList indicates that SystemInformationBlockType12 is present:
      3> acquire SystemInformationBlockType12;
5.3.3 RRC connection establishment

5.3.3.1 General

The purpose of this procedure is to establish an RRC connection. RRC connection establishment involves SRB1 establishment. The procedure is also used to transfer the initial NAS dedicated information/message from the UE to E-UTRAN.

E-UTRAN applies the procedure as follows:
- to establish SRB1 only.

5.3.3.2 Initiation

The UE initiates the procedure when upper layers request establishment of an RRC connection while the UE is in RRC_IDLE.

Upon initiation of the procedure, the UE shall:

1> if the UE is establishing the RRC connection for mobile terminating calls:
   2> if timer T302 is running:
      3> consider access to the cell as barred;
   2> else:
      3> consider access to the cell as not barred;
1> else if the UE is establishing the RRC connection for emergency calls:
   2> if SystemInformationBlockType2 includes the ac-BarringInfo:
if the ac-BarringForEmergency is set to FALSE:

consider access to the cell as not barred;

else if the UE has one or more Access Classes, as stored on the USIM, with a value in the range 11..15, which is valid for the UE to use according to TS 22.011 [10] and TS 23.122 [11]:

NOTE 1: ACs 12, 13, 14 are only valid for use in the home country and ACs 11, 15 are only valid for use in the HPLMN/ EHPLMN.

if the ac-BarringInfo includes ac-BarringForMO-Data, and for all of the valid Access Classes for the UE, the corresponding bit in the ac-BarringForSpecialAC contained in ac-BarringForMO-Data is set to one:

consider access to the cell as barred;

else:

consider access to the cell as not barred;

else:

consider access to the cell as barred;

else if the UE is establishing the RRC connection for mobile originating calls:

if timer T302 or T303 is running:

consider access to the cell as barred;

else if SystemInformationBlockType2 includes the ac-BarringInfo and the ac-BarringForMO-Data is present:

if the UE has one or more Access Classes, as stored on the USIM, with a value in the range 11..15, which is valid for the UE to use according to TS 22.011 [10] and TS 23.122 [11], and

for at least one of these Access Classes the corresponding bit in the ac-BarringForSpecialAC contained in ac-BarringForMO-Data is set to zero:

consider access to the cell as not barred;

else:

draw a random number ‘rand’ uniformly distributed in the range: $0 \leq \text{rand} < 1$;

if ‘rand’ is lower than the value indicated by ac-BarringFactor included in ac-BarringForMO-Data:

consider access to the cell as not barred;

else:

consider access to the cell as barred;

else:

consider access to the cell as not barred;

else if SystemInformationBlockType2 includes the ac-BarringInfo and the ac-BarringForMO-Signalling is present:
if the UE has one or more Access Classes, as stored on the USIM, with a value in the range 11..15, which is valid for the UE to use according to TS 22.011 [10] and TS 23.122 [11], and

for at least one of these Access Classes the corresponding bit in the \textit{ac-BarringForSpecialAC} contained in \textit{ac-BarringForMO-Signalling} is set to zero:

consider access to the cell as not barred;

else:

draw a random number `$rand$` uniformly distributed in the range: $0 \leq rand < 1$;

if `$rand$` is lower than the value indicated by \textit{ac-BarringFactor} included in \textit{ac-BarringForMO-Signalling}:

consider access to the cell as not barred;

else:

consider access to the cell as barred;

else:

consider access to the cell as not barred;

if access to the cell, as specified above, is not barred:

apply the default physical channel configuration as specified in 9.2.4;

apply the default semi-persistent scheduling configuration as specified in 9.2.3;

apply the default MAC main configuration as specified in 9.2.2;

apply the CCCH configuration as specified in 9.1.1.2;

apply the $\textit{timeAlignmentTimerCommon}$ included in $\textit{SystemInformationBlockType2}$;

start timer T300;

initiate transmission of the $\textit{RRCConnectionRequest}$ message in accordance with 5.3.3.3;

\begin{note}
Upon initiating the connection establishment procedure, the UE is not required to ensure it maintains up to date system information applicable only for UEs in RRC\_IDLE state. However, the UE needs to perform system information acquisition upon cell re-selection.
\end{note}

else:

if the UE is establishing the RRC connection for mobile originating calls and if both timers T302 and T303 are not running:

draw a random number `$rand$` that is uniformly distributed in the range $0 \leq rand < 1$;

start timer T303 with the timer value calculated as follows, using the \textit{ac-BarringTime} included in \textit{ac-BarringForMO-Data}:

$T303 = (0.7 + 0.6 \cdot rand) \cdot \textit{ac-BarringTime}$

inform upper layers about the failure to establish the RRC connection and that access barring for mobile originating calls is applicable, upon which the procedure ends;

else if the UE is establishing the RRC connection for mobile originating signalling and if both timers T302 and T305 are not running:

draw a random number `$rand$` that is uniformly distributed in the range $0 \leq rand < 1$;

start timer T305 with the timer value calculated as follows, using the \textit{ac-BarringTime} included in \textit{ac-BarringForMO-Signalling}: 

\begin{align*} 
{T305} &= (0.7 + 0.6 \cdot rand) \cdot \textit{ac-BarringTime} 
\end{align*}
T305 = (0.7 + 0.6 \cdot \text{rand}) \cdot \text{ac-BarringTime}

3> inform upper layers about the failure to establish the RRC connection and that access barring for mobile originating signalling is applicable, upon which the procedure ends;

2> else if the UE is establishing the RRC connection for emergency calls:
3> inform upper layers about the failure to establish the RRC connection and that access barring for emergency calls is applicable, upon which the procedure ends;

2> else:
3> inform upper layers about the failure to establish the RRC connection, upon which the procedure ends;

5.3.3.3 Actions related to transmission of RRCConnectionRequest message

The UE shall set the contents of RRCConnectionRequest message as follows:

1> set the ue-Identity as follows:

2> if upper layers provide an S-TMSI:
3> set the ue-Identity to the value received from upper layers;

2> else:
3> draw a random value in the range 0 .. 2^{40}-1 and set the ue-Identity to this value;

NOTE 1: Upper layers provide the S-TMSI if the UE is registered in the TA of the current cell.

1> set the establishmentCause in accordance with the information received from upper layers;

The UE shall submit the RRCConnectionRequest message to lower layers for transmission.

The UE shall continue cell re-selection related measurements as well as cell re-selection evaluation. If the conditions for cell re-selection are fulfilled, the UE shall perform cell re-selection as specified in 5.3.3.5.

5.3.3.4 Reception of the RRCConnectionSetup by the UE

NOTE: Prior to this, lower layer signalling is used to allocate a C-RNTI. For further details see TS 36.321 [6];

The UE shall:

1> perform the radio resource configuration procedure in accordance with the received radioResourceConfigDedicated and as specified in 5.3.10;

1> if stored, discard the cell reselection priority information provided by the idleModeMobilityControlInfo or inherited from another RAT;

1> stop timer T300;

1> stop timer T302, if running;

1> stop timer T303, if running;

1> stop timer T305, if running;

1> perform the actions as specified in 5.3.3.7;

1> stop timer T320, if running;

1> enter RRC_CONNECTED;

1> stop the cell re-selection procedure;

1> set the content of RRCConnectionSetupComplete message as follows:
2> set the selected PLMN-Identity to the PLMN selected by upper layers (see TS 23.122 [11], TS 24.301 [35]) from the PLMN(s) included in the plmn-IdentityList in SystemInformationBlockType1;

2> if upper layers provide the 'Registered MME', include and set the registered MME as follows:

3> if the PLMN identity of the 'Registered MME' is different from the PLMN selected by the upper layers:

4> include the plmnIdentity in the registeredMME and set it to the value of the PLMN identity in the 'Registered MME' received from upper layers;

3> set the mmegi and the mmec to the value received from upper layers;

2> set the dedicatedInfoNAS to include the information received from upper layers;

2> submit the RRCConnectionSetupComplete message to lower layers for transmission, upon which the procedure ends;

5.3.3.5 Cell re-selection while T300, T302, T303 or T305 is running

The UE shall:

1> if cell reselection occurs while T300, T302, T303 or T305 is running:

2> if timer T302, T303 and/or T305 is running:

3> stop timer T302, T303 and T305, whichever ones were running;

3> perform the actions as specified in 5.3.3.7;

2> if timer T300 is running:

3> stop timer T300;

3> reset MAC, release the MAC configuration and re-establish RLC for all RBs that are established;

3> inform upper layers about the failure to establish the RRC connection, upon which the procedure ends;

5.3.3.6 T300 expiry

The UE shall:

1> if timer T300 expires:

2> reset MAC, release the MAC configuration and re-establish RLC for all RBs that are established;

2> inform upper layers about the failure to establish the RRC connection, upon which the procedure ends;

5.3.3.7 T302, T303 or T305 expiry or stop

The UE shall:

1> if timer T302 expires or is stopped:

2> inform upper layers about barring alleviation for mobile terminating access;

2> if timer T303 is not running:

3> inform upper layers about barring alleviation for mobile originating calls;

2> if timer T305 is not running:

3> inform upper layers about barring alleviation for mobile originating signalling;

1> if timer T303 expires or is stopped:

2> if timer T302 is not running:
3. inform upper layers about barring alleviation for mobile originating calls;

1. if timer T305 expires or is stopped:

2. if timer T302 is not running:

3. inform upper layers about barring alleviation for mobile originating signalling;

5.3.3.8 Reception of the RRCConnectionReject by the UE

The UE shall:

1. stop timer T300;

1. reset MAC and release the MAC configuration;

1. start timer T302, with the timer value set to the waitTime;

1. inform upper layers about the failure to establish the RRC connection and that access barring for mobile originating calls, mobile originating signalling and mobile terminating access is applicable, upon which the procedure ends;

5.3.3.9 Abortion of RRC connection establishment

If upper layers abort the RRC connection establishment procedure while the UE has not yet entered RRC_CONNECTED, the UE shall:

1. stop timer T300, if running;

1. reset MAC, release the MAC configuration and re-establish RLC for all RBs that are established;

5.3.3.10 Handling of SSAC related parameters

Upon request from the upper layers, the UE shall:

1. set the local variables BarringFactorForMMTEL-Voice and BarringTimeForMMTEL-Voice as follows:

2. if the UE is in RRC_IDLE and ssac-BarringForMMTEL-Voice is present:

3. if the UE has one or more Access Classes, as stored on the USIM, with a value in the range 11..15, which is valid for the UE to use according to TS 22.011 [10] and TS 23.122 [11], and

NOTE: ACs 12, 13, 14 are only valid for use in the home country and ACs 11, 15 are only valid for use in the HPLMN/ EHPLMN.

3. if, for at least one of these Access Classes, the corresponding bit in the ac-BarringForSpecialAC contained in ssac-BarringForMMTEL-Voice is set to zero:

4. set BarringFactorForMMTEL-Voice to one and BarringTimeForMMTEL-Voice to zero;

3. else:

4. set BarringFactorForMMTEL-Voice and BarringTimeForMMTEL-Voice to the value of ac-BarringFactor and ac-BarringTime included in ssac-BarringForMMTEL-Voice, respectively;

2. else set BarringFactorForMMTEL-Voice to one and BarringTimeForMMTEL-Voice to zero;

1. set the local variables BarringFactorForMMTEL-Video and BarringTimeForMMTEL-Video as follows:

2. if the UE is in RRC_IDLE and ssac-BarringForMMTEL-Video is present:

3. if the UE has one or more Access Classes, as stored on the USIM, with a value in the range 11..15, which is valid for the UE to use according to TS 22.011 [10] and TS 23.122 [11], and

3. if, for at least one of these Access Classes, the corresponding bit in the ac-BarringForSpecialAC contained in ssac-BarringForMMTEL-Video is set to zero:
4> set BarringFactorForMMTEL-Video to one and BarringTimeForMMTEL-Video to zero;

3> else:

4> set BarringFactorForMMTEL-Video and BarringTimeForMMTEL-Video to the value of ac-
BarringFactor and ac-BarringTime included in ssac-BarringForMMTEL-Video, respectively;

2> else set BarringFactorForMMTEL-Video to one and BarringTimeForMMTEL-Video to zero;

1> forward the variables BarringFactorForMMTEL-Voice, BarringTimeForMMTEL-Voice,
BarringFactorForMMTEL-Video and BarringTimeForMMTEL-Video to the upper layers;

5.3.4 Initial security activation

5.3.4.1 General

The purpose of this procedure is to activate AS security upon RRC connection establishment.

5.3.4.2 Initiation

E-UTRAN initiates the security mode command procedure to a UE in RRC_CONNECTED. Moreover, E-UTRAN applies the procedure as follows:

- when only SRB1 is established, i.e. prior to establishment of SRB2 and/ or DRBs.

5.3.4.3 Reception of the SecurityModeCommand by the UE

The UE shall:

1> derive the $K_{SNB}$ key, as specified in TS 33.401 [32];

1> derive the $K_{RRCH}$ key associated with the integrityProtAlgorithm indicated in the SecurityModeCommand message, as specified in TS 33.401 [32];
1> request lower layers to verify the integrity protection of the `SecurityModeCommand` message, using the algorithm indicated by the `integrityProtAlgorithm` as included in the `SecurityModeCommand` message and the `K_{RRCint}` key;

1> if the `SecurityModeCommand` message passes the integrity protection check:

2> derive the `K_{RRCenc}` key and the `K_{UPenc}` key associated with the `cipheringAlgorithm` indicated in the `SecurityModeCommand` message, as specified in TS 33.401 [32];

2> configure lower layers to apply integrity protection using the indicated algorithm and the `K_{RRCint}` key immediately, i.e. integrity protection shall be applied to all subsequent messages received and sent by the UE, including the `SecurityModeComplete` message;

2> configure lower layers to apply ciphering using the indicated algorithm, the `K_{RRCenc}` key and the `K_{UPenc}` key after completing the procedure, i.e. ciphering shall be applied to all subsequent messages received and sent by the UE, except for the `SecurityModeComplete` message which is sent unciphered;

2> consider AS security to be activated;

2> submit the `SecurityModeComplete` message to lower layers for transmission, upon which the procedure ends;

1> else:

2> continue using the configuration used prior to the reception of the `SecurityModeCommand` message, i.e. neither apply integrity protection nor ciphering.

2> submit the `SecurityModeFailure` message to lower layers for transmission, upon which the procedure ends;

5.3.5 RRC connection reconfiguration

5.3.5.1 General

![Diagram](image1)

Figure 5.3.5.1-1: RRC connection reconfiguration, successful

![Diagram](image2)

Figure 5.3.5.1-2: RRC connection reconfiguration, failure
The purpose of this procedure is to modify an RRC connection, e.g. to establish/modify/release RBs, to perform handover, to setup/modify/release measurements. As part of the procedure, NAS dedicated information may be transferred from E-UTRAN to the UE.

5.3.5.2 Initiation

E-UTRAN may initiate the RRC connection reconfiguration procedure to a UE in RRC_CONNECTED. E-UTRAN applies the procedure as follows:

- the mobilityControlInfo is included only when AS-security has been activated, and SRB2 with at least one DRB are setup and not suspended;
- the establishment of RBs (other than SRB1, that is established during RRC connection establishment) is included only when AS security has been activated;

5.3.5.3 Reception of an RRCConnectionReconfiguration not including the mobilityControlInfo by the UE

If the RRCConnectionReconfiguration message does not include the mobilityControlInfo and the UE is able to comply with the configuration included in this message, the UE shall:

1> if this is the first RRCConnectionReconfiguration message after successful completion of the RRC Connection Re-establishment procedure:
   2> re-establish PDCP for SRB2 and for all DRBs that are established, if any;
   2> re-establish RLC for SRB2 and for all DRBs that are established, if any;
   2> if the RRCConnectionReconfiguration message includes the fullConfig:
      3> perform the radio configuration procedure as specified in section 5.3.5.8;
   2> if the RRCConnectionReconfiguration message includes the radioResourceConfigDedicated:
      3> perform the radio resource configuration procedure as specified in 5.3.10;
   2> resume SRB2 and all DRBs that are suspended, if any;

NOTE 1: The handling of the radio bearers after the successful completion of the PDCP re-establishment, e.g. the re-transmission of unacknowledged PDCP SDUs (as well as the associated status reporting), the handling of the SN and the HFN, is specified in TS 36.323 [8].

1> else:
   2> if the RRCConnectionReconfiguration message includes the radioResourceConfigDedicated:
      3> perform the radio resource configuration procedure as specified in 5.3.10;

NOTE 2: If the RRCConnectionReconfiguration message includes the establishment of radio bearers other than SRB1, the UE may start using these radio bearers immediately, i.e. there is no need to wait for an outstanding acknowledgment of the SecurityModeComplete message.

1> if the RRCConnectionReconfiguration message includes the dedicatedInfoNASList:
   2> forward each element of the dedicatedInfoNASList to upper layers in the same order as listed;
1> if the RRCConnectionReconfiguration message includes the measConfig:
   2> perform the measurement configuration procedure as specified in 5.5.2;
1> if the RRCConnectionReconfiguration message includes the reportProximityConfig:
   2> perform the proximity indication in accordance with the received reportProximityConfig;
1> submit the RRCConnectionReconfigurationComplete message to lower layers for transmission using the new configuration, upon which the procedure ends;
5.3.5.4 Reception of an RRCConnectionReconfiguration including the mobilityControlInfo by the UE (handover)

If the RRCConnectionReconfiguration message includes the mobilityControlInfo and the UE is able to comply with the configuration included in this message, the UE shall:

1> stop timer T310, if running;
1> start timer T304 with the timer value set to t304, as included in the mobilityControlInfo;
1> if the carrierFreq is included:
   2> consider the target cell to be one on the frequency indicated by the carrierFreq with a physical cell identity indicated by the targetPhysCellId;
1> else:
   2> consider the target cell to be one on the current frequency with a physical cell identity indicated by the targetPhysCellId;
1> start synchronising to the DL of the target cell;

NOTE 1: The UE should perform the handover as soon as possible following the reception of the RRC message triggering the handover, which could be before confirming successful reception (HARQ and ARQ) of this message.
1> reset MAC;
1> re-establish PDCP for all RBs that are established;

NOTE 2: The handling of the radio bearers after the successful completion of the PDCP re-establishment, e.g. the re-transmission of unacknowledged PDCP SDUs (as well as the associated status reporting), the handling of the SN and the HFN, is specified in TS 36.323 [8].
1> re-establish RLC for all RBs that are established;
1> apply the value of the newUE-Identity as the C-RNTI;
1> if the RRCConnectionReconfiguration message includes the fullConfig:
   2> perform the radio configuration procedure as specified in section 5.3.5.8;
1> configure lower layers in accordance with the received radioResourceConfigCommon;
1> configure lower layers in accordance with any additional fields, not covered in the previous, if included in the received mobilityControlInfo;
1> if the RRCConnectionReconfiguration message includes the radioResourceConfigDedicated:
   2> perform the radio resource configuration procedure as specified in 5.3.10;
1> if the keyChangeIndicator received in the securityConfigHO is set to TRUE:
   2> update the K_{NB} key based on the fresh K_{ASME} key taken into use with the previous successful NAS SMC procedure, as specified in TS 33.401 [32];
1> else:
   2> update the K_{NB} key based on the current K_{NB} or the NH, using the nextHopChainingCount value indicated in the securityConfigHO, as specified in TS 33.401 [32];
1> store the nextHopChainingCount value;
1> if the securityAlgorithmConfig is included in the securityConfigHO:
   2> derive the K_{RRCint} key associated with the integrityProtAlgorithm, as specified in TS 33.401 [32];
2> derive the $K_{RRC_{enc}}$ key and the $K_{UP_{enc}}$ key associated with the cipheringAlgorithm, as specified in TS 33.401 [32];

1> else:

2> derive the $K_{RRC_{int}}$ key associated with the current integrity algorithm, as specified in TS 33.401 [32];
2> derive the $K_{RRC_{enc}}$ key and the $K_{UP_{enc}}$ key associated with the current ciphering algorithm, as specified in TS 33.401 [32];

1> configure lower layers to apply the integrity protection algorithm and the $K_{RRC_{int}}$ key, i.e. the integrity protection configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;
1> configure lower layers to apply the ciphering algorithm, the $K_{RRC_{enc}}$ key and the $K_{UP_{enc}}$ key, i.e. the ciphering configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;
1> perform the measurement related actions as specified in 5.5.6.1;
1> if the $RRC_{ConnectionReconfiguration}$ message includes the measConfig:
2> perform the measurement configuration procedure as specified in 5.5.2;
1> release reportProximityConfig and clear any associated proximity status reporting timer;
1> if the $RRC_{ConnectionReconfiguration}$ message includes the reportProximityConfig:
2> perform the proximity indication in accordance with the received reportProximityConfig;
1> submit the $RRC_{ConnectionReconfigurationComplete}$ message to lower layers for transmission;
1> if MAC successfully completes the random access procedure:
2> stop timer T304;
2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the target cell, if any;
2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the target cell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of the target cell;

NOTE 3: Whenever the UE shall setup or reconfigure a configuration in accordance with a field that is received it applies the new configuration, except for the cases addressed by the above statements.
2> the procedure ends;

NOTE 4: The UE is not required to determine the SFN of the target cell by acquiring system information from that cell before performing RACH access in the target cell.

5.3.5.5 Reconfiguration failure

The UE shall:

1> if the UE is unable to comply with (part of) the configuration included in the $RRC_{ConnectionReconfiguration}$ message:
2> continue using the configuration used prior to the reception of $RRC_{ConnectionReconfiguration}$ message;
2> if security has not been activated:
3> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'other';
2> else:
3> initiate the connection re-establishment procedure as specified in 5.3.7, upon which the connection reconfiguration procedure ends;

NOTE 1: The UE may apply above failure handling also in case the RRCConnectionReconfiguration message causes a protocol error for which the generic error handling as defined in 5.7 specifies that the UE shall ignore the message.

NOTE 2: If the UE is unable to comply with part of the configuration, it does not apply any part of the configuration, i.e. there is no partial success/failure.

5.3.5.6 T304 expiry (handover failure)

The UE shall:

1> if T304 expires (handover failure):

   NOTE: Following T304 expiry any dedicated preamble, if provided within the rach-ConfigDedicated, is not available for use by the UE anymore.

2> revert back to the configuration used in the source cell, excluding the configuration configured by the physicalConfigDedicated, the mac-MainConfig and the sps-Config;

2> initiate the connection re-establishment procedure as specified in 5.3.7, upon which the connection reconfiguration procedure ends;

5.3.5.7 Void

5.3.5.8 Radio Configuration involving full configuration option

The UE shall:

1> release/clear all current dedicated radio configurations except the C-RNTI, the security configuration and the PDCP, RLC and logical channel configurations for the RBs;

NOTE 1: Radio configuration is not just the resource configuration but includes other configurations like MeasConfig and OtherConfig.

1> if the RRCConnectionReconfiguration message includes the mobilityControlInfo:

   2> release/clear all current common radio configurations;

   2> use the default values specified in 9.2.5 for timer T310, T311 and constant N310, N311;

1> else:

   2> use values for timers T301, T310, T311 and constants N310, N311, as included in ue-TimersAndConstants received in SystemInformationBlockType2;

1> apply the default physical channel configuration as specified in 9.2.4;

1> apply the default semi-persistent scheduling configuration as specified in 9.2.3;

1> apply the default MAC main configuration as specified in 9.2.2;

1> for each srb-Identity value included in the srb-ToAddModList (SRB reconfiguration):

   2> apply the specified configuration defined in 9.1.2 for the corresponding SRB;

   2> apply the corresponding default RLC configuration for the SRB specified in 9.2.1.1 for SRB1 or in 9.2.1.2 for SRB2;

   2> apply the corresponding default logical channel configuration for the SRB as specified in 9.2.1.1 for SRB1 or in 9.2.1.2 for SRB2;

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NOTE 2: This is to get the SRBs (SRB1 and SRB2 for handover and SRB2 for reconfiguration after reestablishment) to a known state from which the reconfiguration message can do further configuration.

1> for each *eps-BearerIdentity* value included in the *drb-ToAddModList* that is part of the current UE configuration:
   2> release the PDCP entity;
   2> release the RLC entity or entities;
   2> release the DTCH logical channel;
   2> release the *drb-identity*;

NOTE 3: This will retain the *eps-bearerIdentity* but remove the DRBs including *drb-identity* of these bearers from the current UE configuration and trigger the setup of the DRBs within the AS in Section 5.3.10.3 using the new configuration. The *eps-bearerIdentity* acts as the anchor for associating the released and re-setup DRB.

1> for each *eps-BearerIdentity* value that is part of the current UE configuration but not part of the *drb-ToAddModList*:
   2> perform DRB release as specified in 5.3.10.2;

5.3.6 Counter check

5.3.6.1 General

![Counter check procedure diagram](Image)

Figure 5.3.6.1-1: Counter check procedure

The counter check procedure is used by E-UTRAN to request the UE to verify the amount of data sent/received on each DRB. More specifically, the UE is requested to check if, for each DRB, the most significant bits of the COUNT match with the values indicated by E-UTRAN.

NOTE: The procedure enables E-UTRAN to detect packet insertion by an intruder (a 'man in the middle').

5.3.6.2 Initiation

E-UTRAN initiates the procedure by sending a *CounterCheck* message.

NOTE: E-UTRAN may initiate the procedure when any of the COUNT values reaches a specific value.

5.3.6.3 Reception of the *CounterCheck* message by the UE

Upon receiving the *CounterCheck* message, the UE shall:

1> for each DRB that is established:
   2> if no COUNT exists for a given direction (uplink or downlink) because it is a uni-directional bearer configured only for the other direction:
   3> assume the COUNT value to be '0' for the unused direction;
2> if the `drb-Identity` is not included in the `drb-CountMSB-InfoList`:

3> include the DRB in the `drb-CountInfoList` in the `CounterCheckResponse` message by including the `drb-Identity`, the `count-Uplink` and the `count-Downlink` set to the value of the corresponding COUNT;

2> else if, for at least one direction, the most significant bits of the COUNT are different from the value indicated in the `drb-CountMSB-InfoList`:

3> include the DRB in the `drb-CountInfoList` in the `CounterCheckResponse` message by including the `drb-Identity`, the `count-Uplink` and the `count-Downlink` set to the value of the corresponding COUNT;

1> for each DRB that is included in the `drb-CountMSB-InfoList` in the `CounterCheck` message that is not established:

2> include the DRB in the `drb-CountInfoList` in the `CounterCheckResponse` message by including the `drb-Identity`, the `count-Uplink` and the `count-Downlink` with the most significant bits set identical to the corresponding values in the `drb-CountMSB-InfoList` and the least significant bits set to zero;

1> submit the `CounterCheckResponse` message to lower layers for transmission upon which the procedure ends;

5.3.7  RRC connection re-establishment

5.3.7.1  General

The purpose of this procedure is to re-establish the RRC connection, which involves the resumption of SRB1 operation and the re-activation of security.

A UE in RRC_CONNECTED, for which security has been activated, may initiate the procedure in order to continue the RRC connection. The connection re-establishment succeeds only if the concerned cell is prepared i.e. has a valid UE context. In case E-UTRAN accepts the re-establishment, SRB1 operation resumes while the operation of other radio bearers remains suspended. If AS security has not been activated, the UE does not initiate the procedure but instead moves to RRC_IDLE directly.
E-UTRAN applies the procedure as follows:

- to reconfigure SRB1 and to resume data transfer only for this RB;
- to re-activate AS security without changing algorithms.

5.3.7.2 Initiation

The UE shall only initiate the procedure when AS security has been activated. The UE initiates the procedure when one of the following conditions is met:

1. upon detecting radio link failure, in accordance with 5.3.11; or
2. upon handover failure, in accordance with 5.3.5.6; or
3. upon mobility from E-UTRA failure, in accordance with 5.4.3.5; or
4. upon integrity check failure indication from lower layers; or
5. upon an RRC connection reconfiguration failure, in accordance with 5.3.5.5;

Upon initiation of the procedure, the UE shall:

1. stop timer T310, if running;
2. start timer T311;
3. suspend all RBs except SRB0;
4. reset MAC;
5. apply the default physical channel configuration as specified in 9.2.4;
6. apply the default semi-persistent scheduling configuration as specified in 9.2.3;
7. apply the default MAC main configuration as specified in 9.2.2;
8. release reportProximityConfig and clear any associated proximity status reporting timer;
9. perform cell selection in accordance with the cell selection process as specified in TS 36.304 [4];

5.3.7.3 Actions following cell selection while T311 is running

Upon selecting a suitable E-UTRA cell, the UE shall:

1. stop timer T311;
2. start timer T301;
3. apply the timeAlignmentTimerCommon included in SystemInformationBlockType2;
4. initiate transmission of the RRCConnectionReestablishmentRequest message in accordance with 5.3.7.4;

NOTE: This procedure applies also if the UE returns to the source cell.

Upon selecting an inter-RAT cell, the UE shall:

1. perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'RRC connection failure';

5.3.7.4 Actions related to transmission of RRCConnectionReestablishmentRequest message

The UE shall set the contents of RRCConnectionReestablishmentRequest message as follows:

1. set the ue-Identity as follows:
2> set the c-RNTI to the C-RNTI used in the source cell (handover and mobility from E-UTRA failure) or used in the cell in which the trigger for the re-establishment occurred (other cases);

2> set the physCellId to the physical cell identity of the source cell (handover and mobility from E-UTRA failure) or of the cell in which the trigger for the re-establishment occurred (other cases);

2> set the shortMAC-I to the 16 least significant bits of the MAC-I calculated:
   3> over the ASN.1 encoded as per section 8 (i.e., a multiple of 8 bits) VarShortMAC-Input;
   3> with the $K_{RRCint}$ key and integrity protection algorithm that was used in the source cell (handover and mobility from E-UTRA failure) or of the cell in which the trigger for the re-establishment occurred (other cases); and
   3> with all input bits for COUNT, BEARER and DIRECTION set to binary ones;

1> set the reestablishmentCause as follows:
   2> if the re-establishment procedure was initiated due to reconfiguration failure as specified in 5.3.5.5 (the UE is unable to comply with the reconfiguration):
      3> set the reestablishmentCause to the value 'reconfigurationFailure';
   2> else if the re-establishment procedure was initiated due to handover failure as specified in 5.3.5.6 (intra-LTE handover failure) or 5.4.3.5 (inter-RAT mobility from EUTRA failure):
      3> set the reestablishmentCause to the value 'handoverFailure';
   2> else:
      3> set the reestablishmentCause to the value 'otherFailure';

The UE shall submit the RRCConnectionReestablishmentRequest message to lower layers for transmission.

5.3.7.5 Reception of the RRCConnectionReestablishment by the UE

NOTE: Prior to this, lower layer signalling is used to allocate a C-RNTI. For further details see TS 36.321 [6]:

The UE shall:

1> stop timer T301;
1> re-establish PDCP for SRB1;
1> re-establish RLC for SRB1;
1> perform the radio resource configuration procedure in accordance with the received radioResourceConfigDedicated and as specified in 5.3.10;
1> resume SRB1;
1> update the $K_{ENB}$ key based on the $K_{ASME}$ key to which the current $K_{ENB}$ is associated, using the nextHopChainingCount value indicated in the RRCConnectionReestablishment message, as specified in TS 33.401 [32];
1> store the nextHopChainingCount value;
1> derive the $K_{RRCint}$ key associated with the previously configured integrity algorithm, as specified in TS 33.401 [32];
1> derive the $K_{RRCenc}$ key and the $K_{EPCenc}$ key associated with the previously configured ciphering algorithm, as specified in TS 33.401 [32];
1> configure lower layers to activate integrity protection using the previously configured algorithm and the $K_{RRCint}$ key immediately, i.e., integrity protection shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;
configure lower layers to apply ciphering using the previously configured algorithm, the $K_{\text{RRCenc}}$ key and the $K_{\text{UPenc}}$ key immediately, i.e., ciphering shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

1> set the content of $\text{RRCConnectionReestablishmentComplete}$ message as follows:

2> include the $\text{rlf-InfoAvailable}$ and set it to true, if the UE has radio link failure information available that is related to the last occurrence of radio link failure;

1> perform the measurement related actions as specified in 5.5.6.1;

1> submit the $\text{RRCConnectionReestablishmentComplete}$ message to lower layers for transmission, upon which the procedure ends;

### 5.3.7.6 T311 expiry

Upon T311 expiry, the UE shall:

1> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'RRC connection failure';

### 5.3.7.7 T301 expiry or selected cell no longer suitable

The UE shall:

1> if timer T301 expires; or

1> if the selected cell becomes no longer suitable according to the cell selection criteria as specified in TS 36.304 [4]:

2> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'RRC connection failure';

### 5.3.7.8 Reception of $\text{RRCConnectionReestablishmentReject}$ by the UE

Upon receiving the $\text{RRCConnectionReestablishmentReject}$ message, the UE shall:

1> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'RRC connection failure';

### 5.3.8 RRC connection release

#### 5.3.8.1 General

The purpose of this procedure is to release the RRC connection, which includes the release of the established radio bearers as well as all radio resources.

#### 5.3.8.2 Initiation

E-UTRAN initiates the RRC connection release procedure to a UE in RRC_CONNECTED.
5.3.8.3  Reception of the **RRCConnectionRelease** by the UE

The UE shall:

1> delay the following actions defined in this sub-clause 60 ms from the moment the **RRCConnectionRelease** message was received or optionally when lower layers indicate that the receipt of the **RRCConnectionRelease** message has been successfully acknowledged, whichever is earlier;

1> if the **RRCConnectionRelease** message includes the **idleModeMobilityControlInfo**:
   2> store the cell reselection priority information provided by the **idleModeMobilityControlInfo**;
   2> if the \( t320 \) is included:
      3> start timer \( T320 \), with the timer value set according to the value of \( t320 \);
   1> else:
      2> apply the cell reselection priority information broadcast in the system information;
1> if the **releaseCause** received in the **RRCConnectionRelease** message indicates 'loadBalancingTAURequired':
   2> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'load balancing TAU required';
1> else:
   2> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'other';

5.3.8.4  **T320 expiry**

The UE shall:

1> if T320 expires:
   2> if stored, discard the cell reselection priority information provided by the **idleModeMobilityControlInfo** or inherited from another RAT;
   2> apply the cell reselection priority information broadcast in the system information;

5.3.9  **RRC connection release requested by upper layers**

5.3.9.1  General

The purpose of this procedure is to release the RRC connection. Access to the current cell may be barred as a result of this procedure.

   **NOTE:** Upper layers invoke the procedure, e.g. upon determining that the network has failed an authentication check, see TS 24.301 [35].

5.3.9.2  Initiation

The UE initiates the procedure when upper layers request the release of the RRC connection.

The UE shall:

1> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'other';
1> if the upper layers indicate barring of the serving cell:
   2> treat the cell used prior to entering RRC_IDLE as barred according to TS 36.304 [4];
5.3.10 Radio resource configuration

5.3.10.0 General

The UE shall:

1> if the received radioResourceConfigDedicated includes the srb-ToAddModList:
   2> perform the SRB addition or reconfiguration as specified in 5.3.10.1;

1> if the received radioResourceConfigDedicated includes the drb-ToReleaseList:
   2> perform DRB release as specified in 5.3.10.2;

1> if the received radioResourceConfigDedicated includes the drb-ToAddModList:
   2> perform DRB addition or reconfiguration as specified in 5.3.10.3;

1> if the received radioResourceConfigDedicated includes the mac-MainConfig:
   2> perform MAC main reconfiguration as specified in 5.3.10.4;

1> if the received radioResourceConfigDedicated includes sps-Config:
   2> perform SPS reconfiguration according to 5.3.10.5;

1> if the received radioResourceConfigDedicated includes the physicalConfigDedicated:
   2> reconfigure the physical channel configuration as specified in 5.3.10.6;

1> if the received radioResourceConfigDedicated includes the rlf-TimersAndConstants:
   2> reconfigure the values of timers and constants as specified in 5.3.10.7;

5.3.10.1 SRB addition/ modification

The UE shall:

1> for each srb-Identity value included in the srb-ToAddModList that is not part of the current UE configuration (SRB establishment):
   2> apply the specified configuration defined in 9.1.2 for the corresponding SRB;
   2> establish a PDCP entity and configure it with the current security configuration, if applicable;
   2> establish an RLC entity in accordance with the received rlc-Config;
   2> establish a DCCH logical channel in accordance with the received logicalChannelConfig and with the logical channel identity set in accordance with 9.1.2;

1> for each srb-Identity value included in the srb-ToAddModList that is part of the current UE configuration (SRB reconfiguration):
   2> reconfigure the RLC entity in accordance with the received rlc-Config;
   2> reconfigure the DCCH logical channel in accordance with the received logicalChannelConfig;

5.3.10.2 DRB release

The UE shall:

1> for each drb-Identity value included in the drb-ToReleaseList that is part of the current UE configuration (DRB release); or

1> for each drb-identity value that is to be released as the result of full configuration option according to 5.3.5.8:
release the PDCP entity;
release the RLC entity or entities;
release the DTCH logical channel;

if the procedure was triggered due to handover:
indicate the release of the DRB(s) and the eps-BearerIdentity of the released DRB(s) to upper layers after successful handover;

else:
indicate the release of the DRB(s) and the eps-BearerIdentity of the released DRB(s) to upper layers immediately.

NOTE: The UE does not consider the message as erroneous if the drb-ToReleaseList includes any drb-Identity value that is not part of the current UE configuration.

5.3.10.3 DRB addition/ modification

The UE shall:

for each drb-Identity value included in the drb-ToAddModList that is not part of the current UE configuration (DRB establishment including the case when full configuration option is used):

establish a PDCP entity and configure it with the current security configuration and in accordance with the received pdcp-Config;
establish an RLC entity or entities in accordance with the received rlc-Config;
establish a DTCH logical channel in accordance with the received logicalChannelIdentity and the received logicalChannelConfig;

if the RRCConnectionReconfiguration message includes the fullConfig IE:
associate the established DRB with corresponding included eps-BearerIdentity;

else:
indicate the establishment of the DRB(s) and the eps-BearerIdentity of the established DRB(s) to upper layers;

for each drb-Identity value included in the drb-ToAddModList that is part of the current UE configuration (DRB reconfiguration):

if the pdcp-Config is included:
reconfigure the PDCP entity in accordance with the received pdcp-Config;

if the rlc-Config is included:
reconfigure the RLC entity or entities in accordance with the received rlc-Config;

if the logicalChannelConfig is included:
reconfigure the DTCH logical channel in accordance with the received logicalChannelConfig;

NOTE: Removal and addition of the same drb-Identity in single radioResourceConfiguration is not supported.

5.3.10.4 MAC main reconfiguration

The UE shall:

reconfigure the MAC main configuration in accordance with the received mac-MainConfig;
5.3.10.5 Semi-persistent scheduling reconfiguration

The UE shall:

1. reconfigure the semi-persistent scheduling in accordance with the received \textit{sps-Config};

5.3.10.6 Physical channel reconfiguration

The UE shall:

1. reconfigure the physical channel configuration in accordance with the received \textit{physicalConfigDedicated};

1. if the \textit{antennaInfo} is included and set to 'explicitValue':

2. if the configured \textit{transmissionMode} is not 'tm3' or 'tm4' or 'tm8':

3. release \textit{ri-ConfigIndex} in \textit{cqi-ReportPeriodic}, if previously configured;

2. if the configured \textit{transmissionMode} is 'tm8' and \textit{pmi-RI-Report} is not present:

3. release \textit{ri-ConfigIndex} in \textit{cqi-ReportPeriodic}, if previously configured;

1. else if the \textit{antennaInfo} is included and set to 'defaultValue':

2. release \textit{ri-ConfigIndex} in \textit{cqi-ReportPeriodic}, if previously configured;

5.3.10.7 Radio Link Failure Timers and Constants reconfiguration

The UE shall:

1. if the received \textit{rlf-TimersAndConstants} is set to 'release':

2. use values for timers T301, T310, T311 and constants N310, N311, as included in \textit{ue-TimersAndConstants} received in SystemInformationBlockType2;

1. else:

2. reconfigure the value of timers and constants in accordance with received \textit{rlf-TimersAndConstants};

5.3.11 Radio link failure related actions

5.3.11.1 Detection of physical layer problems in RRC_CONNECTED

The UE shall:

1. upon receiving N310 consecutive "out-of-sync" indications from lower layers while neither T300, T301, T304 nor T311 is running:

2. start timer T310;

5.3.11.2 Recovery of physical layer problems

Upon receiving N311 consecutive "in-sync" indications from lower layers while T310 is running, the UE shall:

1. stop timer T310;

\textbf{NOTE 1}: In this case, the UE maintains the RRC connection without explicit signalling, i.e. the UE maintains the entire radio resource configuration.

\textbf{NOTE 2}: Periods in time where neither "in-sync" nor "out-of-sync" is reported by layer 1 do not affect the evaluation of the number of consecutive "in-sync" or "out-of-sync" indications.
5.3.11.3 Detection of radio link failure

The UE shall:

1> upon T310 expiry; or
1> upon random access problem indication from MAC while neither T300, T301, T304 nor T311 is running; or
1> upon indication from RLC that the maximum number of retransmissions has been reached:
   2> consider radio link failure to be detected;
   2> if AS security has not been activated:
      3> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'other';
   2> else:
      3> initiate the connection re-establishment procedure as specified in 5.3.7;

5.3.12 UE actions upon leaving RRC_CONNECTED

Upon leaving RRC_CONNECTED, the UE shall:

1> reset MAC;
1> stop all timers that are running except T320;
1> release all radio resources, including release of the RLC entity, the MAC configuration and the associated PDCP entity for all established RBs;
1> indicate the release of the RRC connection to upper layers together with the release cause;
1> if leaving RRC_CONNECTED was not triggered by reception of the MobilityFromEUTRACCommand message:
   2> enter RRC_IDLE and perform procedures as specified in TS 36.304 [4, 5.2.7];

5.3.13 UE actions upon PUCCH/ SRS release request

Upon receiving a PUCCH/ SRS release request from lower layers, the UE shall:

1> apply the default physical channel configuration for CQI-ReportConfig and cqi-Mask if configured as specified in 9.2.4;
1> apply the default physical channel configuration for soundingRS-UL-ConfigDedicated as specified in 9.2.4;
1> apply the default physical channel configuration for schedulingRequestConfig as specified in 9.2.4;
5.3.14 Proximity indication

5.3.14.1 General

The purpose of this procedure is to indicate that the UE is entering or leaving the proximity of one or more cells whose CSG IDs are in the UEs CSG whitelist. The detection of proximity is based on an autonomous search function as defined in TS 36.304 [4].

5.3.14.2 Initiation

A UE in RRC_CONNECTED shall:

1> if the UE enters the proximity of one or more cell(s), whose CSG IDs are in the UEs CSG whitelist, on an E-UTRA frequency while proximity indication is enabled for such E-UTRA cells; or

1> if the UE enters the proximity of one or more cell(s), whose CSG IDs are in the UEs CSG whitelist, on an UTRA frequency while proximity indication is enabled for such UTRA cells; or

1> if the UE leaves the proximity of all cell(s), whose CSG IDs are in the UEs CSG whitelist, on an E-UTRA frequency while proximity indication is enabled for such E-UTRA cells; or

1> if the UE leaves the proximity of all cell(s), whose CSG IDs are in the UEs CSG whitelist, on an UTRA frequency while proximity indication is enabled for such UTRA cells:

2> if the UE has previously not transmitted a ProximityIndication for the RAT and frequency during the current RRC connection, or if more than 5 s has elapsed since the UE has last transmitted a ProximityIndication (either entering or leaving) for the RAT and frequency:

3> initiate transmission of the ProximityIndication message in accordance with 5.3.14.3;

NOTE: In the conditions above, "if the UE enters the proximity of one or more cells whose CSG IDs are in the CSG whitelist" includes the case of already being in the proximity of such cell(s) at the time proximity indication for the corresponding RAT is enabled.

5.3.14.3 Actions related to transmission of ProximityIndication message

The UE shall set the contents of ProximityIndication message as follows:

1> if the UE applies the procedure to report entering the proximity of cell(s) whose CSG IDs are in the UEs CSG whitelist:

2> set type to 'entering';

1> else if the UE applies the procedure to report leaving the proximity of cell(s) whose CSG IDs are in the UEs CSG whitelist:

2> set type to 'leaving';

1> if the proximity indication was triggered for one or more cell(s), whose CSG IDs are in the UEs CSG whitelist, on an E-UTRA frequency:
2> set the \texttt{carrierFreq} to 'eutra' with the value set to the E-ARFCN value of the E-UTRA cell(s) for which proximity indication was triggered;

1> else if the proximity indication was triggered for one or more cell(s), whose CSG IDs are in the UEs CSG whitelist, on a UTRA frequency:

2> set the \texttt{carrierFreq} to 'utra' with the value set to the ARFCN value of the UTRA cell(s) for which proximity indication was triggered;

The UE shall submit the \textit{ProximityIndication} message to lower layers for transmission.

### 5.4 Inter-RAT mobility

#### 5.4.1 Introduction

The general principles of connected mode mobility are described in 5.3.1.3. The general principles of the security handling upon connected mode mobility are described in 5.3.1.2.

For the (network controlled) inter RAT mobility from E-UTRA for a UE in RRC\_CONNECTED, a single procedure is defined that supports both handover, cell change order with optional network assistance (NACC) and enhanced CS fallback to CDMA2000 1xRTT. In case of mobility to CDMA2000, the eNB decides when to move to the other RAT while the target RAT determines to which cell the UE shall move.

#### 5.4.2 Handover to E-UTRA

##### 5.4.2.1 General

![Figure 5.4.2.1-1: Handover to E-UTRA, successful](image)

The purpose of this procedure is to, under the control of the network, transfer a connection between the UE and another Radio Access Network (e.g. GERAN or UTRAN) to E-UTRAN.

The handover to E-UTRA procedure applies when SRBs, possibly in combination with DRBs, are established in another RAT. Handover from UTRAN to E-UTRAN applies only after integrity has been activated in UTRAN.

##### 5.4.2.2 Initiation

The RAN using another RAT initiates the Handover to E-UTRA procedure, in accordance with the specifications applicable for the other RAT, by sending the \texttt{RRCConnectionReconfiguration} message via the radio access technology from which the inter-RAT handover is performed.

E-UTRAN applies the procedure as follows:

- to activate ciphering, possibly using NULL algorithm, if not yet activated in the other RAT;

- to establish SRB1, SRB2 and one or more DRBs, i.e. at least the DRB associated with the default EPS bearer is established;
5.4.2.3 Reception of the *RRConnectionReconfiguration* by the UE

If the UE is able to comply with the configuration included in the *RRConnectionReconfiguration* message, the UE shall:

1. apply the default physical channel configuration as specified in 9.2.4;
2. apply the default semi-persistent scheduling configuration as specified in 9.2.3;
3. apply the default MAC main configuration as specified in 9.2.2;
4. start timer T304 with the timer value set to \(t_{304}\), as included in the *mobilityControlInfo*;
5. consider the target cell to be one on the frequency indicated by the *carrierFreq* with a physical cell identity indicated by the *targetPhysCellId*;
6. start synchronising to the DL of the target cell;
7. set the C-RNTI to the value of the *newUE-Identity*;
8. for the target cell, apply the downlink bandwidth indicated by the *dl-Bandwidth*;
9. for the target cell, apply the uplink bandwidth indicated by (the absence or presence of) the *ul-Bandwidth*;
10. configure lower layers in accordance with the received *radioResourceConfigCommon*;
11. configure lower layers in accordance with any additional fields, not covered in the previous, if included in the received *mobilityControlInfo*;
12. perform the radio resource configuration procedure as specified in 5.3.10;
13. forward the *nas-SecurityParamToEUTRA* to the upper layers;
14. derive the \(K_{\text{NB}}\) key, as specified in TS 33.401 [32];
15. derive the \(K_{\text{RRC}}\) key associated with the *integrityProtAlgorithm*, as specified in TS 33.401 [32];
16. derive the \(K_{\text{RRC}}\) key and the \(K_{\text{UP}}\) key associated with the *cipheringAlgorithm*, as specified in TS 33.401 [32];
17. configure lower layers to apply the indicated integrity protection algorithm and the \(K_{\text{RRC}}\) key immediately, i.e. the indicated integrity protection configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;
18. configure lower layers to apply the indicated ciphering algorithm, the \(K_{\text{RRC}}\) key and the \(K_{\text{UP}}\) key immediately, i.e. the indicated ciphering configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;
19. if the *RRConnectionReconfiguration* message includes the *measConfig*:
   2. perform the measurement configuration procedure as specified in 5.5.2;
20. if the *RRConnectionReconfiguration* message includes the *reportProximityConfig*:
   2. perform the proximity indication configuration in accordance with the received *reportProximityConfig*;
21. submit the *RRConnectionReconfigurationComplete* message to lower layers for transmission using the new configuration;
22. if the *RRConnectionReconfiguration* message does not include the *rlf-TimersAndConstants*:
   2. use the default values specified in 9.2.5 for timer T310, T311 and constant N310, N311;
23. if MAC successfully completes the random access procedure:
   2. stop timer T304;
   2. apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the target cell, if any;
apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the target cell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of the target cell;

NOTE 1: Whenever the UE shall setup or reconfigure a configuration in accordance with a field that is received it applies the new configuration, except for the cases addressed by the above statements.

enter E-UTRA RRC_CONNECTED, upon which the procedure ends;

NOTE 2: The UE is not required to determine the SFN of the target cell by acquiring system information from that cell before performing RACH access in the target cell.

5.4.2.4 Reconfiguration failure

The UE shall:

1> if the UE is unable to comply with (part of) the configuration included in the RRCConnectionReconfiguration message:

2> perform the actions defined for this failure case as defined in the specifications applicable for the other RAT;

NOTE 1: The UE may apply above failure handling also in case the RRCConnectionReconfiguration message causes a protocol error for which the generic error handling as defined in 5.7 specifies that the UE shall ignore the message.

NOTE 2: If the UE is unable to comply with part of the configuration, it does not apply any part of the configuration, i.e. there is no partial success/ failure.

5.4.2.5 T304 expiry (handover to E-UTRA failure)

The UE shall:

1> upon T304 expiry (handover to E-UTRA failure):

2> reset MAC;

2> perform the actions defined for this failure case as defined in the specifications applicable for the other RAT;

5.4.3 Mobility from E-UTRA

5.4.3.1 General

![Figure 5.4.3.1-1: Mobility from E-UTRA, successful](image-url)
The purpose of this procedure is to move a UE in RRC_CONNECTED to a cell using another Radio Access Technology (RAT), e.g. GERAN, UTRA or CDMA2000 systems. The mobility from E-UTRA procedure covers the following type of mobility:

- handover, i.e. the `MobilityFromEUTRACCommand` message includes radio resources that have been allocated for the UE in the target cell;
- cell change order, i.e. the `MobilityFromEUTRACCommand` message may include information facilitating access of and/or connection establishment in the target cell, e.g. system information. Cell change order is applicable only to GERAN; and
- enhanced CS fallback to CDMA2000 1xRTT, i.e. the `MobilityFromEUTRACCommand` message includes radio resources that have been allocated for the UE in the target cell. The enhanced CS fallback to CDMA2000 1xRTT may be combined with concurrent handover or redirection to CDMA2000 HRPD.

5.4.3.2 Initiation
E-UTRAN initiates the mobility from E-UTRA procedure to a UE in RRC_CONNECTED, possibly in response to a `MeasurementReport` message or in response to reception of CS fallback indication for the UE from MME, by sending a `MobilityFromEUTRACCommand` message. E-UTRAN applies the procedure as follows:

- the procedure is initiated only when AS-security has been activated, and SRB2 with at least one DRB are setup and not suspended;

5.4.3.3 Reception of the `MobilityFromEUTRACCommand` by the UE
The UE shall be able to receive a `MobilityFromEUTRACCommand` message and perform a cell change order to GERAN, even if no prior UE measurements have been performed on the target cell.

The UE shall:

1> stop timer T310, if running;
1> if the `MobilityFromEUTRACCommand` message includes the `purpose` set to 'handover':
   2> if the `targetRAT-Type` is set to 'utra' or 'geran':
      3> consider inter-RAT mobility as initiated towards the RAT indicated by the `targetRAT-Type` included in the `MobilityFromEUTRACCommand` message;
      3> forward the `nas-SecurityParamFromEUTRA` to the upper layers;
      3> access the target cell indicated in the inter-RAT message in accordance with the specifications of the target RAT;
      3> if the `targetRAT-Type` is set to 'geran':
         4> use the contents of `systemInformation`, if provided for PS Handover, as the system information to begin access on the target GERAN cell;
NOTE 1: If there are DRBs for which no radio bearers are established in the target RAT as indicated in the targetRAT-MessageContainer in the message, the E-UTRA RRC part of the UE does not indicate the release of the concerned DRBs to the upper layers. Upper layers may derive which bearers are not established from information received from the AS of the target RAT.

1> else if the targetRAT-Type is set to 'cdma2000-1XRTT' or 'cdma2000-HRPD':
   2> forward the targetRAT-Type and the targetRAT-MessageContainer to the CDMA2000 upper layers for the UE to access the cell(s) indicated in the inter-RAT message in accordance with the specifications of the CDMA2000 target-RAT;

1> else if the MobilityFromEUTRACommand message includes the purpose set to 'cellChangeOrder':
   2> start timer T304 with the timer value set to t304, as included in the MobilityFromEUTRACommand message;
   2> if the targetRAT-Type is set to 'geran':
      3> if networkControlOrder is included in the MobilityFromEUTRACommand message:
         4> apply the value as specified in TS 44.060 [36];
      3> else:
         4> acquire networkControlOrder and apply the value as specified in TS 44.060 [36];
      3> use the contents of systemInformation, if provided, as the system information to begin access on the target GERAN cell;

NOTE 2: The systemInformation is constructed in the same way as in 2G to 2G NACC, i.e. the PSI messages are encoded as such, whereas the SI messages exclude 2 octets of headers, see TS 44.060[36].

1> if networkControlOrder is included in the MobilityFromEUTRACommand message:
   2> apply the value as specified in TS 44.060 [36];
   3> else:
      4> acquire networkControlOrder and apply the value as specified in TS 44.060 [36];
      3> use the contents of systemInformation, if provided, as the system information to begin access on the target GERAN cell;

NOTE 3: The criteria for success or failure of the cell change order to GERAN are specified in TS 44.060[36].

1> if the MobilityFromEUTRACommand message includes the purpose set to 'e-CSFB':
   2> if messageContCDMA2000-1XRTT is present:
      3> forward the messageContCDMA2000-1XRTT to the CDMA2000 upper layers for the UE to access the cell(s) indicated in the inter-RAT message in accordance with the specification of the target RAT;
   2> if mobilityCDMA2000-HRPD is present and is set to 'handover':
      3> forward the messageContCDMA2000-1XRTT to the CDMA2000 upper layers for the UE to access the cell(s) indicated in the inter-RAT message in accordance with the specification of the target RAT;
   2> if mobilityCDMA2000-HRPD is present and is set to 'redirection':
      3> forward the redirectedCarrierInfoCDMA2000-HRPD to the CDMA2000 upper layers;

NOTE 4: When the CDMA2000 upper layers in the UE receive both the messageContCDMA2000-1XRTT and messageContCDMA2000-HRPD the UE performs concurrent access to both CDMA2000 1xRTT and CDMA2000 HRPD RAT.

5.4.3.4 Successful completion of the mobility from E-UTRA

Upon successfully completing the handover, the cell change order or enhanced 1xRTT CS fallback, the UE shall:

1> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'other';
1> stop timer T304, if running;

NOTE: If the UE performs enhanced 1xRTT CS fallback along with concurrent mobility to CDMA2000 HRPD and the connection to either CDMA2000 1xRTT or CDMA2000 HRPD succeeds, then the mobility from E-UTRA is considered successful.
5.4.3.5 Mobility from E-UTRA failure

The UE shall:

1. if T304 expires (mobility from E-UTRA failure); or
2. if the UE does not succeed in establishing the connection to the target radio access technology; or
3. if the UE is unable to comply with (part of) the configuration included in the MobilityFromEUTRACommand message; or
4. if there is a protocol error in the inter RAT information included in the MobilityFromEUTRACommand message, causing the UE to fail the procedure according to the specifications applicable for the target RAT:
   1. stop T304, if running;
   2. if the cs-FallbackIndicator in the MobilityFromEUTRACommand message was set to 'TRUE':
      1. indicate to upper layers that the CS Fallback procedure has failed;
      2. revert back to the configuration used in the source cell, excluding the configuration configured by the physicalConfigDedicated, mac-MainConfig and sps-Config;
      3. initiate the connection re-establishment procedure as specified in 5.3.7;

   NOTE: For enhanced CS fallback to CDMA2000 1xRTT, the above UE behavior applies only when the UE is attempting the enhanced 1xRTT CS fallback and connection to the target radio access technology fails or if the UE is attempting enhanced 1xRTT CS fallback along with concurrent mobility to CDMA2000 HRPD and connection to both the target radio access technologies fails.

5.4.4 Handover from E-UTRA preparation request (CDMA2000)

5.4.4.1 General

![HandoverFromEUTRAPreparationRequest](image)

Figure 5.4.4.1-1: Handover from E-UTRA preparation request

The purpose of this procedure is to trigger the UE to prepare for handover or enhanced 1xRTT CS fallback to CDMA2000 by requesting a connection with this network. The UE may use this procedure to concurrently prepare for handover to CDMA2000 HRPD along with preparation for enhanced CS fallback to CDMA2000 1xRTT. This procedure applies to CDMA2000 capable UEs only.

The handover from E-UTRA preparation request procedure applies when signalling radio bearers are established.

5.4.4.2 Initiation

E-UTRAN initiates the handover from E-UTRA preparation request procedure to a UE in RRC_CONNECTED, possibly in response to a MeasurementReport message or CS fallback indication for the UE, by sending a HandoverFromEUTRAPreparationRequest message. E-UTRA initiates the procedure only when AS security has been activated.

5.4.4.3 Reception of the HandoverFromEUTRAPreparationRequest by the UE

Upon reception of the HandoverFromEUTRAPreparationRequest message, the UE shall:
1> indicate the request to prepare handover or enhanced 1xRTT CS fallback and forward the *cdma2000-Type* to the CDMA2000 upper layers;

1> if *cdma2000-Type* is set to 'type1XRTT':

2> forward the *rand* and the *mobilityParameters* to the CDMA2000 upper layers;

1> if *concurrPrepCDMA2000-HRPD* is present in the received message:

2> forward *concurrPrepCDMA2000-HRPD* to the CDMA2000 upper layers;

1> else

2> forward *concurrPrepCDMA2000-HRPD*, with its value set to *FALSE*, to the CDMA2000 upper layers;

5.4.5 UL handover preparation transfer (CDMA2000)

5.4.5.1 General

![Figure 5.4.5.1-1: UL handover preparation transfer](image)

The purpose of this procedure is to tunnel the handover related CDMA2000 dedicated information or enhanced 1xRTT CS fallback related CDMA2000 dedicated information from UE to E-UTRAN when requested by the higher layers. The procedure is triggered by the higher layers on receipt of *HandoverFromEUTRAPreparationRequest* message. If preparing for enhanced CS fallback to CDMA2000 1xRTT and handover to CDMA2000 HRPD, the UE sends two consecutive *ULHandoverPreparationTransfer* messages to E-UTRAN, one per addressed CDMA2000 RAT Type. This procedure applies to CDMA2000 capable UEs only.

5.4.5.2 Initiation

A UE in RRC_CONNECTED initiates the UL Handover Preparation Transfer procedure whenever there is a need to transfer handover or enhanced 1xRTT CS fallback related non-3GPP dedicated information. The UE initiates the UL handover preparation transfer procedure by sending the *ULHandoverPreparationTransfer* message.

5.4.5.3 Actions related to transmission of the *ULHandoverPreparationTransfer* message

The UE shall set the contents of the *ULHandoverPreparationTransfer* message as follows:

1> include the *cdma2000-Type* and the *dedicatedInfo*;

1> if the *cdma2000-Type* is set to 'type1XRTT':

2> include the *meid* and set it to the value received from the CDMA2000 upper layers;

1> submit the *ULHandoverPreparationTransfer* message to lower layers for transmission, upon which the procedure ends;

5.4.5.4 Failure to deliver the *ULHandoverPreparationTransfer* message

The UE shall:

1> if the UE is unable to guarantee successful delivery of *ULHandoverPreparationTransfer* messages:
5.4.6 Inter-RAT cell change order to E-UTRAN

5.4.6.1 General

The purpose of the inter-RAT cell change order to E-UTRAN procedure is to transfer, under the control of the source radio access technology, a connection between the UE and another radio access technology (e.g. GSM/GPRS) to E-UTRAN.

5.4.6.2 Initiation

The procedure is initiated when a radio access technology other than E-UTRAN, e.g. GSM/GPRS, using procedures specific for that RAT, orders the UE to change to an E-UTRAN cell. In response, upper layers request the establishment of an RRC connection as specified in subclause 5.3.3.

NOTE: Within the message used to order the UE to change to an E-UTRAN cell, the source RAT should specify the identity of the target E-UTRAN cell as specified in the specifications for that RAT.

The UE shall:

1> upon receiving an RRCConnectionSetup message:

2> consider the inter-RAT cell change order procedure to have completed successfully;

5.4.6.3 UE fails to complete an inter-RAT cell change order

If the inter-RAT cell change order fails the UE shall return to the other radio access technology and proceed as specified in the appropriate specifications for that RAT.

The UE shall:

1> upon failure to establish the RRC connection as specified in subclause 5.3.3:

2> consider the inter-RAT cell change order procedure to have failed;

NOTE: The cell change was network ordered. Therefore, failure to change to the target cell should not cause the UE to move to UE-controlled cell selection.

5.5 Measurements

5.5.1 Introduction

The UE reports measurement information in accordance with the measurement configuration as provided by E-UTRAN. E-UTRAN provides the measurement configuration applicable for a UE in RRC_CONNECTED by means of dedicated signalling, i.e. using the RRCConnectionReconfiguration message.

The UE can be requested to perform the following types of measurements:

- Intra-frequency measurements: measurements at the downlink carrier frequency of the serving cell.
- Inter-frequency measurements: measurements at frequencies that differ from the downlink carrier frequency of the serving cell.
- Inter-RAT measurements of UTRA frequencies.
- Inter-RAT measurements of GERAN frequencies.
- Inter-RAT measurements of CDMA2000 HRPD or CDMA2000 1xRTT frequencies.

The measurement configuration includes the following parameters:
1. **Measurement objects**: The objects on which the UE shall perform the measurements.
   - For intra-frequency and inter-frequency measurements a measurement object is a single E-UTRA carrier frequency. Associated with this carrier frequency, E-UTRAN can configure a list of cell specific offsets and a list of 'blacklisted' cells. Blacklisted cells are not considered in event evaluation or measurement reporting.
   - For inter-RAT UTRA measurements a measurement object is a set of cells on a single UTRA carrier frequency.
   - For inter-RAT GERAN measurements a measurement object is a set of GERAN carrier frequencies.
   - For inter-RAT CDMA2000 measurements a measurement object is a set of cells on a single (HRPD or 1xRTT) carrier frequency.

   **NOTE 1**: Some measurements using the above mentioned measurement objects, only concern a single cell, e.g. measurements used to report neighbouring cell system information, serving cell UE Rx- Tx time difference.

2. **Reporting configurations**: A list of reporting configurations where each reporting configuration consists of the following:
   - Reporting criterion: The criterion that triggers the UE to send a measurement report. This can either be periodical or a single event description.
   - Reporting format: The quantities that the UE includes in the measurement report and associated information (e.g. number of cells to report).

3. **Measurement identities**: A list of measurement identities where each measurement identity links one measurement object with one reporting configuration. By configuring multiple measurement identities it is possible to link more than one measurement object to the same reporting configuration, as well as to link more than one reporting configuration to the same measurement object. The measurement identity is used as a reference number in the measurement report.

4. **Quantity configurations**: One quantity configuration is configured per RAT type. The quantity configuration defines the measurement quantities and associated filtering used for all event evaluation and related reporting of that measurement type. One filter can be configured per measurement quantity.

5. **Measurement gaps**: Periods that the UE may use to perform measurements, i.e. no (UL, DL) transmissions are scheduled.

   E-UTRAN only configures a single measurement object for a given frequency, i.e. it is not possible to configure two or more measurement objects for the same frequency with different associated parameters, e.g. different offsets and/ or blacklists. E-UTRAN may configure multiple instances of the same event e.g. by configuring two reporting configurations with different thresholds.

   The UE maintains a single measurement object list, a single reporting configuration list, and a single measurement identities list. The measurement object list includes measurement objects, that are specified per RAT type, possibly including an intra-frequency object (i.e. the object corresponding to the serving frequency), inter-frequency object(s) and inter-RAT objects. Similarly, the reporting configuration list includes E-UTRA and inter-RAT reporting configurations. Any measurement object can be linked to any reporting configuration of the same RAT type. Some reporting configurations may not be linked to a measurement object. Likewise, some measurement objects may not be linked to a reporting configuration.

   The measurement procedures distinguish the following types of cells:
   1. The serving cell.
   2. Listed cells - these are cells listed within the measurement object(s).
   3. Detected cells - these are cells that are not listed within the measurement object(s) but are detected by the UE on the carrier frequency(ies) indicated by the measurement object(s).

   For E-UTRA, the UE measures and reports on the serving cell, listed cells and detected cells. For inter-RAT UTRA, the UE measures and reports on listed cells and optionally on cells that are within a range for which reporting is allowed by E-UTRAN. For inter-RAT GERAN, the UE measures and reports on detected cells. For inter-RAT CDMA2000, the UE measures and reports on listed cells.
NOTE 2: For inter-RAT UTRA and CDMA2000, the UE measures and reports also on detected cells for the purpose of SON.

NOTE 3: This specification is based on the assumption that typically CSG cells of home deployment type are not indicated within the neighbour list. Furthermore, the assumption is that for non-home deployments, the physical cell identity is unique within the area of a large macro cell (i.e. as for UTRAN).

Whenever the procedural specification, other than contained in sub-clause 5.5.2, refers to a field it concerns a field included in the VarMeasConfig unless explicitly stated otherwise i.e. only the measurement configuration procedure covers the direct UE action related to the received measConfig.

5.5.2 Measurement configuration

5.5.2.1 General

E-UTRAN applies the procedure as follows:

- to ensure that, whenever the UE has a measConfig, it includes a measObject for the serving frequency;
- to configure at most one measurement identity using a reporting configuration with the purpose set to 'reportCGI';

The UE shall:

1> if the received measConfig includes the measObjectToRemoveList:
   2> perform the measurement object removal procedure as specified in 5.5.2.4;
1> if the received measConfig includes the measObjectToAddModList:
   2> perform the measurement object addition/ modification procedure as specified in 5.5.2.5;
1> if the received measConfig includes the reportConfigToRemoveList:
   2> perform the reporting configuration removal procedure as specified in 5.5.2.6;
1> if the received measConfig includes the reportConfigToAddModList:
   2> perform the reporting configuration addition/ modification procedure as specified in 5.5.2.7;
1> if the received measConfig includes the quantityConfig:
   2> perform the quantity configuration procedure as specified in 5.5.2.8;
1> if the received measConfig includes the measIdToRemoveList:
   2> perform the measurement identity removal procedure as specified in 5.5.2.2;
1> if the received measConfig includes the measIdToAddModList:
   2> perform the measurement identity addition/ modification procedure as specified in 5.5.2.3;
1> if the received measConfig includes the measGapConfig:
   2> perform the measurement gap configuration procedure as specified in 5.5.2.9;
1> if the received measConfig includes the s-Measure:
   2> set the parameter s-Measure within VarMeasConfig to the lowest value of the RSRP ranges indicated by the received value of s-Measure;
1> if the received measConfig includes the preRegistrationInfoHRPD:
   2> forward the preRegistrationInfoHRPD to CDMA2000 upper layers;
1> if the received measConfig includes the speedStatePars:
2> set the parameter speedStatePars within VarMeasConfig to the received value of speedStatePars;

5.5.2.2 Measurement identity removal

The UE shall:

1> for each measId included in the received measIdToRemoveList that is part of the current UE configuration in varMeasConfig:
   2> remove the entry with the matching measId from the measIdList within the VarMeasConfig;
   2> remove the measurement reporting entry for this measId from the VarMeasReportList, if included;
   2> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. timeToTrigger) for this measId;

NOTE: The UE does not consider the message as erroneous if the measIdToRemoveList includes any measId value that is not part of the current UE configuration.

5.5.2.3 Measurement identity addition/ modification

E-UTRAN applies the procedure as follows:

- configure a measId only if the corresponding measurement object, the corresponding reporting configuration and the corresponding quantity configuration, are configured;

The UE shall:

1> for each measId included in the received measIdToAddModList:
   2> if an entry with the matching measId exists in the measIdList within the VarMeasConfig:
      3> replace the entry with the value received for this measId;
   2> else:
      3> add a new entry for this measId within the VarMeasConfig;
   2> remove the measurement reporting entry for this measId from the VarMeasReportList, if included;
   2> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. timeToTrigger) for this measId;
   2> if the triggerType is set to 'periodical' and the purpose is set to 'reportCGI' in the reportConfig associated with this measId:
      3> if the measObject associated with this measId concerns E-UTRA:
         4> if the si-RequestForHO is included in the reportConfig associated with this measId:
            5> start timer T321 with the timer value set to 150 ms for this measId;
         4> else:
            5> start timer T321 with the timer value set to 1 second for this measId;
      3> else if the measObject associated with this measId concerns UTRA:
         4> if the si-RequestForHO is included in the reportConfig associated with this measId:
            5> start timer T321 with the timer value set to [1 second] for this measId;
         4> else:
            5> start timer T321 with the timer value set to 8 seconds for this measId;
      3> else:

4> start timer T321 with the timer value set to 8 seconds for this measId;

5.5.2.4 Measurement object removal

The UE shall:

1> for each measObjectId included in the received measObjectToRemoveList that is part of the current UE configuration in varMeasConfig:

2> remove the entry with the matching measObjectId from the measObjectList within the VarMeasConfig;

2> remove all measId associated with this measObjectId from the measIdList within the VarMeasConfig, if any;

2> if a measId is removed from the measIdList:

3> remove the measurement reporting entry for this measId from the VarMeasReportList, if included;

3> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. timeToTrigger) for this measId;

NOTE: The UE does not consider the message as erroneous if the measObjectToRemoveList includes any measObjectId value that is not part of the current UE configuration.

5.5.2.5 Measurement object addition/ modification

The UE shall:

1> for each measObjectId included in the received measObjectToAddModList:

2> if an entry with the matching measObjectId exists in the measObjectList within the VarMeasConfig, for this entry:

3> replace the entry with the value received for this measObject, except for the fields cellsToAddModList, blackCellsToAddModList, cellsToRemoveList and blackCellsToRemoveList:

3> if the received measObject includes the cellsToRemoveList:

4> for each cellIndex included in the cellsToRemoveList:

5> remove the entry with the matching cellIndex from the cellsToAddModList;

3> if the received measObject includes the cellsToAddModList:

4> for each cellIndex value included in the cellsToAddModList:

5> if an entry with the matching cellIndex exists in the cellsToAddModList:

6> replace the entry with the value received for this cellIndex;

5> else:

6> add a new entry for the received cellIndex to the cellsToAddModList;

3> if the received measObject includes the blackCellsToRemoveList:

4> for each cellIndex included in the blackCellsToRemoveList:

5> remove the entry with the matching cellIndex from the blackCellsToAddModList;

3> if the received measObject includes the blackCellsToAddModList:

4> for each cellIndex included in the blackCellsToAddModList:

5> if an entry with the matching cellIndex is included in the blackCellsToAddModList:

6> replace the entry with the value received for this cellIndex;
5.5.2.6 Reporting configuration removal

The UE shall:

1> for each reportConfigId included in the received reportConfigToRemoveList that is part of the current UE configuration in varMeasConfig:

2> remove the entry with the matching reportConfigId from the reportConfigList within the VarMeasConfig;

2> remove all measId associated with the reportConfigId from the measIdList within the VarMeasConfig, if any;

2> if a measId is removed from the measIdList:

3> remove the measurement reporting entry for this measId from the VarMeasReportList, if included;

3> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. timeToTrigger) for this measId;

NOTE: The UE does not consider the message as erroneous if the reportConfigToRemoveList includes any reportConfigId value that is not part of the current UE configuration.

5.5.2.7 Reporting configuration addition/modification

The UE shall:

1> for each reportConfigId included in the received reportConfigToAddModList:

2> if an entry with the matching reportConfigId exists in the reportConfigList within the VarMeasConfig, for this entry:

3> replace the entry with the value received for this reportConfig;

3> for each measId associated with this reportConfigId included in the measIdList within the VarMeasConfig, if any:

4> remove the measurement reporting entry for this measId from in VarMeasReportList, if included;

4> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. timeToTrigger) for this measId;

2> else:

3> add a new entry for the received reportConfig to the reportConfigList within the VarMeasConfig;

5.5.2.8 Quantity configuration

The UE shall:

1> for each RAT for which the received quantityConfig includes parameter(s):
5.5.2.9 Measurement gap configuration

The UE shall:

1. if `measGapConfig` is set to 'setup':
   2. if a measurement gap configuration is already setup, release the measurement gap configuration;
   3. setup the measurement gap configuration indicated by the `measGapConfig` in accordance with the received `gapOffset`, i.e., each gap starts at an SFN and subframe meeting the following condition:
      
      $\text{SFN} \mod T = \text{FLOOR}(\frac{\text{gapOffset}}{10})$
      
      $\text{subframe} = \text{gapOffset} \mod 10$;
      
      with $T = \text{MGRP}/10$ as defined in TS 36.133 [16];

1. else:
   2. release the measurement gap configuration;

5.5.3 Performing measurements

5.5.3.1 General

For all measurements the UE applies the layer 3 filtering as specified in 5.5.3.2, before using the measured results for evaluation of reporting criteria or for measurement reporting.

The UE shall:

1. for each `measId` included in the `measIdList` within `VarMeasConfig`:
   2. if the purpose for the associated `reportConfig` is set to 'reportCGI':
      3. if `si-RequestForHO` is configured for the associated `reportConfig`:
         4. perform the corresponding measurements on the frequency and RAT indicated in the associated `measObject` using autonomous gaps as necessary;
      3. else:
         4. perform the corresponding measurements on the frequency and RAT indicated in the associated `measObject` using available idle periods or using autonomous gaps as necessary;

NOTE 1: If autonomous gaps are used to perform measurements, the UE is allowed to temporarily abort communication with the serving cell, i.e. create autonomous gaps to perform the corresponding measurements within the limits specified in TS 36.133 [16]. Otherwise, the UE only supports the measurements with the purpose set to 'reportCGI' only if E-UTRAN has provided sufficient idle periods.

3. try to acquire the global cell identity of the cell indicated by the `cellForWhichToReportCGI` in the associated `measObject` by acquiring the relevant system information from the concerned cell;

3. if the cell indicated by the `cellForWhichToReportCGI` included in the associated `measObject` is an E-UTRAN cell:
4> try to acquire the CSG identity, if the CSG identity is broadcast in the concerned cell;

4> if si-RequestForHO is not configured for the associated reportConfig:

5> try to acquire the list of additional PLMN Identities, as included in the plmn-IdentityList, if multiple PLMN identities are broadcast in the concerned cell;

NOTE 2: The 'primary' PLMN is part of the global cell identity.

3> if the cell indicated by the cellForWhichToReportCGI included in the associated measObject is a UTRAN cell:

4> try to acquire the LAC, the RAC and the list of additional PLMN Identities, if multiple PLMN identities are broadcast in the concerned cell;

4> try to acquire the CSG identity, if the CSG identity is broadcast in the concerned cell;

3> if the cell indicated by the cellForWhichToReportCGI included in the associated measObject is a GERAN cell:

4> try to acquire the RAC in the concerned cell;

3> if the cell indicated by the cellForWhichToReportCGI included in the associated measObject is a CDMA2000 cell and the cdma2000-Type included in the measObject is 'typeHRPD':

4> try to acquire the Sector ID in the concerned cell;

3> if the cell indicated by the cellForWhichToReportCGI included in the associated measObject is a CDMA2000 cell and the cdma2000-Type included in the measObject is 'type1XRTT':

4> try to acquire the BASE ID, SID and NID in the concerned cell;

2> else:

3> if a measurement gap configuration is setup; or

3> if the UE does not require measurement gaps to perform the concerned measurements:

4> if s-Measure is not configured; or

4> if s-Measure is configured and the serving cell RSRP, after layer 3 filtering, is lower than this value:

5> perform the corresponding measurements of neighbouring cells on the frequencies and RATs indicated in the concerned measObject;

4> if the ue-RxTxTimeDiffPeriodical is configured in the associated reportConfig:

5> perform the UE Rx – Tx time difference measurements on the serving cell;

2> perform the evaluation of reporting criteria as specified in 5.5.4;

NOTE 3: The 's-Measure' defines when the UE is required to perform measurements. The UE is however allowed to perform measurements also when the serving cell RSRP exceeds 's-Measure', e.g., to measure cells broadcasting a CSG identity following use of the autonomous search function as defined in TS 36.304 [4].

5.5.3.2 Layer 3 filtering

The UE shall:

1> for each measurement quantity that the UE performs measurements according to 5.5.3.1:

NOTE 1: This does not include quantities configured solely for UE Rx- Tx time difference measurements i.e. for those type of measurements the UE ignores the triggerQuantity and reportQuantity.

2> filter the measured result, before using for evaluation of reporting criteria or for measurement reporting, by the following formula:
\[ F_n = (1 - a) \cdot F_{n-1} + a \cdot M_n \]

where

- \( M_n \) is the latest received measurement result from the physical layer;
- \( F_n \) is the updated filtered measurement result, that is used for evaluation of reporting criteria or for measurement reporting;
- \( F_{n-1} \) is the old filtered measurement result, where \( F_0 \) is set to \( M_1 \) when the first measurement result from the physical layer is received; and
- \( a = \frac{1}{2^k} \), where \( k \) is the filter coefficient for the corresponding measurement quantity received by the quantityConfig.

2> adapt the filter such that the time characteristics of the filter are preserved at different input rates, observing that the filter coefficient \( k \) assumes a sample rate equal to 200 ms;

NOTE 2: If \( k \) is set to 0, no layer 3 filtering is applicable.

NOTE 3: The filtering is performed in the same domain as used for evaluation of reporting criteria or for measurement reporting, i.e., logarithmic filtering for logarithmic measurements.

NOTE 4: The filter input rate is implementation dependent, to fulfill the performance requirements set in [16]. For further details about the physical layer measurements, see TS 36.133 [16].

### 5.5.4 Measurement report triggering

#### 5.5.4.1 General

The UE shall:

1> for each measId included in the measIdList within VarMeasConfig:

2> if the corresponding reportConfig includes a purpose set to ‘reportStrongestCellsForSON’:
   
3> consider any neighbouring cell detected on the associated frequency to be applicable;

2> else if the corresponding reportConfig includes a purpose set to ‘reportCGI’:
   
3> consider any neighbouring cell detected on the associated frequency/ set of frequencies (GERAN) which has a physical cell identity matching the value of the cellForWhichToReportCGI included in the corresponding measObject within the VarMeasConfig to be applicable;

2> else:

3> if the corresponding measObject concerns E-UTRA:
   
4> if the ue-RxTxTimeDiffPeriodical, eventA1 or eventA2 is configured in the corresponding reportConfig:
   
5> consider only the serving cell to be applicable;

4> else:
   
5> consider any neighbouring cell detected on the associated frequency to be applicable when the concerned cell is not included in the blackCellsToAddModList defined within the VarMeasConfig for this measId;

3> else if the corresponding measObject concerns UTRA or CDMA2000:
   
4> consider a neighbouring cell on the associated frequency to be applicable when the concerned cell is included in the cellsToAddModList defined within the VarMeasConfig for this measId (i.e. the cell is included in the white-list);
NOTE 0: The UE may also consider a neighbouring cell on the associated UTRA frequency to be applicable when the concerned cell is included in the csg-allowedReportingCells within the VarMeasConfig for this measId, if configured in the corresponding measObjectUTRA (i.e. the cell is included in the range of physical cell identities for which reporting is allowed).

3> else if the corresponding measObject concerns GERAN:

4> consider a neighbouring cell on the associated set of frequencies to be applicable when the concerned cell matches the ncc-Permitted defined within the VarMeasConfig for this measId;

2> if the triggerType is set to 'event' and if the entry condition applicable for this event, i.e. the event corresponding with the eventId of the corresponding reportConfig within VarMeasConfig, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during timeToTrigger defined for this event within the VarMeasConfig, while the VarMeasReportList does not include an measurement reporting entry for this measId (a first cell triggers the event):

3> include a measurement reporting entry within the VarMeasReportList for this measId;

3> set the numberOfReportsSent defined within the VarMeasReportList for this measId to 0;

3> include the concerned cell(s) in the cellsTriggeredList defined within the VarMeasReportList for this measId;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the triggerType is set to 'event' and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the cellsTriggeredList defined within the VarMeasReportList for this measId for all measurements after layer 3 filtering taken during timeToTrigger defined for this event within the VarMeasConfig for this event:

3> remove the concerned cell(s) in the cellsTriggeredList defined within the VarMeasReportList for this measId;

3> if reportOnLeave is set to TRUE for the corresponding reporting configuration:

4> initiate the measurement reporting procedure, as specified in 5.5.5;

3> if the cellsTriggeredList defined within the VarMeasReportList for this measId is empty:

4> remove the measurement reporting entry within the VarMeasReportList for this measId;

4> stop the periodical reporting timer for this measId, if running;

2> if the purpose is included and set to 'reportStrongestCells' or to 'reportStrongestCellsForSON' and if a (first) measurement result is available for one or more applicable cells:

3> include a measurement reporting entry within the VarMeasReportList for this measId;

3> set the numberOfReportsSent defined within the VarMeasReportList for this measId to 0;

3> initiate the measurement reporting procedure, as specified in 5.5.5;
NOTE 1: If the purpose is set to 'reportStrongestCells', the UE initiates a first measurement report immediately after the quantity to be reported becomes available for at least either serving cell or one of the applicable cells. If the purpose is set to 'reportStrongestCellsForSON', the UE initiates a first measurement report when it has determined the strongest cells on the associated frequency.

2> upon expiry of the periodical reporting timer for this measId:

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the purpose is included and set to 'reportCGI' and if the UE acquired the information needed to set all fields of cgi-Info for the requested cell:

3> include a measurement reporting entry within the VarMeasReportList for this measId;

3> set the numberOfReportsSent defined within the VarMeasReportList for this measId to 0;

3> stop timer T321;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> upon expiry of the T321 for this measId:

3> include a measurement reporting entry within the VarMeasReportList for this measId;

3> set the numberOfReportsSent defined within the VarMeasReportList for this measId to 0;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

NOTE 2: The UE does not stop the periodical reporting with triggerType set to 'event' or to 'periodical' while the corresponding measurement is not performed due to the serving cell RSRP being equal to or better than s-Measure or due to the measurement gap not being setup.

NOTE 3: If the UE is configured with DRX, the UE may delay the measurement reporting for event triggered and periodical triggered measurements until the Active Time, which is defined in TS 36.321 [6].

5.5.4.2 Event A1 (Serving becomes better than threshold)

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A1-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A1-2, as specified below, is fulfilled;

Inequality A1-1 (Entering condition)

\[Ms - Hys > Thresh\]

Inequality A1-2 (Leaving condition)

\[Ms + Hys < Thresh\]

The variables in the formula are defined as follows:

\(Ms\) is the measurement result of the serving cell, not taking into account any offsets.

\(Hys\) is the hysteresis parameter for this event (i.e. hysteresis as defined within reportConfigEUTRA for this event).

\(Thresh\) is the threshold parameter for this event (i.e. a1-Threshold as defined within reportConfigEUTRA for this event).

\(Ms\) is expressed in dBm in case of RSRP, or in dB in case of RSRQ.

\(Hys\) is expressed in dB.

\(Thresh\) is expressed in the same unit as \(Ms\).
5.5.4.3 Event A2 (Serving becomes worse than threshold)

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A2-1, as specified below, is fulfilled;
1> consider the leaving condition for this event to be satisfied when condition A2-2, as specified below, is fulfilled;

Inequality A2-1 (Entering condition)

\[ Ms + Hys < Thresh \]

Inequality A2-2 (Leaving condition)

\[ Ms - Hys > Thresh \]

The variables in the formula are defined as follows:

- \( Ms \) is the measurement result of the serving cell, not taking into account any offsets.
- \( Hys \) is the hysteresis parameter for this event (i.e. hysteresis as defined within reportConfigEUTRA for this event).
- \( Thresh \) is the threshold parameter for this event (i.e. a2-Threshold as defined within reportConfigEUTRA for this event).

\( Ms \) is expressed in dBm in case of RSRP, or in dB in case of RSRQ.

\( Hys \) is expressed in dB.

\( Thresh \) is expressed in the same unit as \( Ms \).

5.5.4.4 Event A3 (Neighbour becomes offset better than serving)

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A3-1, as specified below, is fulfilled;
1> consider the leaving condition for this event to be satisfied when condition A3-2, as specified below, is fulfilled;

Inequality A3-1 (Entering condition)

\[ Mn + Ofn + Ocn - Hys > Ms + Ofs + Ocs + Off \]

Inequality A3-2 (Leaving condition)

\[ Mn + Ofn + Ocn + Hys < Ms + Ofs + Ocs + Off \]

The variables in the formula are defined as follows:

- \( Mn \) is the measurement result of the neighbouring cell, not taking into account any offsets.
- \( Ofn \) is the frequency specific offset of the frequency of the neighbour cell (i.e. offsetFreq as defined within measObjectEUTRA corresponding to the frequency of the neighbour cell).
- \( Ocn \) is the cell specific offset of the neighbour cell (i.e. cellIndividualOffset as defined within measObjectEUTRA corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.
- \( Ms \) is the measurement result of the serving cell, not taking into account any offsets.
- \( Ofs \) is the frequency specific offset of the serving frequency (i.e. offsetFreq as defined within measObjectEUTRA corresponding to the serving frequency).
- \( Ocs \) is the cell specific offset of the serving cell (i.e. cellIndividualOffset as defined within measObjectEUTRA corresponding to the serving frequency), and is set to zero if not configured for the serving cell.
- \( Hys \) is the hysteresis parameter for this event (i.e. hysteresis as defined within reportConfigEUTRA for this event).
**Off** is the offset parameter for this event (i.e. \textit{a3-Offset} as defined within \textit{reportConfigEUTRA} for this event).

\textit{Mn}, \textit{Ms} are expressed in dBm in case of RSRP, or in dB in case of RSRQ.

\textit{Ofn}, \textit{Ocn}, \textit{Ocs}, \textit{Hys}, \textit{Off} are expressed in dB.

### 5.5.4.5 Event A4 (Neighbour becomes better than threshold)

The UE shall:

1. consider the entering condition for this event to be satisfied when condition A4-1, as specified below, is fulfilled;
2. consider the leaving condition for this event to be satisfied when condition A4-2, as specified below, is fulfilled;

Inequality A4-1 (Entering condition)

\[ \text{Mn} + \text{Ofn} + \text{Ocn} - \text{Hys} > \text{Thresh} \]

Inequality A4-2 (Leaving condition)

\[ \text{Mn} + \text{Ofn} + \text{Ocn} + \text{Hys} < \text{Thresh} \]

The variables in the formula are defined as follows:

\textit{Mn} is the measurement result of the neighbouring cell, not taking into account any offsets.

\textit{Ofn} is the frequency specific offset of the frequency of the neighbour cell (i.e. \textit{offsetFreq} as defined within \textit{measObjectEUTRA} corresponding to the frequency of the neighbour cell).

\textit{Ocn} is the cell specific offset of the neighbour cell (i.e. \textit{cellIndividualOffset} as defined within \textit{measObjectEUTRA} corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.

\textit{Hys} is the hysteresis parameter for this event (i.e. \textit{hysteresis} as defined within \textit{reportConfigEUTRA} for this event).

\textit{Thresh} is the threshold parameter for this event (i.e. \textit{a4-Threshold} as defined within \textit{reportConfigEUTRA} for this event).

\textit{Mn} is expressed in dBm in case of RSRP, or in dB in case of RSRQ.

\textit{Ofn}, \textit{Ocn}, \textit{Hys} are expressed in dB.

\textit{Thresh} is expressed in the same unit as \textit{Ms}.

### 5.5.4.6 Event A5 (Serving becomes worse than threshold1 and neighbour becomes better than threshold2)

The UE shall:

1. consider the entering condition for this event to be satisfied when both conditions A5-1 and condition A5-2, as specified below, are fulfilled;
2. consider the leaving condition for this event to be satisfied when condition A5-3 or condition A5-4, i.e. at least one of the two, as specified below, is fulfilled;

Inequality A5-1 (Entering condition 1)

\[ \text{Ms} + \text{Hys} < \text{Thresh} \]

Inequality A5-2 (Entering condition 2)

\[ \text{Mn} + \text{Ofn} + \text{Ocn} - \text{Hys} > \text{Thresh2} \]

Inequality A5-3 (Leaving condition 1)

\[ \text{Ms} - \text{Hys} > \text{Threshl} \]
Inequality A5-4 (Leaving condition 2)

\[ M_n + O_{fn} + O_{cn} + H_{ys} < T_{hresh}\]

The variables in the formula are defined as follows:

- \( M_s \) is the measurement result of the serving cell, not taking into account any offsets.
- \( M_n \) is the measurement result of the neighbouring cell, not taking into account any offsets.
- \( O_{fn} \) is the frequency specific offset of the frequency of the neighbour cell (i.e. \( offsetFreq \) as defined within \( measObjectEUTRA \) corresponding to the frequency of the neighbour cell).
- \( O_{cn} \) is the cell specific offset of the neighbour cell (i.e. \( cellIndividualOffset \) as defined within \( measObjectEUTRA \) corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.
- \( H_{ys} \) is the hysteresis parameter for this event (i.e. \( hysteresis \) as defined within \( reportConfigEUTRA \) for this event).
- \( T_{hresh1} \) is the threshold parameter for this event (i.e. \( a5-Threshold1 \) as defined within \( reportConfigEUTRA \) for this event).
- \( T_{hresh2} \) is the threshold parameter for this event (i.e. \( a5-Threshold2 \) as defined within \( reportConfigEUTRA \) for this event).

\( M_n, M_s \) are expressed in dBm in case of RSRP, or in dB in case of RSRQ.

\( O_{fn}, O_{cn}, H_{ys} \) are expressed in dB.

\( T_{hresh1} \) is expressed in the same unit as \( M_s \).

\( T_{hresh2} \) is expressed in the same unit as \( M_n \).

5.5.4.7 Event B1 (Inter RAT neighbour becomes better than threshold)

The UE shall:

1. For UTRA and CDMA2000, only trigger the event for cells included in the corresponding measurement object;
2. Consider the entering condition for this event to be satisfied when condition B1-1, as specified below, is fulfilled;
3. Consider the leaving condition for this event to be satisfied when condition B1-2, as specified below, is fulfilled;

Inequality B1-1 (Entering condition)

\[ M_n + O_{fn} - H_{ys} > T_{hresh} \]

Inequality B1-2 (Leaving condition)

\[ M_n + O_{fn} + H_{ys} < T_{hresh} \]

The variables in the formula are defined as follows:

- \( M_n \) is the measurement result of the inter-RAT neighbour cell, not taking into account any offsets. For CDMA 2000 measurement result, \( pilotStrength \) is divided by -2.
- \( O_{fn} \) is the frequency specific offset of the frequency of the inter-RAT neighbour cell (i.e. \( offsetFreq \) as defined within the \( measObject \) corresponding to the frequency of the neighbour inter-RAT cell).
- \( H_{ys} \) is the hysteresis parameter for this event (i.e. \( hysteresis \) as defined within \( reportConfigInterRAT \) for this event).
- \( T_{hresh} \) is the threshold parameter for this event (i.e. \( b1-Threshold \) as defined within \( reportConfigInterRAT \) for this event). For CDMA2000, \( b1-Threshold \) is divided by -2.

\( M_n \) is expressed in dBm or in dB, depending on the measurement quantity of the inter-RAT neighbour cell.

\( O_{fn}, H_{ys} \) are expressed in dB.
**Thresh** is expressed in the same unit as **Mn**.

5.5.4.8 Event B2 (Serving becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2)

The UE shall:

1. for UTRA and CDMA2000, only trigger the event for cells included in the corresponding measurement object;
2. consider the entering condition for this event to be satisfied when both condition B2-1 and condition B2-2, as specified below, are fulfilled;
3. consider the leaving condition for this event to be satisfied when condition B2-3 or condition B2-4, i.e. at least one of the two, as specified below, is fulfilled;

Inequality B2-1 (Entering condition 1)

\[ M_s + Hys < \text{Thresh1} \]

Inequality B2-2 (Entering condition 2)

\[ M_n + \text{Ofn} - Hys > \text{Thresh2} \]

Inequality B2-3 (Leaving condition 1)

\[ M_s - Hys > \text{Thresh1} \]

Inequality B2-4 (Leaving condition 2)

\[ M_n + \text{Ofn} + Hys < \text{Thresh2} \]

The variables in the formula are defined as follows:

- **Ms** is the measurement result of the serving cell, not taking into account any offsets.
- **Mn** is the measurement result of the inter-RAT neighbour cell, not taking into account any offsets. For CDMA2000 measurement result, **pilotStrength** is divided by -2.
- **Ofn** is the frequency specific offset of the frequency of the inter-RAT neighbour cell (i.e. **offsetFreq** as defined within the **measObject** corresponding to the frequency of the inter-RAT neighbour cell).
- **Hys** is the hysteresis parameter for this event (i.e. **hysteresis** as defined within **reportConfigInterRAT** for this event).
- **Thresh1** is the threshold parameter for this event (i.e. **b2-Threshold1** as defined within **reportConfigInterRAT** for this event).
- **Thresh2** is the threshold parameter for this event (i.e. **b2-Threshold2** as defined within **reportConfigInterRAT** for this event). For CDMA2000, **b2-Threshold2** is divided by -2.
- **Ms** is expressed in dBm in case of RSRP, or in dB in case of RSRQ.
- **Mn** is expressed in dBm or dB, depending on the measurement quantity of the inter-RAT neighbour cell.
- **Ofn, Hys** are expressed in dB.
- **Thresh1** is expressed in the same unit as **Ms**.
- **Thresh2** is expressed in the same unit as **Mn**.
5.5.5 Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to E-UTRAN.

For the measId for which the measurement reporting procedure was triggered, the UE shall set the measResults within the MeasurementReport message as follows:

1> set the measId to the measurement identity that triggered the measurement reporting;
2> set the measResultServCell to include the quantities of serving cell;
3> if there is at least one applicable neighbouring cell to report:
4> set the measResultNeighCells to include the best neighbouring cells up to maxReportCells in accordance with the following:

   3> if the triggerType is set to 'event':
      4> include the cells included in the cellsTriggeredList as defined within the VarMeasReportList for this measId;
   3> else:
      4> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;

NOTE: The reliability of the report (i.e. the certainty it contains the strongest cells on the concerned frequency) depends on the measurement configuration i.e. the reportInterval. The related performance requirements are specified in TS 36.133 [16].

3> for each cell that is included in the measResultNeighCells, include the physCellId;
3> if the triggerType is set to 'event'; or the purpose is set to 'reportStrongestCells' or to 'reportStrongestCellsForSON':
4> for each included cell, include the layer 3 filtered measured results in accordance with the reportConfig for this measId, ordered as follows:
5> if the measObject associated with this measId concerns E-UTRA:
   5> if the measResult to include the quantity(ies) indicated in the reportQuantity within the concerned reportConfig in order of decreasing triggerQuantity, i.e. the best cell is included first;
5> else:
   6> set the measResult to the quantity as configured for the concerned RAT within the quantityConfig in order of either decreasing quantity for UTRA and GERAN or increasing quantity for CDMA2000 pilotStrength, i.e. the best cell is included first;
3> else if the purpose is set to 'reportCGI':
4> if the mandatory present fields of the cgi-Info for the cell indicated by the cellForWhichToReportCGI in the associated measObject have been obtained:
5> if the cell broadcasts a CSG identity:
6> include the csg-Identity;
6> include the csg-MemberStatus and set it to 'member' if the CSG identity is included in the UE’s CSG whitelist;
5> if the 'si-RequestForHO' is configured within the reportConfig associated with this measId:
6> include the cgi-Info containing all the fields that have been successfully acquired, except for the plmn-IdentityList;
5> else:
6> include the cgi-Info containing all the fields that have been successfully acquired;
1> if the ue-RxTxTimeDiffPeriodical is configured within the corresponding reportConfig for this measId:
2> set the ue-RxTxTimeDiffResult to the measurement result provided by lower layers;
2> set the currentSFN;
1> increment the numberOfReportsSent as defined within the VarMeasReportList for this measId by 1;
1> stop the periodical reporting timer, if running;
1> if the numberOfReportsSent as defined within the VarMeasReportList for this measId is less than the reportAmount as defined within the corresponding reportConfig for this measId:
2> start the periodical reporting timer with the value of reportInterval as defined within the corresponding reportConfig for this measId;
1> else:
2> if the triggerType is set to 'periodical':
3> remove the entry within the VarMeasReportList for this measId;
3> remove this measId from the measIdList within VarMeasConfig;
1> if the measured results are for CDMA2000 HRPD:
2> set the preRegistrationStatusHRPD to the UE’s CDMA2000 upper layer’s HRPD preRegistrationStatus;
1> if the measured results are for CDMA2000 1xRTT:
2> set the preRegistrationStatusHRPD to 'FALSE';
1> submit the MeasurementReport message to lower layers for transmission, upon which the procedure ends;

5.5.6 Measurement related actions

5.5.6.1 Actions upon handover and re-establishment

E-UTRAN applies the handover procedure as follows:

- when performing the handover procedure, as specified in 5.3.5.4, ensure that a measObjectId corresponding to the handover target carrier frequency is configured as a result of the procedures described in this sub-clause and in 5.3.5.4;

E-UTRAN applies the re-establishment procedure as follows:

- when performing the connection re-establishment procedure, as specified in 5.3.7, ensure that a measObjectId corresponding to the target carrier frequency is configured as a result of the procedure described in this sub-clause and the subsequent connection reconfiguration procedure immediately following the re-establishment procedure;
The UE shall:

1> for each measId included in the measIdList within VarMeasConfig:
   2> if the triggerType is set to 'periodical':
      3> remove this measId from the measIdList within VarMeasConfig:
1> if the procedure was triggered due to inter-frequency handover or successful re-establishment to an inter-frequency cell, update the measId values in the measIdList within VarMeasConfig as follows:
2> if a measObjectId value corresponding to the target carrier frequency exists in the measObjectList within VarMeasConfig:
   3> for each measId value in the measIdList:
      4> if the measId value is linked to the measObjectId value corresponding to the source carrier frequency:
         5> link this measId value to the measObjectId value corresponding to the target carrier frequency;
      4> else if the measId value is linked to the measObjectId value corresponding to the target carrier frequency:
         5> link this measId value to the measObjectId value corresponding to the source carrier frequency;
2> else:
   3> remove all measId values that are linked to the measObjectId value corresponding to the source carrier frequency;
1> remove all measurement reporting entries within VarMeasReportList;
1> stop the periodical reporting timer or timer T321, whichever one is running, as well as associated information (e.g. timeToTrigger) for all measId;
1> release the measurement gaps, if activated;

NOTE: If the UE requires measurement gaps to perform inter-frequency or inter-RAT measurements, the UE resumes the inter-frequency and inter-RAT measurements after the E-UTRAN has setup the measurement gaps.

5.5.6.2 Speed dependant scaling of measurement related parameters

The UE shall adjust the value of the following parameter configured by the E-UTRAN depending on the UE speed: timeToTrigger. The UE shall apply 3 different levels, which are selected as follows:

The UE shall:

1> perform mobility state detection using the mobility state detection as specified in TS 36.304 [4] with the following modifications:
   2> counting handovers instead of cell reselections;
   2> applying the parameter applicable for RRC_CONNECTED as included in speedStatePars within VarMeasConfig;
1> if high mobility state is detected:
   2> use the timeToTrigger value multiplied by sf-High within VarMeasConfig;
1> else if medium mobility state is detected:
   2> use the timeToTrigger value multiplied by sf-Medium within VarMeasConfig;
1> else
   2> no scaling is applied;
5.6 Other

5.6.1 DL information transfer

5.6.1.1 General

The purpose of this procedure is to transfer NAS or (tunnelled) non-3GPP dedicated information from E-UTRAN to a UE in RRC_CONNECTED.

5.6.1.2 Initiation

E-UTRAN initiates the DL information transfer procedure whenever there is a need to transfer NAS or non-3GPP dedicated information. E-UTRAN initiates the DL information transfer procedure by sending the DLInformationTransfer message.

5.6.1.3 Reception of the DLInformationTransfer by the UE

Upon receiving DLInformationTransfer message, the UE shall:

1> if the dedicatedInfoType is set to 'dedicatedInfoNAS':
   2> forward the dedicatedInfoNAS to the NAS upper layers.

1> if the dedicatedInfoType is set to 'dedicatedInfoCDMA2000-1XRTT' or to 'dedicatedInfoCDMA2000-HRPD':
   2> forward the dedicatedInfoCDMA2000 to the CDMA2000 upper layers;

5.6.2 UL information transfer

5.6.2.1 General

The purpose of this procedure is to transfer NAS or (tunnelled) non-3GPP dedicated information from the UE to E-UTRAN.

5.6.2.2 Initiation

A UE in RRC_CONNECTED initiates the UL information transfer procedure whenever there is a need to transfer NAS or non-3GPP dedicated information, except at RRC connection establishment in which case the NAS information is
piggybacked to the \texttt{RRConnectionSetupComplete} message. The UE initiates the UL information transfer procedure by sending the \texttt{ULInformationTransfer} message. When CDMA2000 information has to be transferred, the UE shall initiate the procedure only if SRB2 is established.

5.6.2.3 Actions related to transmission of \texttt{ULInformationTransfer} message

The UE shall set the contents of the \texttt{ULInformationTransfer} message as follows:

1. if there is a need to transfer NAS information:
   2. set the \texttt{dedicatedInfoType} to include the \texttt{dedicatedInfoNAS};
1. if there is a need to transfer CDMA2000 1XRTT information:
   2. set the \texttt{dedicatedInfoType} to include the \texttt{dedicatedInfoCDMA2000-1XRTT};
1. if there is a need to transfer CDMA2000 HRPD information:
   2. set the \texttt{dedicatedInfoType} to include the \texttt{dedicatedInfoCDMA2000-HRPD};
1. submit the \texttt{ULInformationTransfer} message to lower layers for transmission, upon which the procedure ends;

5.6.2.4 Failure to deliver \texttt{ULInformationTransfer} message

The UE shall:

1. if mobility (i.e. handover, RRC connection re-establishment) occurs before the successful delivery of \texttt{ULInformationTransfer} messages has been confirmed by lower layers:
   2. inform upper layers about the possible failure to deliver the information contained in the concerned \texttt{ULInformationTransfer} messages;

5.6.3 UE capability transfer

5.6.3.1 General

![Diagram of UE capability transfer](image)

\textbf{Figure 5.6.3.1-1: UE capability transfer}

The purpose of this procedure is to transfer UE radio access capability information from the UE to E-UTRAN.

If the UE has changed its E-UTRAN radio access capabilities, the UE shall request higher layers to initiate the necessary NAS procedures (see TS 23.401 [41]) that would result in the update of UE radio access capabilities using a new RRC connection.

\textbf{NOTE}: Change of the UE's GERAN UE radio capabilities in RRC\_IDLE is supported by use of Tracking Area Update.
5.6.3.2 Initiation

E-UTRAN initiates the procedure to a UE in RRC_CONNECTED when it needs (additional) UE radio access capability information.

5.6.3.3 Reception of the **UECapabilityEnquiry** by the UE

The UE shall:

1. set the contents of **UECapabilityInformation** message as follows:

2. if the **ue-CapabilityRequest** includes 'eutra':
   3. include the **UE-EUTRA-Capability** within a **ue-CapabilityRAT-Container** and with the **rat-Type** set to 'eutra';

2. if the **ue-CapabilityRequest** includes 'geran-cs' and if the UE supports GERAN CS domain:
   3. include the UE radio access capabilities for GERAN CS within a **ue-CapabilityRAT-Container** and with the **rat-Type** set to 'geran-cs';

2. if the **ue-CapabilityRequest** includes 'geran-ps' and if the UE supports GERAN PS domain:
   3. include the UE radio access capabilities for GERAN PS within a **ue-CapabilityRAT-Container** and with the **rat-Type** set to 'geran-ps';

2. if the **ue-CapabilityRequest** includes 'utra' and if the UE supports UTRA:
   3. include the UE radio access capabilities for UTRA within a **ue-CapabilityRAT-Container** and with the **rat-Type** set to 'utra';

2. if the **ue-CapabilityRequest** includes 'cdma2000-1XRTT' and if the UE supports CDMA2000 1xRTT:
   3. include the UE radio access capabilities for CDMA2000 within a **ue-CapabilityRAT-Container** and with the **rat-Type** set to 'cdma2000-1XRTT';

1. submit the **UECapabilityInformation** message to lower layers for transmission, upon which the procedure ends;

5.6.4 CSFB to 1x Parameter transfer

5.6.4.1 General

![Figure 5.6.4.1-1: CSFB to 1x Parameter transfer](image)

The purpose of this procedure is to transfer the CDMA2000 1xRTT parameters required to register the UE in the CDMA2000 1xRTT network for CSFB support.
5.6.4.2 Initiation
A UE in RRC_CONNECTED initiates the CSFB to 1x Parameter transfer procedure upon request from the CDMA2000 upper layers. The UE initiates the CSFB to 1x Parameter transfer procedure by sending the CSFBParametersRequestCDMA2000 message.

5.6.4.3 Actions related to transmission of CSFBParametersRequestCDMA2000 message
The UE shall:
1. submit the CSFBParametersRequestCDMA2000 message to lower layers for transmission using the current configuration;

5.6.4.4 Reception of the CSFBParametersResponseCDMA2000 message
Upon reception of the CSFBParametersResponseCDMA2000 message, the UE shall:
1. forward the rand and the mobilityParameters to the CDMA2000 1xRTT upper layers;

5.6.5 UE Information
5.6.5.1 General

![UE information procedure diagram](image)

Figure 5.6.5.1-1: UE information procedure

The UE information procedure is used by E-UTRAN to request the UE to report information.

5.6.5.2 Initiation
E-UTRAN initiates the procedure by sending the UEInformationRequest message.

5.6.5.3 Reception of the UEInformationRequest message
Upon receiving the UEInformationRequest message, the UE shall:
1. if rach-ReportReq is set to true, set the contents of the rach-Report in the UEInformationResponse message as follows:
   2. set the numberOfPreamblesSent to indicate the number of preambles sent by MAC for the last successfully completed random access procedure
   2. if contention is detected by MAC for at least one of the transmitted preambles for the last successfully completed random access procedure:
      3. set the contentionDetected to true;
   2. else:
      3. set the contentionDetected to false;
if rlf-ReportReq is set to true and there is radio link failure information available, set the contents of the rlf-Report in the UEInformationResponse message as follows:

1. set the measResultLastServCell;
2. set the measResultNeighCells to include best neighbouring cells, ordered such that the best cell is listed first, and based on measurements collected up to the moment the UE detected radio link failure;
3. if the UE was configured to perform measurements for one or more EUTRA frequencies, include the measResultListEUTRA and include the corresponding carrierFreq and measResultList;
3. if the UE was configured to perform measurement reporting for one or more neighbouring UTRA frequencies, include the measResultListUTRA and include the corresponding carrierFreq and measResultList;
3. if the UE was configured to perform measurement reporting for one or more neighbouring GERAN frequencies, include the measResultListGERAN;
3. if the UE was configured to perform measurement reporting for one or more neighbouring CDMA2000 frequencies, include the measResultsCDMA2000 and include the corresponding carrierFreq and measResultList;

NOTE The measured quantities are filtered by L3 filter as configured in mobility measurement configuration. Blacklisted cells are not required to be reported.

1. submit the UEInformationResponse message to lower layers for transmission upon which the procedure ends;

5.7 Generic error handling

5.7.1 General

The generic error handling defined in the subsequent sub-clauses applies unless explicitly specified otherwise e.g. within the procedure specific error handling.

The UE shall consider a value as not comprehended when it is set:

- to an extended value that is not defined in the version of the transfer syntax supported by the UE.
- to a spare or reserved value unless the specification defines specific behaviour that the UE shall apply upon receiving the concerned spare/ reserved value.

The UE shall consider a field as not comprehended when it is defined:

- as spare or reserved unless the specification defines specific behaviour that the UE shall apply upon receiving the concerned spare/ reserved field.

5.7.2 ASN.1 violation or encoding error

The UE shall:

1. when receiving an RRC message on the BCCH, PCCH, CCCH, or MCCH for which the abstract syntax is invalid [13]:
2. ignore the message;

NOTE This section applies in case one or more fields is set to a value, other than a spare, reserved or extended value, not defined in this version of the transfer syntax. E.g. in the case the UE receives value 12 for a field defined as INTEGER (1..11). In cases like this, it may not be possible to reliably detect which field is in the error hence the error handling is at the message level.
5.7.3 Field set to a not comprehended value

The UE shall, when receiving an RRC message on any logical channel:

1> if the message includes a field that has a value that the UE does not comprehend:
   2> if a default value is defined for this field:
      3> treat the message while using the default value defined for this field;
   2> else if the concerned field is optional:
      3> treat the message as if the field were absent and in accordance with the need code for absence of the concerned field;
   2> else:
      3> treat the message as if the field were absent and in accordance with sub-clause 5.7.4;

5.7.4 Mandatory field missing

The UE shall:

1> if the message includes a field that is mandatory to include in the message (e.g. because conditions for mandatory presence are fulfilled) and that field is absent or treated as absent:
   2> if the RRC message was received on DCCH or CCCH:
      3> ignore the message;
   2> else:
      3> if the field concerns a (sub-field of) an entry of a list (i.e. a SEQUENCE OF):  
         4> treat the list as if the entry including the missing or not comprehended field was not present;
      3> else if the field concerns a sub-field of another field, referred to as the 'parent' field i.e. the field that is one nesting level up compared to the erroneous field:
         4> consider the 'parent' field to be set to a not comprehended value;
         4> apply the generic error handling to the subsequent 'parent' field(s), until reaching the top nesting level i.e. the message level;
      3> else (field at message level):
         4> ignore the message;

NOTE: The error handling defined in these sub-clauses implies that the UE ignores a message with the message type or version set to a not comprehended value.

5.7.5 Not comprehended field

The UE shall, when receiving an RRC message on any logical channel:

1> if the message includes a field that the UE does not comprehend:
   2> treat the rest of the message as if the field was absent;

NOTE: This section does not apply to the case of an extension to the value range of a field. Such cases are addressed instead by the requirements in section 5.7.3.
5.8 MBMS

5.8.1 Introduction

5.8.1.1 General

In general the control information relevant only for UEs supporting MBMS is separated as much as possible from unicast control information. Most of the MBMS control information is provided on a logical channel specific for MBMS common control information: the MCCH. E-UTRA employs one MCCH logical channel per MBSFN area. In case the network configures multiple MBSFN areas, the UE acquires the MBMS control information from the MCCHs that are configured to identify if services it is interested to receive are ongoing. The action applicable when the UE is unable to simultaneously receive MBMS and unicast services is up to UE implementation. In this release of the specification, an MBMS capable UE is only required to support reception of a single MBMS service at a time, and reception of more than one MBMS service (also possibly on more than one MBSFN area) in parallel is left for UE implementation. The MCCH carries a single message, the MBSFNAreaConfiguration message, which indicates the MBMS sessions that are ongoing as well as the (corresponding) radio resource configuration.

A limited amount of MBMS control information is provided on the BCCH. This primarily concerns the information needed to acquire the MCCH(s). This information is carried by means of a single MBMS specific SystemInformationBlock: SystemInformationBlockType13. An MBSFN area is identified solely by the mbsfn-AreaId in SystemInformationBlockType13. At mobility, the UE considers that the MBSFN area is continuous when the source cell and the target cell broadcast the same value in the mbsfn-AreaId.

5.8.1.2 Scheduling

The MCCH information is transmitted periodically, using a configurable repetition period. Scheduling information is not provided for MCCH i.e. both the time domain scheduling as well as the lower layer configuration are semi-statically configured, as defined within SystemInformationBlockType13.

For MBMS user data, which is carried by the MTCH logical channel, E-UTRAN periodically provides MCH scheduling information (MSI) at lower layers (MAC). This MCH information only concerns the time domain scheduling i.e. the frequency domain scheduling and the lower layer configuration are semi-statically configured. The periodicity of the MSI is configurable and defined by the MCH scheduling period.

5.8.1.3 MCCH information validity and notification of changes

Change of MCCH information only occurs at specific radio frames, i.e. the concept of a modification period is used. Within a modification period, the same MCCH information may be transmitted a number of times, as defined by its scheduling (which is based on a repetition period). The modification period boundaries are defined by SFN values for which SFN mod \( m = 0 \), where \( m \) is the number of radio frames comprising the modification period. The modification period is configured by means of SystemInformationBlockType13.

When the network changes (some of) the MCCH information, it notifies the UEs about the change during a first modification period. In the next modification period, the network transmits the updated MCCH information. These general principles are illustrated in figure 5.8.1.3-1, in which different colours indicate different MCCH information. Upon receiving a change notification, a UE interested to receive MBMS services acquires the new MCCH information immediately from the start of the next modification period. The UE applies the previously acquired MCCH information until the UE acquires the new MCCH information.

![Figure 5.8.1.3-1: Change of MCCH Information](image-url)
Indication of an MBMS specific RNTI, the M-RNTI (see TS 36.321 [6]), on PDCCH is used to inform UEs in RRC_IDLE and UEs in RRC_CONNECTED about an MCCH information change. When receiving an MCCH information change notification, the UE knows that the MCCH information will change at the next modification period boundary. The notification on PDCCH indicates which of the MCCHs will change, which is done by means of an 8-bit bitmap. Within this bitmap, the bit at the position indicated by the field \textit{notificationIndicator} is used to indicate changes for that MBSFN area: if the bit is set to “1”, the corresponding MCCH will change. No further details are provided e.g. regarding which MCCH information will change. The MCCH information change notification is used only to inform the UE about a change of MCCH information upon session start.

The MCCH information change notifications on PDCCH are transmitted periodically and are carried on MBSFN subframes only. These MCCH information change notification occasions are common for all MCCHs that are configured, and configurable by parameters included in \textit{SystemInformationBlockType13}: a repetition coefficient, a radio frame offset and a subframe index. These common notification occasions are based on the MCCH with the shortest modification period.

\textbf{NOTE 1:} E-UTRAN may modify the MBMS configuration information provided on MCCH at the same time as updating the MBMS configuration information carried on BCCH i.e. at a coinciding BCCH and MCCH modification period. Upon detecting that a new MCCH is configured on BCCH, a UE interested to receive one or more MBMS services should acquire the MCCH, unless it knows that the services it is interested in are not provided by the corresponding MBSFN area.

A UE that is receiving an MBMS service shall acquire the MCCH information from the start of each modification period. A UE that is not receiving an MBMS service, as well as UEs that are receiving an MBMS service but potentially interested to receive other services not started yet in another MBSFN area, shall verify that the stored MCCH information remains valid by attempting to find the MCCH information change notification at least \textit{notificationRepetitionCoeff} times during the modification period of the applicable MCCH(s), if no MCCH information change notification is received.

\textbf{NOTE 2:} In case the UE is aware which MCCH(s) E-UTRAN uses for the service(s) it is interested to receive, the UE may only need to monitor change notifications for a subset of the MCCHs that are configured, referred to as the ‘applicable MCCH(s)’ in the above.

\section*{5.8.2 MCCH information acquisition}

\subsection*{5.8.2.1 General}

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{MCCH_information_acquisition.png}
\caption{MCCH information acquisition}
\end{figure}

The UE applies the MCCH information acquisition procedure to acquire the MBMS control information that is broadcasted by the E-UTRAN. The procedure applies to MBMS capable UEs that are in RRC_IDLE or in RRC_CONNECTED.

\subsection*{5.8.2.2 Initiation}

A UE interested to receive MBMS services shall apply the MCCH information acquisition procedure upon entering the corresponding MBSFN area (e.g. upon power on, following UE mobility) and upon receiving a notification that the MCCH information has changed. A UE that is receiving an MBMS service shall apply the MCCH information acquisition procedure to acquire the MCCH, that corresponds with the service that is being received, at the start of each modification period.

Unless explicitly stated otherwise in the procedural specification, the MCCH information acquisition procedure overwrites any stored MCCH information, i.e. delta configuration is not applicable for MCCH information and the UE discontinues using a field if it is absent in MCCH information unless explicitly specified otherwise.
5.8.2.3 MCCH information acquisition by the UE

An MBMS capable UE shall:

1> if the procedure is triggered by a MCCH information change notification:
   2> start acquiring the *MBSFNAreaConfiguration* message from the beginning of the modification period
      following the one in which the change notification was received;

   NOTE 1: The UE continues using the previously received MCCH information until the new MCCH information
   has been acquired.

1> if the UE enters an MBSFN area:
   2> acquire the *MBSFNAreaConfiguration* message at the next repetition period;

1> if the UE is receiving an MBMS service:
   2> start acquiring the *MBSFNAreaConfiguration* message, that corresponds with the service that is being
      received, from the beginning of each modification period;

5.8.2.4 Actions upon reception of the *MBSFNAreaConfiguration* message

No UE requirements related to the contents of this *MBSFNAreaConfiguration* apply other than those specified
elsewhere e.g. within procedures using the concerned system information, the corresponding field descriptions.

5.8.3 MBMS PTM radio bearer configuration

5.8.3.1 General

The MBMS PTM radio bearer configuration procedure is used by the UE to configure RLC, MAC and the physical
layer upon starting and or stopping to receive a MRB. The procedure applies to UEs interested to receive one or more
MBMS services.

   NOTE: In case the UE is unable to receive an MBMS service due to capability limitations, upper layers may take
   appropriate action e.g. terminate a lower priority unicast service.

5.8.3.2 Initiation

The UE applies the MRB establishment procedure to start receiving a session of a service it has an interest in. The
procedure may be initiated e.g. upon start of the MBMS session, upon (re-)entry of the corresponding MBSFN service
area, upon becoming interested in the MBMS service, upon removal of UE capability limitations inhibiting reception of
the concerned service.

The UE applies the MRB release procedure to stop receiving a session. The procedure may be initiated e.g. upon stop of
the MBMS session, upon leaving the corresponding MBSFN service area, upon losing interest in the MBMS service,
when capability limitations start inhibiting reception of the concerned service.

5.8.3.3 MRB establishment

Upon MRB establishment, the UE shall:

1> establish an RLC entity in accordance with the configuration specified in 9.1.1.4;

1> configure an MTCH logical channel in accordance with the received *logicalChannelIdentity*, applicable for the
   MRB, as included in the *MBSFNAreaConfiguration* message;

1> configure the physical layer in accordance with the *pmch-Config*, applicable for the MRB, as included in the
   *MBSFNAreaConfiguration* message;

1> inform upper layers about the establishment of the MRB by indicating the corresponding *tmgi* and *sessionId*;
5.8.3.4 MRB release

Upon MRB release, the UE shall:

1> release the RLC entity as well as the related MAC and physical layer configuration;

1> inform upper layers about the release of the MRB by indicating the corresponding tmgi and sessionId;

6 Protocol data units, formats and parameters (tabular & ASN.1)

6.1 General

The contents of each RRC message is specified in sub-clause 6.2 using ASN.1 to specify the message syntax and using tables when needed to provide further detailed information about the information elements specified in the message syntax. The syntax of the information elements that are defined as stand-alone abstract types is further specified in a similar manner in sub-clause 6.3.

The need for information elements to be present in a message or an abstract type, i.e., the ASN.1 fields that are specified as OPTIONAL in the abstract notation (ASN.1), is specified by means of comment text tags attached to the OPTIONAL statement in the abstract syntax. All comment text tags are available for use in the downlink direction only. The meaning of each tag is specified in table 6.1-1.

Table 6.1-1: Meaning of abbreviations used to specify the need for information elements to be present

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cond conditionTag (Used in downlink only)</td>
<td>Conditionally present An information element for which the need is specified by means of conditions. For each conditionTag, the need is specified in a tabular form following the ASN.1 segment. In case, according to the conditions, a field is not present, the UE takes no action and where applicable shall continue to use the existing value (and/ or the associated functionality) unless explicitly stated otherwise in the description of the field itself.</td>
</tr>
<tr>
<td>Need OP (Used in downlink only)</td>
<td>Optionally present An information element that is optional to signal. For downlink messages, the UE is not required to take any special action on absence of the IE beyond what is specified in the procedural text or the field description table following the ASN.1 segment. The UE behaviour on absence should be captured either in the procedural text or in the field description.</td>
</tr>
<tr>
<td>Need ON (Used in downlink only)</td>
<td>Optionally present, No action An information element that is optional to signal. If the message is received by the UE, and in case the information element is absent, the UE takes no action and where applicable shall continue to use the existing value (and/ or the associated functionality).</td>
</tr>
<tr>
<td>Need OR (Used in downlink only)</td>
<td>Optionally present, Release An information element that is optional to signal. If the message is received by the UE, and in case the information element is absent, the UE shall discontinue/ stop using/ delete any existing value (and/ or the associated functionality).</td>
</tr>
</tbody>
</table>

Any IE with Need ON in system information shall be interpreted as Need OR.

Need codes may not be specified for a group, used in downlink, which includes one or more extensions. Upon absence of such a field, the UE shall:

- For each individual extension, including extensions that are mandatory to include in the optional group, act in accordance with the need code that is defined for the extension;

- Apply this behaviour not only for extensions included directly within the optional field, but also for extensions defined at further nesting levels;

NOTE: The above applies for groups of non critical extensions using double brackets, as well as non-critical extensions at the end of a message or at the end of a structure contained in a BIT STRING or OCTET STRING.
6.2 RRC messages

NOTE: The messages included in this section reflect the current status of the discussions. Additional messages may be included at a later stage.

6.2.1 General message structure

– EUTRA-RRC-Definitions

This ASN.1 segment is the start of the E-UTRA RRC PDU definitions.

```
-- ASN1START
EUTRA-RRC-Definitions DEFINITIONS AUTOMATIC TAGS ::= BEGIN
-- ASN1STOP
```

– BCCH-BCH-Message

The BCCH-BCH-Message class is the set of RRC messages that may be sent from the E-UTRAN to the UE via BCH on the BCCH logical channel.

```
-- ASN1START
BCCH-BCH-Message ::= SEQUENCE {
    message     BCCH-BCH-MessageType
}
BCCH-BCH-MessageType ::= MasterInformationBlock
-- ASN1STOP
```

– BCCH-DL-SCH-Message

The BCCH-DL-SCH-Message class is the set of RRC messages that may be sent from the E-UTRAN to the UE via DL-SCH on the BCCH logical channel.

```
-- ASN1START
BCCH-DL-SCH-Message ::= SEQUENCE {
    message     BCCH-DL-SCH-MessageType
}
BCCH-DL-SCH-MessageType ::= CHOICE {
    c1      CHOICE {
        systemInformation      SystemInformation,
        systemInformationBlockType1    SystemInformationBlockType1
    },
    messageClassExtension SEQUENCE {}
}
-- ASN1STOP
```

– MCCH-Message

The MCCH-Message class is the set of RRC messages that may be sent from the E-UTRAN to the UE on the MCCH logical channel.

```
-- ASN1START
MCCH-Message ::= SEQUENCE {
    message     MCCH-MessageType
}
-- ASN1STOP
```
PCCH-Message

The `PCCH-Message` class is the set of RRC messages that may be sent from the E-UTRAN to the UE on the PCCH logical channel.

```
PCCH-Message ::= SEQUENCE {
  message     PCCH-MessageType
}
```

```
PCCH-MessageType ::= CHOICE {
  c1      CHOICE {
    paging         Paging
  }
  messageClassExtension SEQUENCE {}
}
```

DL-CCCH-Message

The `DL-CCCH-Message` class is the set of RRC messages that may be sent from the E-UTRAN to the UE on the downlink CCCH logical channel.

```
DL-CCCH-Message ::= SEQUENCE {
  message     DL-CCCH-MessageType
}
```

```
DL-CCCH-MessageType ::= CHOICE {
  c1      CHOICE {
    rrcConnectionReestablishment   RRCConnectionReestablishment,
    rrcConnectionReestablishmentReject   RRCConnectionReestablishmentReject,
    rrcConnectionReject      RRCConnectionReject,
    rrcConnectionSetup      RRCConnectionSetup
  }
  messageClassExtension SEQUENCE {}
}
```

DL-DCCH-Message

The `DL-DCCH-Message` class is the set of RRC messages that may be sent from the E-UTRAN to the UE on the downlink DCCH logical channel.

```
DL-DCCH-Message ::= SEQUENCE {
  message     DL-DCCH-MessageType
}
```

```
DL-DCCH-MessageType ::= CHOICE {
  c1      CHOICE {
    csfbParametersResponseCDMA2000   CSFBParametersResponseCDMA2000,
    dlInformationTransfer     DLInformationTransfer,
    handoverFromEUTRAPreparationRequest  HandoverFromEUTRAPreparationRequest,
  }
  messageClassExtension SEQUENCE {}
}
```
The **UL-CCH-Message** class is the set of RRC messages that may be sent from the UE to the E-UTRAN on the uplink CCCH logical channel.

```asn
UL-CCH-Message ::= SEQUENCE {
    message     UL-CCH-MessageType
}
UL-CCH-MessageType ::= CHOICE {
    c1      CHOICE {
        rrcConnectionReestablishmentRequest  RRCConnectionReestablishmentRequest,
        rrcConnectionRequest     RRCConnectionRequest
    },
    messageClassExtension SEQUENCE {}
}
-- ASN1STOP
```

The **UL-DCCH-Message** class is the set of RRC messages that may be sent from the UE to the E-UTRAN on the uplink DCCH logical channel.

```asn
UL-DCCH-Message ::= SEQUENCE {
    message     UL-DCCH-MessageType
}
UL-DCCH-MessageType ::= CHOICE {
    c1      CHOICE {
        csfbParametersRequestCDMA2000   CSFBParametersRequestCDMA2000,
        measurementReport      MeasurementReport,
        rrcConnectionReconfigurationComplete RRCConnectionReconfigurationComplete,
        rrcConnectionSetupComplete    RRCConnectionSetupComplete,
        securityModeComplete     SecurityModeComplete,
        securityModeFailure      SecurityModeFailure,
        ueCapabilityInformation     UECapabilityInformation,
        ulHandoverPreparationTransfer ulHandoverPreparationTransfer,
        ulInformationTransfer     ULInformationTransfer,
        counterCheckResponse      CounterCheckResponse,
        ueInformationResponse-r9     UEInformationResponse-r9,
        proximityIndication-r9     ProximityIndication-r9,
    },
    messageClassExtension SEQUENCE {}
}
-- ASN1STOP
```
6.2.2 Message definitions

---

CounterCheck

The CounterCheck message is used by the E-UTRAN to indicate the current COUNT MSB values associated to each DRB and to request the UE to compare these to its COUNT MSB values and to report the comparison results to E-UTRAN.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

**CounterCheck message**

```asn1
CounterCheck ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1               CHOICE {
      counterCheck-r8      CounterCheck-r8-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}
  }
}

CounterCheck-r8-IEs ::= SEQUENCE {
  drb-CountMSB-InfoList    DRB-CountMSB-InfoList,
  nonCriticalExtension    CounterCheck-v8a0-IEs       OPTIONAL
}

CounterCheck-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL, -- Need OP
  nonCriticalExtension    SEQUENCE {}       OPTIONAL -- Need OP
}

DRB-CountMSB-InfoList ::= SEQUENCE (SIZE (1..maxDRB)) OF DRB-CountMSB-Info

DRB-CountMSB-Info ::= SEQUENCE {
  drb-Identity     DRB-Identity,
  countMSB-Uplink    INTEGER(0..33554431),
  countMSB-Downlink   INTEGER(0..33554431)
}
```

---

**CounterCheck field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>drb-CountMSB-InfoList</code></td>
<td>Indicates the MSBs of the COUNT values of the DRBs.</td>
</tr>
<tr>
<td><code>count-MSB-Uplink</code></td>
<td>Indicates the value of 25 MSBs from uplink COUNT associated to this DRB.</td>
</tr>
<tr>
<td><code>count-MSB-Downlink</code></td>
<td>Indicates the value of 25 MSBs from downlink COUNT associated to this DRB.</td>
</tr>
</tbody>
</table>
CounterCheckResponse

The CounterCheckResponse message is used by the UE to respond to a CounterCheck message.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

**CounterCheckResponse message**

```asn1
CounterCheckResponse ::= SEQUENCE {
    rrc-TransactionIdentifier   RRC-TransactionIdentifier,
    criticalExtensions     CHOICE {
        counterCheckResponse-r8    CounterCheckResponse-r8-IEs,
        criticalExtensionsFuture   SEQUENCE {}      
    }
}

CounterCheckResponse-r8-IEs ::= SEQUENCE {
    drb-CountInfoList     DRB-CountInfoList,
    nonCriticalExtension    CounterCheckResponse-v8a0-IEs

    OPTIONAL
}

CounterCheckResponse-v8a0-IEs ::= SEQUENCE {
    lateNonCriticalExtension   OCTET STRING      OPTIONAL,
    nonCriticalExtension    SEQUENCE {}       OPTIONAL
}

DRB-CountInfoList ::= SEQUENCE (SIZE (0..maxDRB)) OF DRB-CountInfo

DRB-CountInfo ::= SEQUENCE {
    drb-Identity     DRB-Identity,
    count-Uplink     INTEGER(0..4294967295),
    count-Downlink     INTEGER(0..4294967295)
}
```

---

**CounterCheckResponse field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>drb-CountInfoList</td>
<td>Indicates the COUNT values of the DRBs.</td>
</tr>
<tr>
<td>count-Uplink</td>
<td>Indicates the value of uplink COUNT associated to this DRB.</td>
</tr>
<tr>
<td>count-Downlink</td>
<td>Indicates the value of downlink COUNT associated to this DRB.</td>
</tr>
</tbody>
</table>

---

CSFBParametersRequestCDMA2000

The CSFBParametersRequestCDMA2000 message is used by the UE to obtain the CDMA2000 1xRTT Parameters from the network. The UE needs these parameters to generate the CDMA2000 1xRTT Registration message used to register with the CDMA2000 1xRTT Network which is required to support CSFB to CDMA2000 1xRTT.
Signalling radio bearer: SRB1
RLC-SAP: AM
Logical channel: DCCH
Direction: UE to E-UTRAN

CSFBParametersRequestCDMA2000 message

-- ASN1START
CSFBParametersRequestCDMA2000 ::= SEQUENCE {
    criticalExtensions CHOICE {
        csfbParametersRequestCDMA2000-r8 CSFBParametersRequestCDMA2000-r8-IEs,
        criticalExtensionsFuture SEQUENCE {}
    }
}
CSFBParametersRequestCDMA2000-r8-IEs ::= SEQUENCE {
    nonCriticalExtension CSFBParametersRequestCDMA2000-v8a0-IEs OPTIONAL
}
CSFBParametersRequestCDMA2000-v8a0-IEs ::= SEQUENCE {
    lateNonCriticalExtension OCTET STRING OPTIONAL,
    nonCriticalExtension SEQUENCE {} OPTIONAL
}
-- ASN1STOP

CSFBParametersResponseCDMA2000

The CSFBParametersResponseCDMA2000 message is used to provide the CDMA2000 1xRTT Parameters to the UE so the UE can register with the CDMA2000 1xRTT Network to support CSFB to CDMA2000 1xRTT.

Signalling radio bearer: SRB1
RLC-SAP: AM
Logical channel: DCCH
Direction: E-UTRAN to UE

CSFBParametersResponseCDMA2000 message

-- ASN1START
CSFBParametersResponseCDMA2000 ::= SEQUENCE {
    rrc-TransactionIdentifier RRC-TransactionIdentifier,
    criticalExtensions CHOICE {
        csfbParametersResponseCDMA2000-r8 CSFBParametersResponseCDMA2000-r8-IEs,
        criticalExtensionsFuture SEQUENCE {}
    }
}
CSFBParametersResponseCDMA2000-r8-IEs ::= SEQUENCE {
    rand RAND-CDMA2000,
    mobilityParameters MobilityParametersCDMA2000,
    nonCriticalExtension CSFBParametersResponseCDMA2000-v8a0-IEs OPTIONAL
}
CSFBParametersResponseCDMA2000-v8a0-IEs ::= SEQUENCE {
    lateNonCriticalExtension OCTET STRING OPTIONAL, -- Need OF
    nonCriticalExtension SEQUENCE {} OPTIONAL -- Need OF
}
-- ASN1STOP
**DLInformationTransfer**

The *DLInformationTransfer* message is used for the downlink transfer of dedicated NAS information.

- Signalling radio bearer: SRB2 or SRB1 (only if SRB2 not established yet. If SRB2 is suspended, E-UTRAN does not send this message until SRB2 is resumed.)
- RLC-SAP: AM
- Logical channel: DCCH
- Direction: E-UTRAN to UE

### DLInformationTransfer message

```asn1
DLInformationTransfer ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1         CHOICE {
      dlInformationTransfer-r8   DLInformationTransfer-r8-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}
  }
}

DLInformationTransfer-r8-IEs ::= SEQUENCE {
  dedicatedInfoType     CHOICE {
    dedicatedInfoNAS     DedicatedInfoNAS,
    dedicatedInfoCDMA2000-1XRTT   DedicatedInfoCDMA2000,
    dedicatedInfoCDMA2000-HPRD   DedicatedInfoCDMA2000
  },
  nonCriticalExtension    DLInformationTransfer-v8a0-IEs      OPTIONAL
}

DLInformationTransfer-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL, -- Need OP
  nonCriticalExtension    SEQUENCE {}       OPTIONAL -- Need OP
}
```

---

**HandoverFromEUTRAPreparationRequest (CDMA2000)**

The *HandoverFromEUTRAPreparationRequest* message is used to trigger the handover preparation procedure with a CDMA2000 RAT. This message is also used to trigger a tunneled preparation procedure with a CDMA2000 1xRTT RAT to obtain traffic channel resources for the enhanced CS fallback to CDMA2000 1xRTT, which may also involve a concurrent preparation for handover to CDMA2000 HRPD.

- Signalling radio bearer: SRB1
- RLC-SAP: AM
- Logical channel: DCCH
- Direction: E-UTRAN to UE

### HandoverFromEUTRAPreparationRequest message

```asn1
HandoverFromEUTRAPreparationRequest ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1         CHOICE {
      handoverFromEUTRAPreparationRequest-r8     HandoverFromEUTRAPreparationRequest-r8-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    }
  }
}
```

---
HandoverFromEUTRAPreparationRequest-r8-IEs ::= SEQUENCE {
  cdma2000-Type CDMA2000-Type,
  rand       RAND-CDMA2000    OPTIONAL,  -- Cond cdma2000-Type
  mobilityParameters MobilityParametersCDMA2000 OPTIONAL,  -- Cond cdma2000-Type
  nonCriticalExtension HandoverFromEUTRAPreparationRequest-v890-IEs OPTIONAL
}

HandoverFromEUTRAPreparationRequest-v890-IEs ::= SEQUENCE {
  lateNonCriticalExtension OCTET STRING    OPTIONAL, -- Need OP
  nonCriticalExtension HandoverFromEUTRAPreparationRequest-v920-IEs OPTIONAL
}

HandoverFromEUTRAPreparationRequest-v920-IEs ::= SEQUENCE {
  concurrPrepCDMA2000-HRPD-r9 BOOLEAN      OPTIONAL, -- Cond cdma2000-Type
  nonCriticalExtension SEQUENCE {}     OPTIONAL -- Need OP
}

-- ASN1STOP

---

**HandoverFromEUTRAPreparationRequest field descriptions**

**concurrPrepCDMA2000-HRPD**

Value TRUE indicates that upper layers should initiate concurrent preparation for handover to CDMA2000 HRPD in addition to preparation for enhanced CS fallback to CDMA2000 1xRTT.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>cdma2000-Type</td>
<td>The field is mandatory present if the cdma2000-Type = type1XRTT; otherwise it is not present.</td>
</tr>
</tbody>
</table>

---

**MasterInformationBlock**

The *MasterInformationBlock* includes the system information transmitted on BCH.

- Signalling radio bearer: N/A
- RLC-SAP: TM
- Logical channel: BCCH
- Direction: E-UTRAN to UE

---

---

**MasterInformationBlock**

---

---

---
### MasterInformationBlock field descriptions

**dl-Bandwidth**
Parameter: transmission bandwidth configuration, NRB in downlink, see TS 36.101 [42, table 5.6-1]. n6 corresponds to 6 resource blocks, n15 to 15 resource blocks and so on.

**systemFrameNumber**
Defines the 8 most significant bits of the SFN. As indicated in TS 36.211 [21, 6.6.1], the 2 least significant bits of the SFN are acquired implicitly in the P-BCH decoding, i.e. timing of 40ms P-BCH TTI indicates 2 least significant bits (within 40ms P-BCH TTI, the first radio frame: 00, the second radio frame: 01, the third radio frame: 10, the last radio frame: 11).

---

### MBSFNAreaConfiguration

The **MBSFNAreaConfiguration** message contains the MBMS control information applicable for an MBSFN area. E-UTRAN configures an MCCH for each MBSFN area i.e. the MCCH identifies the MBSFN area.

- Signalling radio bearer: N/A
- RLC-SAP: UM
- Logical channel: MCCH
- Direction: E-UTRAN to UE

**MBSFNAreaConfiguration message**

```asn1
MBSFNAreaConfiguration-r9 ::= SEQUENCE {
  commonSF-Alloc-r9     CommonSF-AllocPatternList-r9,
  commonSF-AllocPeriod-r9    ENUMERATED {
    rf4, rf8, rf16, rf32, rf64, rf128, rf256},
  pmch-InfoList-r9     PMCH-InfoList-r9,
  nonCriticalExtension    MBSFNAreaConfiguration-v930-IEs   OPTIONAL
}

MBSFNAreaConfiguration-v930-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL, -- Need OP
  nonCriticalExtension    SEQUENCE {}       OPTIONAL -- Need OP
}

CommonSF-AllocPatternList-r9 ::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig
```

---

### MBSFNAreaConfiguration field descriptions

**commonSF-Alloc**
Indicates the subframes allocated to the MBSFN area

**commonSF-AllocPeriod**
Indicates the period during which resources corresponding with field commonSF-Alloc are divided between the (P)MCH that are configured for this MBSFN area. The subframe allocation patterns, as defined by commonSF-Alloc, repeat continuously during this period. Value rf4 corresponds to 4 radio frames, rf8 corresponds to 8 radio frames and so on.

---

### MeasurementReport

The **MeasurementReport** message is used for the indication of measurement results.
Signalling radio bearer: SRB1
RLC-SAP: AM
Logical channel: DCCH
Direction: UE to E-UTRAN

**MeasurementReport message**

```
MeasurementReport ::= SEQUENCE {
  criticalExtensions     CHOICE {
    c1         CHOICE{
      measurementReport-r8    MeasurementReport-r8-IEs,
      spare7 NULL,
      spare6 NULL, spare5 NULL, spare4 NULL,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}
  }
}
MeasurementReport-r8-IEs ::=  SEQUENCE {
  measResults       MeasResults,
  nonCriticalExtension    MeasurementReport-v8a0-IEs       OPTIONAL
}
MeasurementReport-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL,
  nonCriticalExtension    SEQUENCE {}       OPTIONAL
}
```

**MobilityFromEUTRACommand**

The MobilityFromEUTRACommand message is used to command handover or a cell change from E-UTRA to another RAT (3GPP or non-3GPP), or enhanced CS fallback to CDMA2000 1xRTT.

Signalling radio bearer: SRB1
RLC-SAP: AM
Logical channel: DCCH
Direction: E-UTRAN to UE

**MobilityFromEUTRACommand message**

```
MobilityFromEUTRACommand ::=  SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1         CHOICE{
      mobilityFromEUTRACommand-r8   MobilityFromEUTRACommand-r8-IEs,
      mobilityFromEUTRACommand-r9   MobilityFromEUTRACommand-r9-IEs,
      spare2 NULL, spare1  NULL
    },
    criticalExtensionsFuture   SEQUENCE {}
  }
}
MobilityFromEUTRACommand-r8-IEs ::= SEQUENCE {
  cs-FallbackIndicator    BOOLEAN,
  purpose        CHOICE{
    handover       Handover,
    cellChangeOrder   CellChangeOrder
  }
}
nonCriticalExtension MobilityFromEUTRACommand-v8a0-IEs
   OPTIONAL
}

MobilityFromEUTRACommand-v8a0-IEs ::= SEQUENCE {
   lateNonCriticalExtension OCTET STRING OPTIONAL, -- Need OP
   nonCriticalExtension MobilityFromEUTRACommand-v8d0-IEs OPTIONAL
}

MobilityFromEUTRACommand-v8d0-IEs ::= SEQUENCE {
   bandIndicator BandIndicatorGERAN OPTIONAL, -- Cond GERAN
   nonCriticalExtension SEQUENCE {} OPTIONAL -- Need OP
}

MobilityFromEUTRACommand-v930-IEs ::= SEQUENCE {
   cs-FallbackIndicator BOOLEAN,
   purpose CHOICE {
      handover Handover,
      cellChangeOrder CellChangeOrder,
      e-CSFB-r9 E-CSFB-r9,
      ...
   },
   nonCriticalExtension MobilityFromEUTRACommand-v930-IEs OPTIONAL
}

MobilityFromEUTRACommand-v960-IEs ::= SEQUENCE {
   bandIndicator BandIndicatorGERAN OPTIONAL, -- Cond GERAN
   nonCriticalExtension SEQUENCE {} OPTIONAL -- Need OP
}

Handover ::= SEQUENCE {
   targetRAT-Type ENUMERATED {
      utra, geran, cdma2000-1xRTT, cdma2000-HRPD,
      spare4, spare3, spare2, spare1, ...},
   targetRAT-MessageContainer OCTET STRING,
   nas-SecurityParamFromEUTRA OCTET STRING (SIZE (1)) OPTIONAL, -- Cond UTRANGERAN
   systemInformation SI-OrPSI-GERAN OPTIONAL -- Cond PSKHO
}

CellChangeOrder ::= SEQUENCE {
   t304 ENUMERATED {
      ms100, ms200, ms500, ms1000,
      ms2000, ms4000, ms8000, spare1},
   targetRAT-Type CHOICE {
      geran SEQUENCE {
         physCellId PhysCellIdGERAN,
         carrierFreq CarrierFreqGERAN,
         networkControlOrder BIT STRING (SIZE (2)) OPTIONAL, -- Need OP
         systemInformation SI-OrPSI-GERAN OPTIONAL -- Need OP
      },
      ...
   },
   ...
},

SI-OrPSI-GERAN ::= CHOICE {
   si SystemInfoListGERAN,
   psi SystemInfoListGERAN
}

E-CSFB-r9 ::= SEQUENCE {
   messageContCDMA2000-1xRTT-r9 OCTET STRING OPTIONAL, -- Need ON
   mobilityCDMA2000-HRPD-r9 ENUMERATED {
      handover, redirection...
   } OPTIONAL, -- Need OP
   messageContCDMA2000-HRPD-r9 OCTET STRING OPTIONAL, -- Cond concHO
   redirectCarrierCDMA2000-HRPD-r9 CarrierFreqCDMA2000 OPTIONAL -- Cond concRedir
}

-- ASN1STOP
### MobilityFromEUTRACmd field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>t304</strong></td>
<td>Timer T304 as described in section 7.3. Value (ms100) corresponds with 100 ms, (ms200) corresponds with 200 ms and so on.</td>
</tr>
<tr>
<td><strong>cs-FallbackIndicator</strong></td>
<td>Value ‘true’ indicates that the CS Fallback procedure to UTRAN or GERAN is triggered.</td>
</tr>
<tr>
<td><strong>purpose</strong></td>
<td>Indicates which type of mobility procedure the UE is requested to perform. EUTRAN always applies value e-CSFB in case of enhanced CS fallback to CDMA2000 (e.g. also when that procedure results in handover to CDMA2000 1XRTT only, in handover to CDMA2000 HRPD only or in redirection to CDMA2000 HRPD only).</td>
</tr>
<tr>
<td><strong>bandIndicator</strong></td>
<td>Indicates how to interpret the ARFCN of the BCCH carrier.</td>
</tr>
<tr>
<td><strong>targetRAT-Type</strong></td>
<td>Indicates the target RAT type.</td>
</tr>
<tr>
<td><strong>targetRAT-MessageContainer</strong></td>
<td>The field contains a message specified in another standard, as indicated by the <strong>targetRAT-Type</strong>, and carries information about the target cell identifier(s) and radio parameters relevant for the target radio access technology. NOTE 1.</td>
</tr>
<tr>
<td><strong>nas-SecurityParamFromEUTRA</strong></td>
<td>Used to deliver the key synchronisation and Key freshness for the E-UTRAN to UTRAN handovers as specified in TS 33.401. The content of the parameter is defined in TS24.301.</td>
</tr>
<tr>
<td><strong>carrierFreq</strong></td>
<td>Contains the carrier frequency of the target GERAN cell.</td>
</tr>
<tr>
<td><strong>networkControlOrder</strong></td>
<td>Parameter NETWORK_CONTROL_ORDER in TS 44.060 [36].</td>
</tr>
<tr>
<td><strong>SystemInfoListGERAN</strong></td>
<td>If purpose = 'CellChangeOrder' and if the field is not present, the UE has to acquire SI/PSI from the GERAN cell.</td>
</tr>
<tr>
<td><strong>mobilityCDMA2000-HRPD</strong></td>
<td>This field indicates whether or not mobility to CDMA2000 HRPD is to be performed by the UE and it also indicates the type of mobility to CDMA2000 HRPD that is to be performed: If this field is not present the UE shall perform only the enhanced CS fallback to CDMA2000 1xRTT.</td>
</tr>
<tr>
<td><strong>messageContCDMA2000-1XRTT</strong></td>
<td>This field contains a message specified in CDMA2000 1xRTT standard that either tells the UE to move to specific 1xRTT target cell(s) or indicates a failure to allocate resources for the enhanced CS fallback to CDMA2000 1xRTT.</td>
</tr>
<tr>
<td><strong>messageContCDMA2000-HRPD</strong></td>
<td>This field contains a message specified in CDMA2000 HRPD standard that either tells the UE to move to specific HRPD target cell(s) or indicates a failure to allocate resources for the handover to CDMA2000 HRPD.</td>
</tr>
<tr>
<td><strong>redirectCarrierCDMA2000-HRPD</strong></td>
<td>The redirectCarrierCDMA2000-HRPD indicates a CDMA2000 carrier frequency and is used to redirect the UE to a HRPD carrier frequency.</td>
</tr>
</tbody>
</table>

#### Conditional presence

<table>
<thead>
<tr>
<th>Presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UTRAGERAN</strong></td>
<td>The field is mandatory present if the <strong>targetRAT-Type</strong> is set to “utra” or “geran”; otherwise the field is not present.</td>
</tr>
<tr>
<td><strong>GERAN</strong></td>
<td>The field should be present if the <strong>purpose</strong> is set to “handover” and the <strong>targetRAT-Type</strong> is set to “geran”; otherwise the field is not present.</td>
</tr>
<tr>
<td><strong>PSHO</strong></td>
<td>The field is mandatory present in case of PS handover toward GERAN; otherwise the field is optionally present, but not used by the UE.</td>
</tr>
<tr>
<td><strong>concRedir</strong></td>
<td>The field is mandatory present if the <strong>mobilityCDMA2000-HRPD</strong> is set to “redirection”; otherwise the field is not present.</td>
</tr>
<tr>
<td><strong>concHO</strong></td>
<td>The field is mandatory present if the <strong>mobilityCDMA2000-HRPD</strong> is set to “handover”; otherwise the field is optional present, need ON.</td>
</tr>
</tbody>
</table>

NOTE 1: The correspondence between the value of the **targetRAT-Type**, the standard to apply and the message contained within the **targetRAT-MessageContainer** is shown in the table below:
### targetRAT-Type

<table>
<thead>
<tr>
<th>targetRAT-Type</th>
<th>Standard to apply</th>
<th>targetRAT-MessageContainer</th>
</tr>
</thead>
<tbody>
<tr>
<td>geran</td>
<td>GSM TS 04.18, version 8.5.0 or later, or 3GPP TS 44.018 (clause 9.1.15)</td>
<td>HANOVER COMMAND</td>
</tr>
<tr>
<td></td>
<td>3GPP TS 44.060, version 6.13.0 or later (clause 11.2.43)</td>
<td>PS HANOVER COMMAND</td>
</tr>
<tr>
<td></td>
<td>3GPP TS 44.060, version 7.6.0 or later (clause 11.2.46)</td>
<td>DTM HANOVER COMMAND</td>
</tr>
<tr>
<td>cdma2000-1XRTT</td>
<td>C.S0001 or later, C.S0007 or later, C.S0008 or later</td>
<td>—</td>
</tr>
<tr>
<td>cdma2000-HRPD</td>
<td>C.S0024 or later</td>
<td>—</td>
</tr>
<tr>
<td>utra</td>
<td>3GPP TS 25.331 (clause 10.2.16a)</td>
<td>HANOVER TO UTRAN COMMAND</td>
</tr>
</tbody>
</table>

---

**Paging**

The *Paging* message is used for the notification of one or more UEs.

- Signalling radio bearer: N/A
- RLC-SAP: TM
- Logical channel: PCCH
- Direction: E-UTRAN to UE

**Paging message**

```asn
Paging ::=     SEQUENCE {
    pagingRecordList    PagingRecordList      OPTIONAL, -- Need ON
    systemInfoModification   ENUMERATED {true}     OPTIONAL, -- Need ON
    etws-Indication     ENUMERATED {true}     OPTIONAL, -- Need ON
    nonCriticalExtension    Paging-v890-IEs      OPTIONAL
}
Paging-v890-IEs ::=   SEQUENCE {
    lateNonCriticalExtension  OCTET STRING       OPTIONAL, -- Need OP
    nonCriticalExtension   Paging-v920-IEs       OPTIONAL
}
Paging-v920-IEs ::=   SEQUENCE {
    cmas-Indication-r9    ENUMERATED {true}     OPTIONAL, -- Need ON
    nonCriticalExtension    SEQUENCE {}       OPTIONAL -- Need OP
}
PagingRecordList ::=    SEQUENCE (SIZE (1..maxPageRec)) OF PagingRecord
PagingRecord ::=     SEQUENCE {
    ue-Identity       PagingUE-Identity,
    cn-Domain       ENUMERATED {ps, cs},
    ...
}
PagingUE-Identity ::=    CHOICE {
    s-TMSI        S-TMSI,
    imsi        IMSI,
    ...
}
IMSI ::=       SEQUENCE (SIZE (6..21)) OF IMSI-Digit
IMSI-Digit ::=      INTEGER (0..9)
```

-- ASN1STOP
**Paging field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>cn-Domain</strong></td>
<td>Indicates the origin of paging.</td>
</tr>
<tr>
<td><strong>ue-Identity</strong></td>
<td>Provides the NAS identity of the UE that is being paged.</td>
</tr>
<tr>
<td><strong>systemInfoModification</strong></td>
<td>If present: indication of a BCCH modification other than SIB10, SIB11 and SIB12.</td>
</tr>
<tr>
<td><strong>etws-Indication</strong></td>
<td>If present: indication of an ETWS primary notification and/ or ETWS secondary notification.</td>
</tr>
<tr>
<td><strong>cmas-Indication</strong></td>
<td>If present: indication of a CMAS notification.</td>
</tr>
<tr>
<td><strong>imsi</strong></td>
<td>The International Mobile Subscriber Identity, a globally unique permanent subscriber identity, see TS 23.003 [27]. The first element contains the first IMSI digit, the second element contains the second IMSI digit and so on.</td>
</tr>
</tbody>
</table>

---

**ProximityIndication**

The ProximityIndication message is used to indicate that the UE is entering or leaving the proximity of one or more cells whose CSG IDs are in the UEs CSG whitelist.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

**ProximityIndication message**

```asn1
ProximityIndication-r9 ::= SEQUENCE {
  criticalExtensions     CHOICE {
    c1         CHOICE {
      proximityIndication-r9    ProximityIndication-r9-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}
  }
}

ProximityIndication-r9-IEs ::= SEQUENCE {
  type-r9        ENUMERATED {entering, leaving},
  carrierFreq-r9   CHOICE {
    eutra-r9       ARFCN-ValueEUTRA,
    utra-r9        ARFCN-ValueUTRA,
    ...            ARFCN-ValueUTRA,
  },
  nonCriticalExtension    ProximityIndication-v930-IEs OPTIONAL
}

ProximityIndication-v930-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL,
  nonCriticalExtension    SEQUENCE {}       OPTIONAL
}
```

---

**ProximityIndication field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>type</strong></td>
<td>Used to indicate whether the UE is entering or leaving the proximity of cell(s) whose CSG IDs are in the UEs CSG whitelist.</td>
</tr>
<tr>
<td><strong>carrierFreq</strong></td>
<td>Indicates the RAT and frequency of the cell(s), whose CSG IDs are in the UEs CSG whitelist, for which the proximity indication is sent.</td>
</tr>
</tbody>
</table>
The **RRCConnectionReconfiguration** message is the command to modify an RRC connection. It may convey information for measurement configuration, mobility control, radio resource configuration (including RBs, MAC main configuration and physical channel configuration) including any associated dedicated NAS information and security configuration.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

### RRCConnectionReconfiguration message

```asn1
RRCConnectionReconfiguration ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1         CHOICE{
      rrcConnectionReconfiguration-r8  RRCConnectionReconfiguration-r8-IEs,
      spare7 NULL,
      spare6 NULL, spare5 NULL, spare4 NULL,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {} } }

RRCConnectionReconfiguration-r8-IEs ::= SEQUENCE {
  measConfig       MeasConfig      OPTIONAL, -- Need ON
  mobilityControlInfo     MobilityControlInfo    OPTIONAL, -- Cond HO
  dedicatedInfoNASList    SEQUENCE (SIZE(1..maxDRB)) OF DedicatedInfoNAS   OPTIONAL, -- Cond nonHO
  radioResourceConfigDedicated RadioResourceConfigDedicated OPTIONAL, -- Cond HO-toEUTRA
  securityConfigHO     SecurityConfigHO    OPTIONAL, -- Cond HO
  nonCriticalExtension    RRCConnectionReconfiguration-v890-IEs OPTIONAL
}

RRCConnectionReconfiguration-v890-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING     OPTIONAL, -- Need OP
  nonCriticalExtension   RRCConnectionReconfiguration-v920-IEs  OPTIONAL
}

RRCConnectionReconfiguration-v920-IEs ::= SEQUENCE {
  otherConfig-r9      OtherConfig-r9     OPTIONAL, -- Need ON
  fullConfig-r9      ENUMERATED {true}    OPTIONAL,  -- Cond HO-
  Reestabtab   nonCriticalExtension    SEQUENCE {}      OPTIONAL -- Need OP
}

SecurityConfigHO ::=    SEQUENCE {
  handoverType      CHOICE {
    intraLTS         SEQUENCE { securityAlgorithmConfig    SecurityAlgorithmConfig OPTIONAL, -- Cond
    fullConfig
    keyChangeIndicator BOOOLEAN,
    nextHopChainingCount NextHopChainingCount
  },
  interRAT         SEQUENCE { securityAlgorithmConfig    SecurityAlgorithmConfig, nas-SecurityParamToEUTRA  OCTET STRING (SIZE(6))
  }
  ...
}

-- ASN1STOP
```
### RRCConnectionReconfiguration field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>dedicatedInfoNASList</strong></td>
<td>This field is used to transfer UE specific NAS layer information between the network and the UE. The RRC layer is transparent for each PDU in the list.</td>
</tr>
<tr>
<td><strong>nas-securityParamToEUTRA</strong></td>
<td>This field is used to transfer UE specific NAS layer information between the network and the UE. The RRC layer is transparent for this field, although it affects activation of AS-security after inter-RAT handover to E-UTRA. The content is defined in TS 24.301.</td>
</tr>
<tr>
<td><strong>keyChangeIndicator</strong></td>
<td>'true' is used only in an intra-cell handover when a K_{eNB} key is derived from a native K_{ASM} key taken into use through the successful NAS SM-C as described in TS 33.401 [32] for K_{eNB} re-keying. 'false' is used in an intra-LTE handover when the new K_{eNB} key is obtained from the current K_{eNB} key or from the NH as described in TS 33.401 [32].</td>
</tr>
<tr>
<td><strong>nextHopChainingCount</strong></td>
<td>Parameter NCC: See TS 33.401 [32]</td>
</tr>
<tr>
<td><strong>fullConfig</strong></td>
<td>Indicates the full configuration option is applicable for the RRC Connection Reconfiguration message.</td>
</tr>
</tbody>
</table>

---

### Conditional presence

<table>
<thead>
<tr>
<th>Presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HO</strong></td>
<td>The field is mandatory present in case of handover within E-UTRA or to E-UTRA; otherwise the field is not present.</td>
</tr>
<tr>
<td><strong>nonHO</strong></td>
<td>The field is not present in case of handover within E-UTRA or to E-UTRA; otherwise it is optional present, need ON.</td>
</tr>
<tr>
<td><strong>HO-toEUTRA</strong></td>
<td>The field is mandatory present in case of handover to E-UTRA or for reconfigurations when fullConfig is included; otherwise the field is optionally present, need ON.</td>
</tr>
<tr>
<td><strong>HO-Reestab</strong></td>
<td>This field is optionally present, need ON, in case of handover within E-UTRA or upon the first reconfiguration after RRC connection re-establishment; otherwise the field is not present.</td>
</tr>
<tr>
<td><strong>fullConfig</strong></td>
<td>This field is mandatory present for handover within E-UTRA when the fullConfig is included; otherwise it is optionally present. Need OP.</td>
</tr>
</tbody>
</table>

---

### RRCConnectionReconfigurationComplete

The **RRCConnectionReconfigurationComplete** message is used to confirm the successful completion of an RRC connection reconfiguration.

- Signalling radio bearer: SRB1
- RLC-SAP: AM
- Logical channel: DCCH
- Direction: UE to E-UTRAN

---

**RRCConnectionReconfigurationComplete message**

```asn1
-- ASN1START
RRCConnectionReconfigurationComplete ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    rrcConnectionReconfigurationComplete-r8
        RRCConnectionReconfigurationComplete-r8-IEs,
    criticalExtensionsFuture   SEQUENCE {}
  }
}

RRCConnectionReconfigurationComplete-r8-IEs ::= SEQUENCE {
  nonCriticalExtension    RRCConnectionReconfigurationComplete-v8a0-IEs
    OPTIONAL
}

RRCConnectionReconfigurationComplete-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING  OPTIONAL,
  nonCriticalExtension    SEQUENCE {}
}
```

---

**ETSI**
**RRCConnectionReestablishment**

The **RRCConnectionReestablishment** message is used to resolve contention and to re-establish SRB1.

- Signalling radio bearer: SRB0
- RLC-SAP: TM
- Logical channel: CCCH
- Direction: E-UTRAN to UE

---

**RRCConnectionReestablishment message**

```asn1
RRCConnectionReestablishment ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1         CHOICE{
      rrcConnectionReestablishment-r8  RRCConnectionReestablishment-r8-IEs,
      spare7 NULL,
      spare6 NULL, spare5 NULL, spare4  NULL,
      spare3 NULL, spare2 NULL, spare1  NULL
    },
    criticalExtensionsFuture   SEQUENCE { }
  }
}
RRCConnectionReestablishment-r8-IEs ::= SEQUENCE {
  radioResourceConfigDedicated  RadioResourceConfigDedicated,
  nextHopChainingCount    NextHopChainingCount,
  nonCriticalExtension    RRCConnectionReestablishment-v8a0-IEs
  OPTIONAL
}
RRCConnectionReestablishment-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL, -- Need OP
  nonCriticalExtension    SEQUENCE {}       OPTIONAL -- Need OP
}
```

---

**RRCConnectionReestablishmentComplete**

The **RRCConnectionReestablishmentComplete** message is used to confirm the successful completion of an RRC connection reestablishment.

- Signalling radio bearer: SRB1
- RLC-SAP: AM
- Logical channel: DCCH
- Direction: UE to E-UTRAN

---

**RRCConnectionReestablishmentComplete message**

```asn1
RRCConnectionReestablishmentComplete ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    rrcConnectionReestablishmentComplete-r8  RRCConnectionReestablishmentComplete-r8-IEs,
    criticalExtensionsFuture   SEQUENCE { }
  }
}
```
RRCConnectionReestablishmentComplete-r8-IEs ::= SEQUENCE {
    nonCriticalExtension    RRCConnectionReestablishmentComplete-v920-IEs
    OPTIONAL
}

RRCConnectionReestablishmentComplete-v920-IEs ::= SEQUENCE {
    rlf-InfoAvailable-r9    ENUMERATED {true}    OPTIONAL,
    nonCriticalExtension    RRCConnectionReestablishmentComplete-v8a0-IEs
    OPTIONAL
}

RRCConnectionReestablishmentComplete-v8a0-IEs ::= SEQUENCE {
    lateNonCriticalExtension   OCTET STRING      OPTIONAL,
    nonCriticalExtension    SEQUENCE {}       OPTIONAL
}

-- ASN1STOP

RRConnectionReestablishmentComplete field descriptions

rlf-InfoAvailable
This field is used to indicate the availability of radio link failure related measurements

---

RRCConnectionReestablishmentReject

The RRCConnectionReestablishmentReject message is used to indicate the rejection of an RRC connection reestablishment request.

Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: E-UTRAN to UE

RRCConnectionReestablishmentReject message

-- ASN1START

RRCConnectionReestablishmentReject ::= SEQUENCE {
    criticalExtensions     CHOICE {
        rrcConnectionReestablishmentReject-r8
        RRCConnectionReestablishmentReject-r8-IEs,
        criticalExtensionsFuture   SEQUENCE {}
    }
}

RRCConnectionReestablishmentReject-r8-IEs ::= SEQUENCE {
    nonCriticalExtension    RRCConnectionReestablishmentReject-v8a0-IEs
    OPTIONAL
}

RRCConnectionReestablishmentReject-v8a0-IEs ::= SEQUENCE {
    lateNonCriticalExtension   OCTET STRING      OPTIONAL, -- Need OF
    nonCriticalExtension    SEQUENCE {}       OPTIONAL, -- Need OF
}

-- ASN1STOP

---

RRCConnectionReestablishmentRequest

The RRCConnectionReestablishmentRequest message is used to request the reestablishment of an RRC connection.
Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: UE to E-UTRAN

### RRCConnectionReestablishmentRequest message

```asn1
RRCConnectionReestablishmentRequest ::= SEQUENCE {
  criticalExtensions     CHOICE {
    rrcConnectionReestablishmentRequest-r8
      RRCConnectionReestablishmentRequest-r8-IEs,
    criticalExtensionsFuture   SEQUENCE {}}
}

RRCConnectionReestablishmentRequest-r8-IEs ::= SEQUENCE {
  ue-Identity       ReestabUE-Identity,
  reestablishmentCause    ReestablishmentCause,
  spare        BIT STRING (SIZE (2))
}

ReestabUE-Identity ::=    SEQUENCE {
  c-RNTI        C-RNTI,
  physCellId       PhysCellId,
  shortMAC-I       ShortMAC-I
}

ReestablishmentCause ::=   ENUMERATED {
  reconfigurationFailure, handoverFailure,
  otherFailure, spare1}
```

### RRCConnectionReestablishmentRequest field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ue-Identity</td>
<td>UE identity included to retrieve UE context and to facilitate contention resolution by lower layers.</td>
</tr>
<tr>
<td>reestablishmentCause</td>
<td>Indicates the failure cause that triggered the re-establishment procedure.</td>
</tr>
<tr>
<td>physCellId</td>
<td>The Physical Cell Identity of the cell the UE was connected to prior to the failure.</td>
</tr>
</tbody>
</table>

---

### RRCConnectionReject

The RRCConnectionReject message is used to reject the RRC connection establishment.

Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: E-UTRAN to UE

```asn1
RRCConnectionReject ::=    SEQUENCE {
  criticalExtensions     CHOICE {
    c1         CHOICE {
      rrcConnectionReject-r8    RRCConnectionReject-r8-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}}
}
```
RRCConnectionReject field descriptions

`waitTime`
Wait time value in seconds.

---

**RRCConnectionRelease**

The **RRCConnectionRelease** message is used to command the release of an RRC connection.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

**RRCConnectionRelease message**

```asn1
RRCConnectionRelease ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,  
criticalExtensions   CHOICE {
    c1         CHOICE {
      rrcConnectionRelease-r8    RRCConnectionRelease-r8-IEs,  
      spare3 NULL, spare2 NULL, spare1 NULL   
    },
    criticalExtensionsFuture   SEQUENCE {}   
  }
}
RRCConnectionRelease-r8-IEs ::= SEQUENCE {
  releaseCause      ReleaseCause,
  redirectedCarrierInfo    RedirectedCarrierInfo    OPTIONAL,  
  idleModeMobilityControlInfo   IdleModeMobilityControlInfo   OPTIONAL,  
  nonCriticalExtension    RRCConnectionRelease-v890-IEs  OPTIONAL  
}
RRCConnectionRelease-v890-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL,   
  nonCriticalExtension    SEQUENCE {}    OPTIONAL   
}
RRCConnectionRelease-v920-IEs ::= SEQUENCE {
  cellInfoList-r9     CHOICE {
    geran-r9      CellInfoListGERAN-r9,  
    utra-FDD-r9      CellInfoListUTRA-FDD-r9,  
    utra-TDD-r9      CellInfoListUTRA-TDD-r9,  
    ...   
  }   OPTIONAL,  
  nonCriticalExtension    SEQUENCE {}   OPTIONAL   
}
ReleaseCause ::= ENUMERATED {loadBalancingTAUrequired,  
  other, spare2, spare1}
RedirectedCarrierInfo ::= CHOICE {
  ...  

---
IdleModeMobilityControlInfo ::= SEQUENCE {
freqPriorityListEUTRA    FreqPriorityListEUTRA   OPTIONAL,  -- Need ON
freqPriorityListGERAN    FreqsPriorityListGERAN   OPTIONAL,  -- Need ON
freqPriorityListUTRA-FDD  FreqPriorityListUTRA-FDD  OPTIONAL,  -- Need ON
freqPriorityListUTRA-TDD  FreqPriorityListUTRA-TDD  OPTIONAL,  -- Need ON
bandClassPriorityListHRPD BandClassPriorityListHRPD  OPTIONAL,  -- Need ON
t320        ENUMERATED {
    min5, min10, min20, min30, min60, min120, min180,
    spare1}      OPTIONAL,  -- Need OR
...
}

FreqPriorityListEUTRA ::= SEQUENCE (SIZE (1..maxFreq)) OF FreqPriorityEUTRA
FreqPriorityEUTRA ::= SEQUENCE {
carrierFreq       ARFCN-ValueEUTRA,
cellReselectionPriority    CellReselectionPriority
}

FreqsPriorityListGERAN ::= SEQUENCE (SIZE (1..maxGNFG)) OF FreqsPriorityGERAN
FreqsPriorityGERAN ::= SEQUENCE {
carrierFreqs      CarrierFreqsGERAN,
cellReselectionPriority    CellReselectionPriority
}

FreqPriorityListUTRA-FDD ::= SEQUENCE (SIZE (1..maxUTRA-FDD-Carrier)) OF FreqPriorityUTRA-FDD
FreqPriorityUTRA-FDD ::= SEQUENCE {
carrierFreq       ARFCN-ValueUTRA,
cellReselectionPriority    CellReselectionPriority
}

FreqPriorityListUTRA-TDD ::= SEQUENCE (SIZE (1..maxUTRA-TDD-Carrier)) OF FreqPriorityUTRA-TDD
FreqPriorityUTRA-TDD ::= SEQUENCE {
carrierFreq       ARFCN-ValueUTRA,
cellReselectionPriority    CellReselectionPriority
}

BandClassPriorityListHRPD ::=  SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF BandClassPriorityHRPD
BandClassPriorityHRPD ::=   SEQUENCE {
    bandClass       BandclassCDMA2000,
cellReselectionPriority    CellReselectionPriority
}

BandClassPriorityList1XRTT ::= SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF BandClassPriority1XRTT
BandClassPriority1XRTT ::=   SEQUENCE {
    bandClass       BandclassCDMA2000,
cellReselectionPriority    CellReselectionPriority
}

CellInfoListGERAN-r9 ::=  SEQUENCE (SIZE (1..maxCellInfoGERAN-r9)) OF CellInfoGERAN-r9
CellInfoGERAN-r9 ::=    SEQUENCE {
    physCellId-r9    PhysCellIdGERAN,
carrierFreq-r9    CarrierFreqGERAN,
systemInformation-r9    SystemInfoListGERAN
}

CellInfoListUTRA-FDD-r9 ::=  SEQUENCE (SIZE (1..maxCellInfoUTRA-r9)) OF CellInfoUTRA-FDD-r9
CellInfoUTRA-FDD-r9 ::=    SEQUENCE {
    physCellId-r9    PhysCellIdUTRA-FDD,
    ultra-BCCH-Container-r9    OCTET STRING
}
releaseCause
The releaseCause is used to indicate the reason for releasing the RRC Connection.

redirectedCarrierInfo
The redirectedCarrierInfo indicates a carrier frequency (downlink for FDD) and is used to redirect the UE to an E-UTRA or an inter-RAT carrier frequency, by means of the cell selection upon leaving RRC_CONNECTED as specified in TS 36.304 [4].

idleModeMobilityControlInfo
Provides dedicated cell reselection priorities. Used for cell reselection as specified in TS 36.304 [4].

carrierFreq or bandClass
Provides a cell reselection priority for each frequency, by means of separate lists for each RAT (including E-UTRA).

t320
Timer T320 as described in section 7.3. Value minN corresponds to N minutes.

carrierFreqs
The list of GERAN carrier frequencies organised into one group of GERAN carrier frequencies.

systemInformation
Container for system information of the GERAN cell. Each OCTET STRING in ‘SystemInfoListGERAN’ contains one complete System Information (SI) message as defined in TS 44.018 [45, table 9.1.1].

cellInfoList
Used to provide system information of one or more cells on the redirected inter-RAT carrier frequency. The system information can be used if, upon redirection, the UE selects an inter-RAT cell indicated by the physCellId and carrierFreq (GERAN) or by the physCellId (other RATs). The choice shall match the redirectedCarrierInfo.

utra-BCCH-Container
Contains System Information Container message as defined in TS 25.331 [19].

---

RRCConnectionRequest

The RRCConnectionRequest message is used to request the establishment of an RRC connection.

Signalling radio bearer: SRB0
RLC-SAP: TM
Logical channel: CCCH
Direction: UE to E-UTRAN

RRCConnectionRequest message

---
**RRCConnectionRequest field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ue-Identity</td>
<td>UE identity included to facilitate contention resolution by lower layers.</td>
</tr>
<tr>
<td>establishmentCause</td>
<td>Provides the establishment cause for the RRC connection request as provided by the upper layers. W.r.t. the cause value names: highPriorityAccess concerns AC11..AC15, 'mt' stands for 'Mobile Terminating' and 'mo' for 'Mobile Originating'.</td>
</tr>
<tr>
<td>randomValue</td>
<td>Integer value in the range 0 to $2^{40} - 1$.</td>
</tr>
</tbody>
</table>

---

**RRCConnectionSetup**

The **RRCConnectionSetup** message is used to establish SRB1.

- **Signalling radio bearer:** SRB0
- **RLC-SAP:** TM
- **Logical channel:** CCCH
- **Direction:** E-UTRAN to UE

---

**RRCConnectionSetup message**

---

```asn1
RRCConnectionRequest-r8-IEs ::= SEQUENCE {
    ue-Identity    InitialUE-Identity,
    establishmentCause EstablishmentCause,
    spare           BIT STRING (SIZE (1))
}

InitialUE-Identity ::= CHOICE {
    s-TMSI        S-TMSI,
    randomValue        BIT STRING (SIZE (40))
}

EstablishmentCause ::= ENUMERATED {
    emergency, highPriorityAccess, mt-Access, mo-Signalling,
    mo-Data, spare3, spare2, spare1
}
-- ASN1STOP
```

---

```asn1
RRCConnectionSetup ::= SEQUENCE {
    rrc-TransactionIdentifier   RRC-TransactionIdentifier,
    criticalExtensions     CHOICE {
        c1         CHOICE {
            rrcConnectionSetup-r8    RRCConnectionSetup-r8-IEs,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4 NULL,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture   SEQUENCE {}  
    }
}

RRCConnectionSetup-r8-IEs ::=  SEQUENCE {
    radioResourceConfigDedicated RadioResourceConfigDedicated,
    nonCriticalExtension    RRCConnectionSetup-v8a0-IEs       OPTIONAL
}

RRCConnectionSetup-v8a0-IEs ::= SEQUENCE {
    lateNonCriticalExtension   OCTET STRING      OPTIONAL, -- Need OP  
    nonCriticalExtension    SEQUENCE {}       OPTIONAL -- Need OP
}
-- ASN1STOP
```
RRCConnectionSetupComplete

The `RRCConnectionSetupComplete` message is used to confirm the successful completion of an RRC connection establishment.

- Signalling radio bearer: SRB1
- RLC-SAP: AM
- Logical channel: DCCH
- Direction: UE to E-UTRAN

**RRCConnectionSetupComplete message**

```ASN1START
RRCConnectionSetupComplete ::= SEQUENCE {
    rrc-TransactionIdentifier   RRC-TransactionIdentifier,
    criticalExtensions     CHOICE {
        c1         CHOICE{
            rrcConnectionSetupComplete-r8  RRCConnectionSetupComplete-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture   SEQUENCE {}
    }
}

RRCConnectionSetupComplete-r8-IEs ::= SEQUENCE {
    selectedPLMN-Identity    INTEGER (1..6),
    registeredMME      RegisteredMME      OPTIONAL,
    dedicatedInfoNAS     DedicatedInfoNAS,
    nonCriticalExtension    RRCConnectionSetupComplete-v8a0-IEs
                        OPTIONAL
}

RRCConnectionSetupComplete-v8a0-IEs ::= SEQUENCE {
    lateNonCriticalExtension   OCTET STRING      OPTIONAL,
    nonCriticalExtension    SEQUENCE {}       OPTIONAL
}

RegisteredMME ::=     SEQUENCE {
    plmn-Identity      PLMN-Identity      OPTIONAL,
    mmegi        BIT STRING (SIZE (16)),
    mmecc           MMEC
}
```

-- ASN1STOP

**RRCConnectionSetupComplete field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>selectedPLMN-Identity</code></td>
<td>Index of the PLMN selected by the UE from the <code>plmn-IdentityList</code> included in SIB1. 1 if the 1st PLMN is selected from the <code>plmn-IdentityList</code> included in SIB1, 2 if the 2nd PLMN is selected from the <code>plmn-IdentityList</code> included in SIB1 and so on.</td>
</tr>
<tr>
<td><code>registeredMME</code></td>
<td>This field is used to transfer the GUMMEI of the MME where the UE is registered, as provided by upper layers.</td>
</tr>
<tr>
<td><code>mmegi</code></td>
<td>Provides the Group Identity of the registered MME within the PLMN, as provided by upper layers, see TS 23.003 [27].</td>
</tr>
</tbody>
</table>

-- SecurityModeCommand

The `SecurityModeCommand` message is used to command the activation of AS security.
SecurityModeCommand message

The SecurityModeCommand message is used to confirm the successful completion of a security mode command.

Signalling radio bearer: SRB1
RLC-SAP: AM
Logical channel: DCCH
Direction: E-UTRAN to UE

SecurityModeComplete message

The SecurityModeComplete message is used to confirm the successful completion of a security mode command.

Signalling radio bearer: SRB1
RLC-SAP: AM
Logical channel: DCCH
Direction: UE to E-UTRAN
SecurityModeFailure

The **SecurityModeFailure** message is used to indicate an unsuccessful completion of a security mode command.

**Signalling radio bearer:** SRB1

**RLC-SAP:** AM

**Logical channel:** DCCH

**Direction:** UE to E-UTRAN

---

SystemInformation

The **SystemInformation** message is used to convey one or more System Information Blocks. All the SIBs included are transmitted with the same periodicity.

**Signalling radio bearer:** N/A

**RLC-SAP:** TM

**Logical channel:** BCCH

**Direction:** E-UTRAN to UE
SystemInformationBlockType1

SystemInformationBlockType1 contains information relevant when evaluating if a UE is allowed to access a cell and defines the scheduling of other system information.

Signalling radio bearer: N/A
RLC-SAP: TM
Logical channel: BCCH
Direction: E-UTRAN to UE

SystemInformationBlockType1 message

---ASN1START---
SystemInformationBlockType1 ::= SEQUENCE {
  cellAccessRelatedInfo    SEQUENCE {
    plmn-IdentityList     PLMN-IdentityList,
    trackingAreaCode     TrackingAreaCode,
    cellIdentity      CellIdentity,
    cellBarred       ENUMERATED {barred, notBarred},
    intraFreqReselection ENUMERATED {allowed, notAllowed},
    csg-Indication      BOOLEAN,
    csg-Identity      CSG-Identity   OPTIONAL -- Need OR
  },
  cellSelectionInfo     SEQUENCE {
    q-RxLevMin       Q-RxLevMin,
    q-RxLevMinOffset     INTEGER (1..8)   OPTIONAL -- Need OP
  },
  p-Max        P-Max      OPTIONAL,   -- Need OP
  freqBandIndicator     INTEGER (1..64),
  schedulingInfoList     SchedulingInfoList,
  tdd-Config       TDD-Config     OPTIONAL, -- Cond TDD
  si-WindowLength      ENUMERATED {
    ms1, ms2, ms5, ms10, ms15, ms20, ms40},
  systemInfoValueTag     INTEGER (0..31),
  nonCriticalExtension    SystemInformationBlockType1-v890-IEs
                        OPTIONAL
},

SystemInformationBlockType1-v890-IEs ::= SEQUENCE {
  lateNonCriticalExtension    OCTET STRING   OPTIONAL, -- Need OP
  nonCriticalExtension     SystemInformationBlockType1-v920-IEs
                        OPTIONAL
},

SystemInformationBlockType1-v920-IEs ::= SEQUENCE {
  ims-EmergencySupport-r9   ENUMERATED (true)    OPTIONAL, -- Need OR
  cellSelectionInfo-v920    CellSelectionInfo-v920      OPTIONAL, -- Cond RSRQ
  nonCriticalExtension    SEQUENCE {}
                        OPTIONAL -- Need OP
}---ASN1STOP---
PLMN-IdentityList ::= SEQUENCE (SIZE (1..6)) OF PLMN-IdentityInfo

PLMN-IdentityInfo ::= SEQUENCE { plmn-Identity PLMN-Identity, cellReservedForOperatorUse ENUMERATED {reserved, notReserved} }

SchedulingInfoList ::= SEQUENCE (SIZE (1..maxSI-Message)) OF SchedulingInfo

SchedulingInfo ::= SEQUENCE { si-Periodicity ENUMERATED { rf8, rf16, rf32, rf64, rf128, rf256, rf512 }, sib-MappingInfo SIB-MappingInfo }

SIB-MappingInfo ::= SEQUENCE (SIZE (0..maxSIB-1)) OF SIB-Type

SIB-Type ::= ENUMERATED { sibType3, sibType4, sibType5, sibType6, sibType7, sibType8, sibType9, sibType10, sibType11, sibType12-v920, sibType13-v920, spare5, spare4, spare3, spare2, spare1, ... }

CellSelectionInfo-v920 ::= SEQUENCE { q-QualMin-r9 Q-QualMin-r9, q-QualMinOffset-r9 INTEGER (1..8) OPTIONAL -- Need OP }

-- ASN1STOP
### SystemInformationBlockType1 field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>plmn-IdentityList</td>
<td>List of PLMN identities. The first listed PLMN-Identity is the primary PLMN.</td>
</tr>
<tr>
<td>cellReservedForOperatorUse</td>
<td>As defined in TS 36.304 [4].</td>
</tr>
<tr>
<td>trackingAreaCode</td>
<td>A trackingAreaCode that is common for all the PLMNs listed.</td>
</tr>
<tr>
<td>cellBarred</td>
<td>‘barred’ means the cell is barred, as defined in TS 36.304 [4].</td>
</tr>
<tr>
<td>intraFreqReselection</td>
<td>Used to control cell reselection to intra-frequency cells when the highest ranked cell is barred, or treated as barred by the UE, as specified in TS 36.304 [4].</td>
</tr>
<tr>
<td>csg-Indicator</td>
<td>If set to TRUE the UE is only allowed to access the cell if the CSG identity matches an entry in the CSG whitelist that the UE has stored.</td>
</tr>
<tr>
<td>q-RxLevMinOffset</td>
<td>Parameter Q_{rxlevminoffset} in TS 36.304 [4]. Actual value Q_{rxlevminoffset} = IE value * 2 [dB]. If absent, the UE applies the (default) value of 0 dB for Q_{rxlevminoffset}. Affects the minimum required Rx level in the cell.</td>
</tr>
<tr>
<td>p-Max</td>
<td>Value applicable for the cell. If absent the UE applies the maximum power according to the UE capability.</td>
</tr>
<tr>
<td>freqBandIndicator</td>
<td>Defined in TS 36.101 [42, table 5.5-1].</td>
</tr>
<tr>
<td>si-Periodicity</td>
<td>Periodicity of the SI-message in radio frames, such that rf8 denotes 8 radio frames, rf16 denotes 16 radio frames, and so on.</td>
</tr>
<tr>
<td>sib-MappingInfo</td>
<td>List of the SIBs mapped to this SystemInformation message. There is no mapping information of SIB2; it is always present in the first SystemInformation message listed in the schedulingInfoList list.</td>
</tr>
<tr>
<td>si-WindowLength</td>
<td>Common SI scheduling window for all SIs. Unit in milliseconds, where ms1 denotes 1 millisecond, ms2 denotes 2 milliseconds and so on.</td>
</tr>
<tr>
<td>systemInfoValueTag</td>
<td>Common for all SIBs other than MIB, SIB1, SIB10, SIB11 and SIB12. Change of MIB and SIB1 is detected by acquisition of the corresponding message.</td>
</tr>
<tr>
<td>csg-Identity</td>
<td>Identity of the Closed Subscriber Group within the primary PLMN the cell belongs to. The field is present in a CSG cell.</td>
</tr>
<tr>
<td>ims-EmergencySupport</td>
<td>Indicates whether the cell supports IMS emergency bearer services for UEs in limited service mode. If absent, IMS emergency call is not supported by the network for the cell for UEs in limited service mode.</td>
</tr>
<tr>
<td>q-QualMin</td>
<td>Parameter “Q_{qualmin}” in TS 36.304 [4]. If cellSelectionInfo-v920 is not present, the UE applies the (default) value of negative infinity for Q_{qualmin}.</td>
</tr>
<tr>
<td>q-QualMinOffset</td>
<td>Parameter “Q_{qualminoffset}” in TS 36.304 [4]. Actual value Q_{qualminoffset} = IE value [dB]. If cellSelectionInfo-v920 is not present or the field is not present, the UE applies the (default) value of 0 dB for Q_{qualminoffset}. Affects the minimum required quality level in the cell.</td>
</tr>
</tbody>
</table>

#### Conditional presence

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDD</td>
<td>This field is mandatory present for TDD; it is not present for FDD and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>RSRQ</td>
<td>The field is mandatory present if SIB3 is being broadcasted and threshServingLowQ is present in SIB3; otherwise optionally present, Need OP.</td>
</tr>
</tbody>
</table>

---

**UECapabilityEnquiry**

The UECapabilityEnquiry message is used to request the transfer of UE radio access capabilities for E-UTRA as well as for other RATs.
Signalling radio bearer: SRB1
RLC-SAP: AM
Logical channel: DCCH
Direction: E-UTRAN to UE

**UECapabilityEnquiry message**

--- ASN1START

**UECapabilityEnquiry ::=**

```
SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions
    CHOICE {
      c1         CHOICE {
        ueCapabilityEnquiry-r8    UECapabilityEnquiry-r8-IEs,
        spare3 NULL, spare2 NULL, spare1 NULL
      },
      criticalExtensionsFuture   SEQUENCE {}
    }
}
```

**UECapabilityEnquiry-r8-IEs ::=**

```
SEQUENCE {
  ue-CapabilityRequest    UE-CapabilityRequest,
  nonCriticalExtension    UECapabilityEnquiry-v8a0-IEs
}
```

**UECapabilityEnquiry-v8a0-IEs ::=**

```
SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL, -- Need OP
  nonCriticalExtension      SEQUENCE {}       OPTIONAL -- Need OP
}
```

**UE-CapabilityRequest ::=**

```
SEQUENCE (SIZE (1..maxRAT-Capabilities)) OF RAT-Type
```

--- ASN1STOP

--- UECapabilityEnquiry field descriptions

**ue-CapabilityRequest**

List of the RATs for which the UE is requested to transfer the UE radio access capabilities i.e. E-UTRA, UTRA, GERAN-CS, GERAN-PS, CDMA2000.

---

**UECapabilityInformation**

The **UECapabilityInformation** message is used to transfer of UE radio access capabilities requested by the E-UTRAN.

Signalling radio bearer: SRB1
RLC-SAP: AM
Logical channel: DCCH
Direction: UE to E-UTRAN

**UECapabilityInformation message**

--- ASN1START

**UECapabilityInformation ::=**

```
SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions
    CHOICE {
      c1         CHOICE {
        ueCapabilityInformation-r8    UECapabilityInformation-r8-IEs,
        spare7 NULL, spare6 NULL, spare5 NULL, spare4 NULL,
        spare3 NULL, spare2 NULL, spare1 NULL
      },
      criticalExtensionsFuture   SEQUENCE {}
    }
}
```
### UEInformationRequest

The **UEInformationRequest** is the command used by E-UTRAN to retrieve information from the UE.

- **Signalling radio bearer:** SRB1
- **RLC-SAP:** AM
- **Logical channel:** DCCH
- **Direction:** E-UTRAN to UE

#### UEInformationRequest message

- **rach-ReportReq**
  This field is used to indicate whether the UE shall report information about the random access procedure.

### UEInformationResponse

The **UEInformationResponse** message is used by the UE to transfer the information requested by the E-UTRAN.

- **Signalling radio bearer:** SRB1
- **RLC-SAP:** AM
- **Logical channel:** DCCH
Direction: UE to E-UTRAN

**UEInformationResponse message**

```asn1
UEInformationResponse-r9 ::= SEQUENCE {
  rrc-TransactionIdentifier RRC-TransactionIdentifier,
  criticalExtensions CHOICE {
    c1 CHOICE {
      ueInformationResponse-r9 UEInformationResponse-r9-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture SEQUENCE {}
  }
}

UEInformationResponse-r9-IEs ::= SEQUENCE {
  rach-Report-r9 SEQUENCE {
    numberOfPreamblesSent-r9 INTEGER (1..200),
    contentionDetected-r9 BOOLEAN OPTIONAL
  },
  rlfReport-r9 RLF-Report-r9 OPTIONAL,
  nonCriticalExtension UEInformationResponse-v930-IEs OPTIONAL
}

UEInformationResponse-v930-IEs ::= SEQUENCE {
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  nonCriticalExtension SEQUENCE {} OPTIONAL
}

RLF-Report-r9 ::= SEQUENCE {
  measResultLastServCell-r9 SEQUENCE {
    rsrpResult-r9 RSRP-Range,
    rsrqResult-r9 RSRQ-Range OPTIONAL
  },
  measResultNeighCells-r9 SEQUENCE {
    measResultListEUTRA-r9 MeasResultList2EUTRA-r9 OPTIONAL,
    measResultListUTRA-r9 MeasResultList2UTRA-r9 OPTIONAL,
    measResultListGERAN-r9 MeasResultList2GERAN-r9 OPTIONAL,
    measResultList2CDMA2000-r9 MeasResultList2CDMA2000-r9 OPTIONAL
  }
}

MeasResultList2EUTRA-r9 ::= SEQUENCE (SIZE (1..maxFreq)) OF MeasResult2EUTRA-r9

MeasResult2EUTRA-r9 ::= SEQUENCE {
  carrierFreq-r9 ARFCN-ValueEUTRA,
  measResultList-r9 MeasResultListEUTRA
}

MeasResultList2UTRA-r9 ::= SEQUENCE (SIZE (1..maxFreq)) OF MeasResult2UTRA-r9

MeasResult2UTRA-r9 ::= SEQUENCE {
  carrierFreq-r9 ARFCN-ValueUTRA,
  measResultList-r9 MeasResultListUTRA
}

MeasResultList2CDMA2000-r9 ::= SEQUENCE (SIZE (1..maxFreq)) OF MeasResult2CDMA2000-r9

MeasResult2CDMA2000-r9 ::= SEQUENCE {
  carrierFreq-r9 CarrierFreqCDMA2000,
  measResultList-r9 MeasResultsCDMA2000
}
```

-- ASN1STOP
**UEInformationResponse field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>numberOfPreamblesSent</td>
<td>This field is used to indicate the number of RACH preambles that were transmitted. Corresponds to parameter PREAMBLE_TRANSMISSION_COUNTER in TS 36.321 [6].</td>
</tr>
<tr>
<td>contentionDetected</td>
<td>This field is used to indicate that contention was detected for at least one of the transmitted preambles, see also [6].</td>
</tr>
<tr>
<td>measResultLastServCell</td>
<td>This field refers to the last measurement results taken in the serving cell, where radio link failure happened.</td>
</tr>
</tbody>
</table>

---

**ULHandoverPreparationTransfer (CDMA2000)**

The **ULHandoverPreparationTransfer** message is used for the uplink transfer of handover related CDMA2000 information when requested by the higher layers.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

**ULHandoverPreparationTransfer message**

```asn1
ULHandoverPreparationTransfer ::= SEQUENCE {
  criticalExtensions  CHOICE {
    c1              CHOICE {
      ulHandoverPreparationTransfer-r8  ULHandoverPreparationTransfer-r8-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture  SEQUENCE {}
  }
}
ULHandoverPreparationTransfer-r8-IEs ::= SEQUENCE {
  cdma2000-Type          CDMA2000-Type,
  meid                  BIT STRING (SIZE (56)) OPTIONAL,
  dedicatedInfo         DedicatedInfoCDMA2000,
  nonCriticalExtension  ULHandoverPreparationTransfer-v8a0-IEs OPTIONAL
}
ULHandoverPreparationTransfer-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension  OCTET STRING OPTIONAL,
  nonCriticalExtension    SEQUENCE {} OPTIONAL
}
```

---

**ULHandoverPreparationTransfer field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>meid</td>
<td>The 56 bit mobile identification number provided by the CDMA2000 Upper layers.</td>
</tr>
</tbody>
</table>

---

**ULInformationTransfer**

The **ULInformationTransfer** message is used for the uplink transfer of dedicated NAS information.

Signalling radio bearer: SRB2 or SRB1(only if SRB2 not established yet). If SRB2 is suspended, the UE does not send this message until SRB2 is resumed

RLC-SAP: AM

Logical channel: DCCH
Direction: UE to E-UTRAN

**ULInformationTransfer message**

```asn1
ULInformationTransfer ::=   SEQUENCE {
    criticalExtensions     CHOICE {
        c1         CHOICE {
            ulInformationTransfer-r8   ULInformationTransfer-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture   SEQUENCE {}
    }
}
ULInformationTransfer-r8-IEs ::= SEQUENCE {
    dedicatedInfoType   CHOICE {
        dedicatedInfoNAS     DedicatedInfoNAS,
        dedicatedInfoCDMA2000-1XRTT   DedicatedInfoCDMA2000,
        dedicatedInfoCDMA2000-HRPD   DedicatedInfoCDMA2000
    },
    nonCriticalExtension    ULInformationTransfer-v8a0-IEs OPTIONAl
}
ULInformationTransfer-v8a0-IEs ::= SEQUENCE {
    lateNonCriticalExtension   OCTET STRING      OPTIONAL,
    nonCriticalExtension    SEQUENCE {}       OPTIONAL
}
```

### 6.3 RRC information elements

#### 6.3.1 System information blocks

**SystemInformationBlockType2**

The IE SystemInformationBlockType2 contains radio resource configuration information that is common for all UEs.

NOTE: UE timers and constants related to functionality for which parameters are provided in another SIB are included in the corresponding SIB.

**SystemInformationBlockType2 information element**

```asn1
SystemInformationBlockType2 ::=  SEQUENCE {
    ac-BarringInfo      SEQUENCE {
        ac-BarringForEmergency    BOOLEAN, -- Need OP
        ac-BarringForMO-Signalling   AC-BarringConfig    OPTIONAL, -- Need OP
        ac-BarringForMO-Data    AC-BarringConfig    OPTIONAL, -- Need OP
    }                  OPTIONAL, -- Need OP
    radioResourceConfigCommon   RadioResourceConfigCommonSIB,
    ue-TimersAndConstants    UE-TimersAndConstants,
    freqInfo       SEQUENCE {
        ul-CarrierFreq      ARFCN-ValueEUTRA    OPTIONAL, -- Need OP
        ul-Bandwidth      ENUMERATED {n6, n15, n25, n50, n75, n100} OPTIONAL, -- Need OP
        additionalSpectrumEmission   AdditionalSpectrumEmission
    },
    mbsfn-SubframeConfigList   MBSFN-SubframeConfigList   OPTIONAL, -- Need OR
    timeAlignmentTimerCommon   TimeAlignmentTimer,
    ...,
    lateNonCriticalExtension   OCTET STRING      OPTIONAL, -- Need OP
    [ [ ssac-BarringForMMTEL-Voice-r9  AC-BarringConfig OPTIONAL, -- Need OP
         ssac-BarringForMMTEL-Video-r9  AC-BarringConfig OPTIONAL -- Need OP
    ]]
```
AC-BarringConfig ::= SEQUENCE {
  ac-BarringFactor ENUMERATED {
    p00, p05, p10, p15, p20, p25, p30, p40,
    p50, p60, p70, p75, p80, p85, p90, p95},
  ac-BarringTime ENUMERATED {s4, s8, s16, s32, s64, s128, s256, s512},
  ac-BarringForSpecialAC BIT STRING (SIZE(5))
}

MBSFN-SubframeConfigList ::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig
-- ASN1STOP

SystemInformationBlockType2 field descriptions

ac-BarringForEmergency
Access class barring for AC 10.

ac-BarringForMO-Signalling
Access class barring for mobile originating signalling.

ac-BarringForMO-Data
Access class barring for mobile originating calls.

ac-BarringFactor
If the random number drawn by the UE is lower than this value, access is allowed. Otherwise the access is barred.
The values are interpreted in the range [0,1): p00 = 0, p05 = 0.05, p10 = 0.10, ..., p95 = 0.95. Values other than 'p00'
can only be set if all bits of the corresponding ac-BarringForSpecialAC are set to 0.

ac-BarringTime
Mean access barring time value in seconds.

ac-BarringForSpecialAC
Access class barring for AC 11-15. The first/ leftmost bit is for AC 11, the second bit is for AC 12, and so on.

ul-CarrierFreq
For FDD: If absent, the (default) value determined from the default TX-RX frequency separation defined in TS 36.101
[42, table 5.7.3-1] applies.
For TDD: This parameter is absent and it is equal to the downlink frequency.

ul-Bandwidth
Parameter: transmission bandwidth configuration, N_{RB}, in uplink, see TS 36.101 [42, table 5.6-1]. Value n6
corresponds to 6 resource blocks, n15 to 15 resource blocks and so on. If for FDD this parameter is absent, the uplink
bandwidth is equal to the downlink bandwidth. For TDD this parameter is absent and it is equal to the downlink
bandwidth.

mbsfn-SubframeConfigList
Defines the subframes that are reserved for MBSFN in downlink.

ssac-BarringForMMTEL-Voice
Service specific access class barring for MMTEL voice originating calls.

ssac-BarringForMMTEL-Video
Service specific access class barring for MMTEL video originating calls.

SystemInformationBlockType3

The IE SystemInformationBlockType3 contains cell re-selection information common for intra-frequency, inter-
frequency and/or inter-RAT cell re-selection (i.e. applicable for more than one type of cell re-selection but not
necessarily all) as well as intra-frequency cell re-selection information other than neighbouring cell related.

SystemInformationBlockType3 information element

-- ASN1START

SystemInformationBlockType3 ::= SEQUENCE {
  cellReselectionInfoCommon q-Hyst
  speedStateReselectionPars MobilityStateParameters q-HystSP
  sf-Medium
  sf-High
}

cellReselectionServingFreqInfo  SEQUENCE {
  s-NonIntraSearch  ReselectionThreshold  OPTIONAL,  -- Need OP
  threshServingLow  ReselectionThreshold,
  cellReselectionPriority  CellReselectionPriority
},
intraFreqCellReselectionInfo  SEQUENCE {
  q-RxLevMin  Q-RxLevMin,
  p-Max  P-Max  OPTIONAL,  -- Need OP
  s-IntraSearch  ReselectionThreshold  OPTIONAL,  -- Need OP
  allowedMeasBandwidth  AllowedMeasBandwidth  OPTIONAL,  -- Need OP
  presenceAntennaPort1  PresenceAntennaPort1,
  neighCellConfig  NeighCellConfig,
  t-ReselectionEUTRA  T-Reselection,
  t-ReselectionEUTRA-SF  SpeedStateScaleFactors  OPTIONAL  -- Need OP
},
lateNonCriticalExtension  OCTET STRING  OPTIONAL,  -- Need OP
[[
  s-IntraSearch-v920  SEQUENCE {
    s-IntraSearchP-r9  ReselectionThreshold,
    s-IntraSearchQ-r9  ReselectionThresholdQ-r9
  }  OPTIONAL,  -- Need OP
  s-NonIntraSearch-v920  SEQUENCE {
    s-NonIntraSearchP-r9  ReselectionThreshold,
    s-NonIntraSearchQ-r9  ReselectionThresholdQ-r9
  }  OPTIONAL,  -- Need OP
  q-QualMin-r9  Q-QualMin-r9  OPTIONAL,  -- Need OP
  threshServingLowQ-r9  ReselectionThresholdQ-r9  OPTIONAL  -- Need OP
]]
-- ASN1STOP
**SystemInformationBlockType3 field descriptions**

**cellReselectionInfoCommon**
Cell re-selection information common for cells.

**q-Hyst**
Parameter $Q_{hyst}$ in 36.304 [4]. Value in dB. Value dB1 corresponds to 1 dB, dB2 corresponds to 2 dB and so on.

**speedStateReselectionPars**
Speed dependent reselection parameters, see TS 36.304 [4]. If this field is absent, i.e. mobilityStateParameters is also not present, UE behaviour is specified in TS 36.304 [4].

**q-HystSF**
Parameter “Speed dependent ScalingFactor for $Q_{hyst}$” in TS 36.304 [4]. The sf-Medium and sf-High concern the additional hysteresis to be applied, in Medium and High Mobility state respectively, to $Q_{hyst}$ as defined in TS 36.304 [4]. In dB. Value dB-6 corresponds to -6dB, dB-4 corresponds to -4dB and so on.

**t-ReselectionEUTRA**
Parameter “TreselectionEUTRA” in TS 36.304 [4].

**t-ReselectionEUTRA-SF**
Parameter “Speed dependent ScalingFactor for TreselectionEUTRA” in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].

**q-RxLevMin**
Parameter “$Q_{rxlevmin}$” in TS 36.304 [4]. applicable for intra-frequency neighbour cells.

**s-IntraSearch**
Parameter “$s_{IntraSearchP}$” in TS 36.304 [4]. If the field $s_{IntraSearchP}$ is present, the UE applies the value of $s_{IntraSearchP}$ instead. Otherwise if neither $s_{IntraSearch}$ nor $s_{IntraSearchP}$ is present, the UE applies the (default) value of infinity for $s_{IntraSearchP}$.

**cellReselectionServingFreqInfo**
Information common for Cell re-selection to inter-frequency and inter-RAT cells.

**s-NonIntraSearch**
Parameter “$s_{NonIntraSearchP}$” in TS 36.304 [4]. If the field $s_{NonIntraSearchP}$ is present, the UE applies the value of $s_{NonIntraSearchP}$ instead. Otherwise if neither $s_{NonIntraSearch}$ nor $s_{NonIntraSearchP}$ is present, the UE applies the (default) value of infinity for $s_{NonIntraSearchP}$.

**threshServingLow**
Parameter “$Thresh_{Serving, LowP}$” in TS 36.304 [4].

**intraFreqCellReselectionInfo**
Cell re-selection information common for intra-frequency cells.

**p-Max**
Value applicable for the intra-frequency neighbouring E-UTRA cells. If absent the UE applies the maximum power according to the UE capability.

**allowedMeasBandwidth**
If absent, the value corresponding to the downlink bandwidth indicated by the $dl-Bandwidth$ included in MasterInformationBlock applies.

**s-IntraSearchP**
Parameter “$s_{IntraSearchP}$” in TS 36.304 [4]. See descriptions under $s_{IntraSearch}$.

**s-IntraSearchQ**
Parameter “$s_{IntraSearchQ}$” in TS 36.304 [4]. See descriptions under $s_{NonIntraSearch}$.

**s-NonIntraSearchP**
Parameter “$s_{NonIntraSearchP}$” in TS 36.304 [4]. See descriptions under $s_{NonIntraSearch}$.

**s-NonIntraSearchQ**
Parameter “$s_{NonIntraSearchQ}$” in TS 36.304 [4]. If the field is not present, the UE applies the (default) value of 0 dB for $s_{NonIntraSearchQ}$.

**q-QualMin**
Parameter “$Q_{qualmin}$” in TS 36.304 [4]. applicable for intra-frequency neighbour cells. If the field is not present, the UE applies the (default) value of negative infinity for $Q_{qualmin}$.

**threshServingLowQ**
Parameter “$Thresh_{Serving, LowQ}$” in TS 36.304 [4].

---

**SystemInformationBlockType4**

The IE *SystemInformationBlockType4* contains neighbouring cell related information relevant only for intra-frequency cell re-selection. The IE includes cells with specific re-selection parameters as well as blacklisted cells.

**SystemInformationBlockType4 information element**

```asn1
-- ASN1START
SystemInformationBlockType4 ::= SEQUENCE {
  intraFreqNeighCellList  IntraFreqNeighCellList  OPTIONAL,    -- Need OR
-- ASN1END
```
intraFreqBlackCellList ::= SEQUENCE (SIZE (1..maxCellBlack)) OF PhysCellIdRange
-- ASN1STOP

SystemInformationBlockType4 field descriptions

intraFreqNeighbCellList
List of intra-frequency neighbouring cells with specific cell re-selection parameters.

q-OffsetCell
Parameter “Qoffset,s,n” in TS 36.304 [4].

intraFreqBlackCellList
List of blacklisted intra-frequency neighbouring cells.

csg-PhysCellIdRange
Set of physical cell identities reserved for CSG cells on the frequency on which this field was received. The received
csg-PhysCellIdRange applies if less than 24 hours has elapsed since it was received and it was received in the same
primary PLMN. The 3 hour validity restriction (section 5.2.1.3) does not apply to this field.

Conditional presence Explanation
CSG This field is optional, need OP, for non-CSG cells, and mandatory for CSG cells.

-- SystemInformationBlockType5

The IE SystemInformationBlockType5 contains information relevant only for inter-frequency cell re-selection i.e.
information about other E-UTRA frequencies and inter-frequency neighbouring cells relevant for cell re-selection. The
IE includes cell re-selection parameters common for a frequency as well as cell specific re-selection parameters.

SystemInformationBlockType5 information element

-- ASN1START
SystemInformationBlockType5 ::= SEQUENCE {
  interFreqCarrierFreqList   InterFreqCarrierFreqList,
  ...,
  lateNonCriticalExtension    OCTET STRING    OPTIONAL -- Need OP
}

InterFreqCarrierFreqList ::= SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo

InterFreqCarrierFreqInfo ::= SEQUENCE {
  d1-CarrierFreq      ARFCN-ValueEUTRA,
  q-RxLevMin       Q-RxLevMin,
  p-Max        P-Max       OPTIONAL,  -- Need OP
  t-ReselectionEUTRA     T-Reselection,
  t-ReselectionEUTRA-SF    SpeedStateScaleFactors   OPTIONAL,  -- Need OP
  threshX-High      ReselectionThreshold,
  threshX-Low       ReselectionThreshold,
  allowedMeasBandwidth    AllowedMeasBandwidth,
  presenceAntennaPort1    PresenceAntennaPort1,
  cellReselectionPriority    CellReselectionPriority,
  neighCellConfig      NeighCellConfig,
  q-OffsetFreq       Q-OffsetRange,
  interFreqNeighCellList    InterFreqNeighCellList   OPTIONAL,   -- Need OR
  interFreqBlackCellList    InterFreqBlackCellList   OPTIONAL,   -- Need OR
  ...,
  [ q-QualMin-r9     Q-QualMin-r9     OPTIONAL,  -- Need OP
    threshX-Q-r9       SEQUENCE { ReselectionThresholdQ-r9,
    ... ]

-- ASN1STOP
SystemInformationBlockType5 field descriptions

**p-Max**
Value applicable for the neighbouring E-UTRA cells on this carrier frequency. If absent the UE applies the maximum power according to the UE capability.

**threshX-High**

**threshX-Low**

**t-ReselectionEUTRA**
Parameter “TreselectionEUTRA” in TS 36.304 [4].

**t-ReselectionEUTRA-SF**
Parameter “Speed dependent ScalingFactor for TreselectionEUTRA” in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].

**q-OffsetFreq**
Parameter “Qoffset, frequency” in TS 36.304 [4].

**interFreqNeighCellList**
List of inter-frequency neighbouring cells with specific cell re-selection parameters.

**q-OffsetCell**
Parameter “Qoffsets,n” in TS 36.304 [4].

**interFreqBlackCellList**
List of blacklisted inter-frequency neighbouring cells.

**q-QualMin**
Parameter “Qqualmin” in TS 36.304 [4]. If the field is not present, the UE applies the (default) value of negative infinity for Qqualmin.

**threshX-HighQ**
Parameter “ThreshX, HighQ” in TS 36.304 [4].

**threshX-LowQ**
Parameter “ThreshX, LowQ” in TS 36.304 [4].

---

SystemInformationBlockType6

The IE SystemInformationBlockType6 contains information relevant only for inter-RAT cell re-selection i.e. information about UTRA frequencies and UTRA neighbouring cells relevant for cell re-selection. The IE includes cell re-selection parameters common for a frequency.

SystemInformationBlockType6 information element

-- ASN1START

SystemInformationBlockType6 ::=  SEQUENCE {
  carrierFreqListUTRA-FDD    CarrierFreqListUTRA-FDD   OPTIONAL,   -- Need OR
  carrierFreqListUTRA-TDD    CarrierFreqListUTRA-TDD   OPTIONAL,   -- Need OR
  t-ReselectionUTRA     T-Reselection,   -- Need OP
  t-ReselectionUTRA-SF    SpeedStateScaleFactors   OPTIONAL,   -- Need OP
  lateNonCriticalExtension   OCTET STRING     OPTIONAL -- Need OP
  } -- ASN1STOP
CarrierFreqListUTRA-FDD ::= SEQUENCE (SIZE (1..maxUTRA-FDD-Carrier)) OF CarrierFreqUTRA-FDD
CarrierFreqUTRA-FDD ::= SEQUENCE {
carrierFreq            ARFCN-ValueUTRA,
cellReselectionPriority CellReselectionPriority OPTIONAL, -- Need OP
threshX-High           ReselectionThreshold,
threshX-Low             ReselectionThreshold,
q-RxLevMin              INTEGER (-60..-13),
p-MaxUTRA               INTEGER (-50..33),
q-QualMin               INTEGER (-24..0),
...                       }
[[ threshX-Q-r9         SEQUENCE {
        threshX-HighQ-r9 ReselectionThresholdQ-r9,
        threshX-LowQ-r9  ReselectionThresholdQ-r9
    } OPTIONAL -- Cond RSRQ ]]
CarrierFreqListUTRA-TDD ::= SEQUENCE (SIZE (1..maxUTRA-TDD-Carrier)) OF CarrierFreqUTRA-TDD
CarrierFreqUTRA-TDD ::= SEQUENCE {
carrierFreq            ARFCN-ValueUTRA,
cellReselectionPriority CellReselectionPriority OPTIONAL, -- Need OP
threshX-High           ReselectionThreshold,
threshX-Low             ReselectionThreshold,
q-RxLevMin              INTEGER (-60..-13),
p-MaxUTRA               INTEGER (-50..33),
...                       }
-- ASN1STOP

**SystemInformationBlockType6 field descriptions**

- t-ReselectionUTRA-SF: Parameter “Speed dependent ScalingFactor for TreselectionUTRA” in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].
- carrierFreqListUTRA-FDD: List of carrier frequencies of UTRA FDD.
- carrierFreqListUTRA-TDD: List of carrier frequencies of UTRA TDD.
- q-RxLevMin: Parameter “QminRxlevm” in TS 25.304 [40]. Actual value = IE value * 2 + 1 [dBm].
- p-MaxUTRA: The maximum allowed transmission power on the (uplink) carrier frequency, see TS 25.304 [40]. In dBm
- q-QualMin: Parameter “QminQual” in TS 25.304 [40]. Actual value = IE value [dB].

**Conditional presence**

<table>
<thead>
<tr>
<th>RSRQ</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The field is mandatory present if the threshServingLowQ is present in systemInformationBlockType3, otherwise it is not present.</td>
</tr>
</tbody>
</table>

The IE SystemInformationBlockType7 contains information relevant only for inter-RAT cell re-selection i.e. information about GERAN frequencies relevant for cell re-selection. The IE includes cell re-selection parameters for each frequency.
SystemInformationBlockType7 information element

--- ASN1START

SystemInformationBlockType7 ::=  SEQUENCE {
  t-ReselectionGERAN         T-Reselection,
  t-ReselectionGERAN-SF     SpeedStateScaleFactors OPTIONAL, -- Need OR
  carrierFreqsInfoList      CarrierFreqsInfoListGERAN OPTIONAL, -- Need OR
  ...,
  lateNonCriticalExtension  OCTET STRING OPTIONAL  -- Need OP
}

CarrierFreqsInfoListGERAN ::=  SEQUENCE (SIZE (1..maxGNFG)) OF CarrierFreqsInfoGERAN

CarrierFreqsInfoGERAN ::=  SEQUENCE {
  carrierFreqs      CarrierFreqsGERAN,
  commonInfo       SEQUENCE {
    cellReselectionPriority  CellReselectionPriority OPTIONAL, -- Need OP
    ncc-Permitted      BIT STRING (SIZE (8)),
    q-RxLevMin       INTEGER (0..45),
    p-MaxGERAN       INTEGER (0..39) OPTIONAL, -- Need OP
    threshX-High      ReselectionThreshold,
    threshX-Low       ReselectionThreshold
  },
  ...
}

--- ASN1STOP

SystemInformationBlockType7 field descriptions

carrierFreqsInfoList
Provides a list of neighbouring GERAN carrier frequencies, which may be monitored for neighbouring GERAN cells. The GERAN carrier frequencies are organised in groups and the cell reselection parameters are provided per group of GERAN carrier frequencies.

carrierFreqs
The list of GERAN carrier frequencies organised into one group of GERAN carrier frequencies.

commonInfo
Defines the set of cell reselection parameters for the group of GERAN carrier frequencies.

T-ReselectionGERAN
Parameter “TreselectionGERAN” in TS 36.304 [4].

T-ReselectionGERAN-SF
Parameter “Speed dependent ScalingFactor for TreselectionGERAN” in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].

ncc-Permitted
Field encoded as a bit map, where bit N is set to "0" if a BCCH carrier with NCC = N-1 is not permitted for monitoring and set to "1" if the BCCH carrier with NCC = N-1 is permitted for monitoring; N = 1 to 8; bit 1 of the bitmap is the leading bit of the bit string.

q-RxLevMin
Parameter “Qrxlevmin” in TS 36.304 [1], minimum required RX level in the GSM cell. The actual value of Qrxlevmin in dBm = (IE value * 2) – 115.

p-MaxGERAN
Maximum allowed transmission power for GERAN on an uplink carrier frequency, see TS 45.008 [28]. Value in dBm. Applicable for the neighbouring GERAN cells on this carrier frequency. If pmaxGERAN is absent, the maximum power according to the UE capability is used.

threshX-High

threshX-Low

--- SystemInformationBlockType8

The IE SystemInformationBlockType8 contains information relevant only for inter-RAT cell re-selection i.e. information about CDMA2000 frequencies and CDMA2000 neighbouring cells relevant for cell re-selection. The IE includes cell re-selection parameters common for a frequency as well as cell specific re-selection parameters.

-- ASN1START
SystemInformationBlockType8 ::= SEQUENCE {
  systemTimeInfo          SystemTimeInfoCDMA2000 OPTIONAL, -- Need OR
  searchWindowSize        INTEGER (0..15) OPTIONAL, -- Need OR
  parametersHRPD         SEQUENCE {
    preRegistrationInfoHRPD PreRegistrationInfoHRPD,
    cellReselectionParametersHRPD CellReselectionParametersCDMA2000 OPTIONAL -- Need OR
  } OPTIONAL, -- Need OR
  parameters1XRTT        SEQUENCE {
    csfb-RegistrationParam1XRTT CSFB-RegistrationParam1XRTT OPTIONAL, -- Need OP
    longCodeState1XRTT      BIT STRING (SIZE (42)) OPTIONAL, -- Need OR
    cellReselectionParameters1XRTT CellReselectionParametersCDMA2000 OPTIONAL -- Need OR
  } OPTIONAL, -- Need OR
  ...,
  lateNonCriticalExtension OCTET STRING OPTIONAL, -- Need OP
  [ [ csfb-SupportForDualRxUEs-r9 BOOLEAN OPTIONAL, -- Need OR
    cellReselectionParametersHRPD-v920 CellReselectionParametersCDMA2000-v920 OPTIONAL, -- Cond NCL-HRPD
  ],
  [ Cond NCL-1XRTT
    cellReselectionParameters1XRTT-v920 CellReselectionParametersCDMA2000-v920 OPTIONAL, --
  ],
  [ Cond REG-1XRTT
    ac-BarringConfig1XRTT-r9   AC-BarringConfig1XRTT-r9 OPTIONAL -- Cond REG-1XRTT
  ] ]
}

CellReselectionParametersCDMA2000 ::= SEQUENCE {
  bandClassList            BandClassListCDMA2000,
  neighCellList            NeighCellListCDMA2000,
  t-ReselectionCDMA2000     T-Reselection,
  t-ReselectionCDMA2000-SF  SpeedStateScaleFactors OPTIONAL -- Need OP
}

CellReselectionParametersCDMA2000-v920 ::= SEQUENCE {
  neighCellList-v920       NeighCellListCDMA2000-v920
}

NeighCellListCDMA2000 ::= SEQUENCE (SIZE (1..16)) OF NeighCellCDMA2000

NeighCellCDMA2000 ::= SEQUENCE {
  bandClass       BandclassCDMA2000,
  neighCellsPerFreqList    NeighCellsPerBandclassListCDMA2000
}

NeighCellsPerBandclassListCDMA2000 ::= SEQUENCE (SIZE (1..16)) OF NeighCellsPerBandclassCDMA2000

NeighCellsPerBandclassCDMA2000 ::= SEQUENCE {
  arfcn        ARFCN-ValueCDMA2000,
  physCellIdList      PhysCellIdListCDMA2000
}

NeighCellListCDMA2000-v920 ::= SEQUENCE (SIZE (1..16)) OF NeighCellCDMA2000-v920

NeighCellCDMA2000-v920 ::= SEQUENCE {
  bandClass       BandclassCDMA2000,
  neighCellsPerFreqList-v920 NeighCellsPerBandclassListCDMA2000-v920
}

NeighCellsPerBandclassListCDMA2000-v920 ::= SEQUENCE (SIZE (1..16)) OF NeighCellsPerBandclassCDMA2000-v920

NeighCellsPerBandclassCDMA2000-v920 ::= SEQUENCE {
  physCellIdListCDMA2000 physCellIdListCDMA2000-v920
}

PhysCellIdListCDMA2000 ::= SEQUENCE (SIZE (1..16)) OF PhysCellIdCDMA2000

PhysCellIdListCDMA2000-v920 ::= SEQUENCE (SIZE (0..24)) OF PhysCellIdCDMA2000

BandClassListCDMA2000 ::= SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF BandClassInfoCDMA2000

BandClassInfoCDMA2000 ::= SEQUENCE {
  bandClass       BandclassCDMA2000,
  cellReselectionPriority    CellReselectionPriority OPTIONAL, -- Need OP
  threshX-High      INTEGER (0..63),
  threshX-Low       INTEGER (0..63),
  ...,
AC-BarringConfig1XRTT-r9 ::= SEQUENCE {
  ac-Barring0to9-r9     INTEGER (0..63),
  ac-Barring10-r9      INTEGER (0..7),
  ac-Barring11-r9      INTEGER (0..7),
  ac-Barring12-r9      INTEGER (0..7),
  ac-Barring13-r9      INTEGER (0..7),
  ac-Barring14-r9      INTEGER (0..7),
  ac-Barring15-r9      INTEGER (0..7),
  ac-BarringReg-r9     INTEGER (0..7),
  ac-BarringEmg-r9     INTEGER (0..7)
}

-- ASN1STOP

SystemInformationBlockType8 field descriptions

systemTimeInfo
Information on CDMA2000 system time. This field is required for a UE with rx-ConfigHRPD= ‘single’ and/or rx-Config1XRTT= ‘single’ to perform handover, cell re-selection, UE measurement based redirection and enhanced 1xRTT CS fallback from E-UTRAN to CDMA2000 according to this specification and TS 36.304 [4]. This field is excluded when estimating changes in system information, i.e. changes of systemTimeInfo should neither result in system information change notifications nor in a modification of systemInfoValueTag in SIB1.

searchWindowSize
The search window size is a CDMA2000 parameter to be used to assist in searching for the neighbouring pilots. For values see C.S0005-A [25, Table 2.6.6.2.1-1] and C.S0024-A [26, Table 8.7.6.2-4]. This field is required for a UE with rx-ConfigHRPD= ‘single’ and/or rx-Config1XRTT= ‘single’ to perform handover, cell re-selection, UE measurement based redirection and enhanced 1xRTT CS fallback from E-UTRAN to CDMA2000 according to this specification and TS 36.304 [4].

parametersHRPD
Parameters applicable only for interworking with CDMA2000 HRPD systems.

preRegistrationInfoHRPD
The CDMA2000 HRPD Pre-Registration Information tells the UE if it should pre-register with the CDMA2000 HRPD network and identifies the Pre-registration zone to the UE.

cellReselectionParametersHRPD
Cell reselection parameters applicable for cell reselection to CDMA2000 HRPD system

bandClassList
List of CDMA2000 frequency bands.

bandClass
Identifies the Frequency Band in which the Carrier can be found. Details can be found in C.S0057-B [24, Table 1.5].

threshX-High
Parameter “ThreshX,HighP” in TS 36.304 [4]. This specifies the high threshold used in reselection towards this CDMA2000 band class expressed as an unsigned binary number equal to FLOOR (-2 x 10 x log10 Ec/Io) in units of 0.5 dB, as defined in C.S0005-A [25].

threshX-Low
Parameter “ThreshX,LowP” in TS 36.304 [4]. This specifies the low threshold used in reselection towards this CDMA2000 band class expressed as an unsigned binary number equal to FLOOR (-2 x 10 x log10 Ec/Io) in units of 0.5 dB, as defined in C.S0005-A [25].

t-ReselectionCDMA2000
Parameter “TreselectionCDMA_HRPD” or “TreselectionCDMA_1xRTT” in TS 36.304 [4].

t-ReselectionCDMA2000-SF
Parameter “Speed dependent ScalingFactor for TreselectionCDMA_HRPD” or TreselectionCDMA_1xRTT” in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].

neighCellList
List of CDMA2000 neighbouring cells. The total number of neighbouring cells in neighCellList for each RAT (1XRTT or HRPD) is limited to 32.

parameters1XRTT
Parameters applicable for interworking with CDMA2000 1XRTT system.
### SystemInformationBlockType8 field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>csfb-RegistrationParam1XRTT</strong></td>
<td>Contains the parameters the UE will use to determine if it should perform a CDMA2000 1xRTT Registration/Re-Registration. This field is included if either CSFB or enhanced CS fallback to CDMA2000 1xRTT is supported.</td>
</tr>
<tr>
<td><strong>longCodeState1XRTT</strong></td>
<td>The state of long code generation registers in CDMA2000 1XRTT system as defined in C.S0002-A [12, Section 1.3] at ( \left\lfloor \frac{t}{10} \right\rfloor \times 10 + 320 ) ms, where ( t ) equals to the cdma-SystemTime. This field is required for SRVCC handover and enhanced CS fallback to CDMA2000 1xRTT operation. Otherwise this IE is not needed. This field is excluded when estimating changes in system information, i.e. changes of longCodeState1XRTT should neither result in system information change notifications nor in a modification of systemInfoValueTag in SIB1.</td>
</tr>
<tr>
<td><strong>cellReselectionParameters1XRTT</strong></td>
<td>Cell reselection parameters applicable only to CDMA2000 1xRTT system.</td>
</tr>
<tr>
<td><strong>neighCellsPerFreqList</strong></td>
<td>List of carrier frequencies and neighbour cell ids in each frequency within a CDMA2000 Band, see C.S0002-A [12] or C.S0024-A [26].</td>
</tr>
<tr>
<td><strong>physCellIdList</strong></td>
<td>Identifies the list of CDMA2000 cell ids, see C.S0002-A [12] or C.S0024-A [26].</td>
</tr>
<tr>
<td><strong>csfb-SupportForDualRxUEs</strong></td>
<td>Value TRUE indicates that the network supports dual Rx CSFB [51].</td>
</tr>
<tr>
<td><strong>cellReselectionParametersHRPD-v920</strong></td>
<td>Cell reselection parameters applicable for cell reselection to CDMA2000 HRPD system. The field is not present if cellReselectionParametersHRPD is not present; otherwise it is optionally present.</td>
</tr>
<tr>
<td><strong>cellReselectionParameters1XRTT-v920</strong></td>
<td>Cell reselection parameters applicable for cell reselection to CDMA2000 1XRTT system. The field is not present if cellReselectionParameters1XRTT is not present; otherwise it is optionally present.</td>
</tr>
<tr>
<td><strong>neighCellList-v920</strong></td>
<td>Extended List of CDMA2000 neighbouring cells. The combined total number of CDMA2000 neighbouring cells in both neighCellList and neighCellList-v920 is limited to 32 for HRPD and 40 for 1xRTT.</td>
</tr>
<tr>
<td><strong>neighCellsPerFreqList-v920</strong></td>
<td>Extended list of neighbour cell ids, in the same CDMA2000 Frequency Band as the corresponding instance in “NeighCellListCDMA2000”.</td>
</tr>
<tr>
<td><strong>physCellIdList-v920</strong></td>
<td>Extended list of CDMA2000 cell ids, in the same CDMA2000 ARFCN as the corresponding instance in “NeighCellsPerBandclassCDMA2000”.</td>
</tr>
<tr>
<td><strong>ac-BarringConfig1XRTT</strong></td>
<td>Contains the access class barring parameters the UE uses to calculate the access class barring factor, see C.S0097 [53].</td>
</tr>
<tr>
<td><strong>ac-Barring0to9</strong></td>
<td>Parameter used for calculating the access class barring factor for access overload classes 0 through 9. It is the parameter “PSIST” in C.S0004-A [34] for access overload classes 0 through 9.</td>
</tr>
<tr>
<td><strong>ac-BarringN</strong></td>
<td>Parameter used for calculating the access class barring factor for access overload class N (N = 10 to 15). It is the parameter “PSIST” in C.S0004-A [34] for access overload class N.</td>
</tr>
<tr>
<td><strong>ac-BarringMsg</strong></td>
<td>Parameter used for modifying the access class barring factor for message transmissions. It is the parameter “MSG_PSIST” in C.S0004-A [34].</td>
</tr>
<tr>
<td><strong>ac-BarringReg</strong></td>
<td>Parameter used for modifying the access class barring factor for autonomous registrations. It is the parameter “REG_PSIST” in C.S0004-A [34].</td>
</tr>
<tr>
<td><strong>ac-BarringEmg</strong></td>
<td>Parameter used for calculating the access class barring factor for emergency calls and emergency message transmissions for access overload classes 0 through 9. It is the parameter “PSIST_EMG” in C.S0004-A [34].</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCL-1XRTT</td>
<td>The field is optional present, need OR, if cellReselectionParameters1XRTT is present; otherwise it is not present.</td>
</tr>
<tr>
<td>NCL-HRPD</td>
<td>The field is optional present, need OR, if cellReselectionParametersHRPD is present; otherwise it is not present.</td>
</tr>
<tr>
<td>REG-1XRTT</td>
<td>The field is optional present, need OR, if csfb-RegistrationParam1XRTT is present; otherwise it is not present.</td>
</tr>
</tbody>
</table>
### SystemInformationBlockType9

The IE `SystemInformationBlockType9` contains a home eNB name (HNB Name).

#### SystemInformationBlockType9 information element

```
SystemInformationBlockType9 ::= SEQUENCE {
    hnb-Name       OCTET STRING (SIZE(1..48))  OPTIONAL, -- Need OR
    ...,
    lateNonCriticalExtension    OCTET STRING    OPTIONAL  -- Need OP
}
```

#### SystemInformationBlockType9 field descriptions

- **hnb-Name**
  Carries the name of the home eNB, coded in UTF-8 with variable number of bytes per character, see TS 22.011 [10].

### SystemInformationBlockType10

The IE `SystemInformationBlockType10` contains an ETWS primary notification.

#### SystemInformationBlockType10 information element

```
SystemInformationBlockType10 ::= SEQUENCE {
    messageIdentifier     BIT STRING (SIZE (16)),
    serialNumber      BIT STRING (SIZE (16)),
    warningType       OCTET STRING (SIZE (2)),
    warningSecurityInfo     OCTET STRING (SIZE (50))  OPTIONAL,  -- Need OP
    ...,
    lateNonCriticalExtension    OCTET STRING    OPTIONAL  -- Need OP
}
```

#### SystemInformationBlockType10 field descriptions

- **messageIdentifier**
  Identifies the source and type of ETWS notification. The leading bit (which is equivalent to the leading bit of the equivalent IE defined in TS 36.413 [39, 9.2.1.44]) contains bit 7 of the first octet of the equivalent IE, defined in and encoded according to TS 23.041 [37, 9.4.1.2.2], while the trailing bit contains bit 0 of the second octet of the same equivalent IE.

- **serialNumber**
  Identifies variations of an ETWS notification. The leading bit (which is equivalent to the leading bit of the equivalent IE defined in TS 36.413 [39, 9.2.1.45]) contains bit 7 of the first octet of the equivalent IE, defined in and encoded according to TS 23.041 [37, 9.4.1.2.1], while the trailing bit contains bit 0 of the second octet of the same equivalent IE.

- **warningType**
  Identifies the warning type of the ETWS primary notification and provides information on emergency user alert and UE popup. The first octet (which is equivalent to the first octet of the equivalent IE defined in TS 36.413 [39, 9.2.1.50]) contains the first octet of the equivalent IE defined in and encoded according to TS 23.041 [37, 9.3.24], and so on.

- **warningSecurityInfo**
  Provides security information for the ETWS notification. The first octet (which is equivalent to the first octet of the equivalent IE defined in TS 36.413 [39, 9.2.1.51]) contains the first octet of the equivalent IE defined in and encoded according to TS 23.041 [37, 9.3.25], and so on.
The IE \texttt{SystemInformationBlockType11} contains an ETWS secondary notification.

\textbf{SystemInformationBlockType11 information element}

\begin{verbatim}
SystemInformationBlockType11 ::= SEQUENCE {
  messageIdentifier     BIT STRING (SIZE (16)),
  serialNumber      BIT STRING (SIZE (16)),
  warningMessageSegmentType   ENUMERATED {notLastSegment, lastSegment},
  warningMessageSegmentNumber   INTEGER (0..63),
  warningMessageSegment    OCTET STRING,
  dataCodingScheme     OCTET STRING (SIZE (1)) OPTIONAL,  -- Cond Segment1
  ...,
  lateNonCriticalExtension    OCTET STRING     OPTIONAL  -- Need OP
}
\end{verbatim}

\textbf{SystemInformationBlockType11 field descriptions}

\textit{messageIdentifier}
Identifies the source and type of ETWS notification. The leading bit (which is equivalent to the leading bit of the equivalent IE defined in TS 36.413 [39, 9.2.1.44]) contains bit 7 of the first octet of the equivalent IE, defined in and encoded according to TS 23.041 [37, 9.4.1.2.2], while the trailing bit contains bit 0 of second octet of the same equivalent IE.

\textit{serialNumber}
Identifies variations of an ETWS notification. The leading bit (which is equivalent to the leading bit of the equivalent IE defined in TS 36.413 [39, 9.2.1.45]) contains bit 7 of the first octet of the equivalent IE, defined in and encoded according to TS 23.041 [37, 9.4.1.2.1], while the trailing bit contains bit 0 of second octet of the same equivalent IE.

\textit{warningMessageSegmentType}
Indicates whether the included ETWS warning message segment is the last segment or not.

\textit{warningMessageSegmentNumber}
Segment number of the ETWS warning message segment contained in the SIB. A segment number of zero corresponds to the first segment, one corresponds to the second segment, and so on.

\textit{warningMessageSegment}
Carries a segment of the \textit{Warning Message Contents} IE defined in TS 36.413 [39, 9.2.1.53]. The first octet of the \textit{Warning Message Contents} IE is equivalent to the first octet of the \textit{CB data} IE defined in and encoded according to TS 23.041 [37, 9.4.2.2.5] and so on.

\textit{dataCodingScheme}
Identifies the alphabet/coding and the language applied variations of an ETWS notification. The octet (which is equivalent to the octet of the equivalent IE defined in TS 36.413 [39, 9.2.1.52]) contains the octet of the equivalent IE defined in TS 23.041 [37, 9.3.2.2.4] and encoded according to TS 23.038 [38].

\begin{table}[h]
\centering
\begin{tabular}{|c|c|}
\hline
\textbf{Conditional presence} & \textbf{Explanation} \\
\hline
\textit{Segment1} & The field is mandatory present in the first segment of SIB11, otherwise it is not present. \\
\hline
\end{tabular}
\end{table}

The IE \texttt{SystemInformationBlockType12} contains a CMAS notification.

\textbf{SystemInformationBlockType12 information element}

\begin{verbatim}
SystemInformationBlockType12-r9 ::= SEQUENCE {
  messageIdentifier-r9    BIT STRING (SIZE (16)),
  serialNumber-r9      BIT STRING (SIZE (16)),
  warningMessageSegmentType-r9  ENUMERATED {notLastSegment, lastSegment},
  warningMessageSegmentNumber-r9   INTEGER (0..63),
  warningMessageSegment-r9   OCTET STRING,
  dataCodingScheme-r9     OCTET STRING (SIZE (1)) OPTIONAL,  -- Cond Segment1
  ...,
  lateNonCriticalExtension    OCTET STRING     OPTIONAL  -- Need OP
}
\end{verbatim}
messageIdentifier
Identifies the source and type of CMAS notification. The leading bit (which is equivalent to the leading bit of the equivalent IE defined in TS 36.413 [39, 9.2.1.44]) contains bit 7 of the first octet of the equivalent IE, defined in and encoded according to TS 23.041 [37, 9.4.1.2.2], while the trailing bit contains bit 0 of second octet of the same equivalent IE.

serialNumber
Identifies variations of a CMAS notification. The leading bit (which is equivalent to the leading bit of the equivalent IE defined in TS 36.413 [39, 9.2.1.45]) contains bit 7 of the first octet of the equivalent IE, defined in and encoded according to TS 23.041 [37, 9.4.1.2.1], while the trailing bit contains bit 0 of second octet of the same equivalent IE.

warningMessageSegmentType
Indicates whether the included CMAS warning message segment is the last segment or not.

warningMessageSegmentNumber
Segment number of the CMAS warning message segment contained in the SIB. A segment number of zero corresponds to the first segment, one corresponds to the second segment, and so on.

dataCodingScheme
Identifies the alphabet/coding and the language applied variations of a CMAS notification. The octet (which is equivalent to the octet of the equivalent IE defined in TS 36.413 [39, 9.2.1.52]) contains the octet of the equivalent IE defined in TS 23.041 [37, 9.3.2.2.4] and encoded according to TS 23.038 [38].

Conditional presence | Explanation
--- | ---
Segment1 | The field is mandatory present in the first segment of SIB12, otherwise it is not present.

SystemInformationBlockType13

The IE `SystemInformationBlockType13` contains the information required to acquire the MBMS control information associated with one or more MBSFN areas.

SystemInformationBlockType13 information element

6.3.2 Radio resource control information elements

AntennaInfo
The IE `AntennaInfoCommon` and the `AntennaInfoDedicated` are used to specify the common and the UE specific antenna configuration respectively.

AntennaInfo information elements
AntennaInfoCommon ::= SEQUENCE {
  antennaPortsCount     ENUMERATED {an1, an2, an4, spare1}
}

AntennaInfoDedicated ::= SEQUENCE {
  transmissionMode     ENUMERATED {
    tm1, tm2, tm3, tm4, tm5, tm6,
    tm7, tm8-v920},
  codebookSubsetRestriction  CHOICE {
    n2TxAntenna-tm3      BIT STRING (SIZE (2)),
    n4TxAntenna-tm3      BIT STRING (SIZE (4)),
    n2TxAntenna-tm4      BIT STRING (SIZE (6)),
    n4TxAntenna-tm4      BIT STRING (SIZE (64)),
    n2TxAntenna-tm5      BIT STRING (SIZE (4)),
    n4TxAntenna-tm5      BIT STRING (SIZE (16)),
    n2TxAntenna-tm6      BIT STRING (SIZE (4)),
    n4TxAntenna-tm6      BIT STRING (SIZE (16))
  }  OPTIONAL,                -- Cond TM
  ue-TransmitAntennaSelection   CHOICE{release       NULL,
                               setup       ENUMERATED {closedLoop, openLoop}
  }
}

AntennaInfoDedicated-v920 ::=  SEQUENCE {
  codebookSubsetRestriction-v920  CHOICE {
    n2TxAntenna-tm8-r9     BIT STRING (SIZE (6)),
    n4TxAntenna-tm8-r9     BIT STRING (SIZE (32))
  }  OPTIONAL                -- Cond TM8

-- ASN1START

AntennaInfo field descriptions

antennaPortsCount Parameter represents the number of cell specific antenna ports where an1 corresponds to 1, an2 to 2 antenna ports etc. see TS 36.211 [21, 6.2.1].

transmissionMode Points to one of Transmission modes defined in TS 36.213 [23, 7.1] where tm1 refers to transmission mode 1, tm2 to transmission mode 2 etc.

codebookSubsetRestriction Parameter: codebookSubsetRestriction, see TS 36.213 [23, 7.2] and TS 36.211 [21, 6.3.4.2.3]. The field codebookSubsetRestriction-v920 is applicable only if PMI/RI reporting is configured.

ue-TransmitAntennaSelection For value setup the field indicates whether UE transmit antenna selection control is closed-loop or open-loop as described in TS 36.213 [23, 8.7].

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM</td>
<td>The field is mandatory present if the transmissionMode is set to tm3, tm4, tm5 or tm6. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>TM8</td>
<td>The field is optional present, need OR, if AntennaInfoDedicated is included and transmissionMode is set to tm8. If AntennaInfoDedicated is included and transmissionMode is set to a value other than tm8, the field is not present and the UE shall delete any existing value for this field. Otherwise the field is not present and the UE takes no action i.e. continues to use the existing value, if previously configured.</td>
</tr>
</tbody>
</table>

— CQI-ReportConfig

The IE CQI-ReportConfig is used to specify the CQI reporting configuration.

CQI-ReportConfig information elements

-- ASN1START

CQI-ReportConfig ::= SEQUENCE {
  cqi-ReportModeAperiodic  ENUMERATED {
    rm12, rm20, rm22, rm30, rm31,
    spare3, spare2, spare1} OPTIONAL, -- Need OR
CQI-ReportConfig field descriptions

cqi-PUCCH-ResourceIndex
Parameter: \( n_{PUCCH}^{(2)} \), see TS 36.213 [23, 7.2].

cqi-mi-ConfigIndex
Parameter: CQI/PMI Periodicity and Offset Configuration Index \( l_{CQI/PMI} \), see TS 36.213 [23, tables 7.2.2-1A and 7.2.2-1C].

ri-ConfigIndex
Parameter: RI Config Index \( l_{RI} \), see TS 36.213 [23, 7.2.2-1B].

K
Parameter: K, see TS 36.213 [23, 7.2.2].

cqi-FormatIndicatorPeriodic
Parameter: PUCCH CQI Feedback Type, see TS 36.213 [23, table 7.2.2-1]. Depending on transmissionMode, reporting mode is implicitly given from the table.

simultaneousAckNackAndCQI
Parameter: Simultaneous-AN-and-CQI. see TS 36.213 [23, 10.1] TRUE indicates that simultaneous transmission of ACK/NACK and CQI is allowed.

cqi-ReportModeAperiodic
Parameter: reporting mode. Value rm12 corresponds to Mode 1-2, rm20 corresponds to Mode 2-0, rm22 corresponds to Mode 2-2 etc. PUSCH reporting modes are described in TS 36.213 [23, 7.2.1].

nomPDSCH-RS-EPRE-Offset
Parameter: \( \Delta_{offset} \), see TS 36.213 [23, 7.2.3]. Actual value = IE value \( \times 2 \) [dB].

cqi-Mask
Limits CQI/PMI/RI reports to the on-duration period of the DRX cycle, see TS 36.321 [6].

pmi-RI-Report
See TS 36.213 [23, 7.2]. The presence of this field means PMI/RI reporting is configured, which is applicable only when transmissionMode is set to tm8; otherwise PMI/RI reporting is not configured.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>cqi-Setup</td>
<td>The field is optional present, need OR, if the cqi-ReportPeriodic in the cqi-ReportConfig is set to ‘setup’. If the field cqi-ReportPeriodic is present and set to ‘release’, the field is not present and the UE shall delete any existing value for this field. Otherwise the field is not present and the UE takes no action i.e. continues to use the existing value, if previously configured.</td>
</tr>
<tr>
<td>PMIRI</td>
<td>The field is optional present, need OR, if cqi-ReportPeriodic is included and set to ‘setup’, or cqi-ReportModeAperiodic is included. If the field cqi-ReportPeriodic is present and set to ‘release’ and cqi-ReportModeAperiodic is absent, the field is not present and the UE shall delete any existing value for this field. Otherwise the field is not present and the UE takes no action i.e. continues to use the existing value, if previously configured.</td>
</tr>
</tbody>
</table>
-- DRB-Identity

The IE DRB-Identity is used to identify a DRB used by a UE.

**DRB-Identity information elements**

```
-- ASN1START
DRB-Identity ::= INTEGER (1..32)
-- ASN1STOP
```

-- LogicalChannelConfig

The IE LogicalChannelConfig is used to configure the logical channel parameters.

**LogicalChannelConfig information element**

```
-- ASN1START
LogicalChannelConfig ::= SEQUENCE {
    ul-SpecificParameters    SEQUENCE {
        priority       INTEGER (1..16),
        prioritisedBitRate     ENUMERATED {
            kBps0, kBps8, kBps16, kBps32, kBps64, kBps128,
            kBps256, infinity, spare8, spare7, spare6,
            spare5, spare4, spare3, spare2, spare1},
        bucketSizeDuration     ENUMERATED {
            ms50, ms100, ms150, ms300, ms500, ms1000, spare2,
            spare1},
        logicalChannelGroup     INTEGER (0..3)   OPTIONAL   -- Need OR
    }   OPTIONAL,                 -- Cond UL
    ...,
    logicalChannelSR-Mask-r9   ENUMERATED {setup}  OPTIONAL  -- Cond SRmask
}   OPTIONAL,                 -- Cond UL

-- ASN1STOP
```

**LogicalChannelConfig field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>priority</td>
<td>Logical channel priority in TS 36.321 [6]. Value is an integer.</td>
</tr>
<tr>
<td>prioritisedBitRate</td>
<td>Prioritised Bit Rate for logical channel prioritization in TS 36.321 [6]. Value in kilobytes/second. Value kBps0 corresponds to 0 kB/second, kBps8 corresponds to 8 kB/second, kBps16 corresponds to 16 kB/second and so on. Infinity is the only applicable value for SRB1 and SRB2</td>
</tr>
<tr>
<td>bucketSizeDuration</td>
<td>Bucket Size Duration for logical channel prioritization in TS 36.321 [6]. Value in milliseconds. Value ms50 corresponds to 50 ms, ms100 corresponds to 100 ms and so on.</td>
</tr>
<tr>
<td>logicalChannelGroup</td>
<td>Mapping of logical channel to logical channel group for BSR reporting in TS 36.321 [6].</td>
</tr>
<tr>
<td>logicalChannelSR-Mask</td>
<td>Controlling SR triggering on a logical channel basis when an uplink grant is configured. See TS 36.321 [6].</td>
</tr>
</tbody>
</table>

- **Conditional presence**

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL</td>
<td>The field is mandatory present for UL logical channels; otherwise it is not present.</td>
</tr>
<tr>
<td>SRmask</td>
<td>The field is optionally present if ul-SpecificParameters is present, need OR; otherwise it is not present.</td>
</tr>
</tbody>
</table>

-- MAC-MainConfig

The IE MAC-MainConfig is used to specify the MAC main configuration for signalling and data radio bearers.
MAC-MainConfig information element

```asn1
MAC-MainConfig ::= SEQUENCE {
  ul-SCH-Config      SEQUENCE {
    maxHARQ-Tx       ENUMERATED {
      n1, n2, n3, n4, n5, n6, n7, n8,
      n10, n12, n16, n20, n24, n28,
      spare2, spare1} OPTIONAL, -- Need ON
  }
  periodicBSR-Timer     ENUMERATED {
    sf5, sf10, sf16, sf20, sf32, sf40, sf64, sf80,
    sf128, sf160, sf320, sf640, sf1280, sf2560,
    infinity, spare1} OPTIONAL, -- Need ON
  retxBSR-Timer      ENUMERATED {
    sf320, sf640, sf1280, sf2560, sf5120,
    sf10240, spare2, spare1},
  ttiBundling        BOOLEAN OPTIONAL, -- Need ON
  drx-Config       DRX-Config OPTIONAL, -- Need ON
  timeAlignmentTimerDedicated   TimeAlignmentTimer,
  phr-Config       CHOICE {
    release        NULL,
    periodicPHR-Timer     ENUMERATED {
      sf10, sf20, sf50, sf100, sf200,
      sf500, sf1000, infinity},
    prohibitPHR-Timer     ENUMERATED {
      sf0, sf10, sf20, sf50, sf100,
      sf200, sf500, sf1000},
    dl-PathlossChange     ENUMERATED {dB1, dB3, dB6, infinity}
  }
  DRX-Config ::=      CHOICE {
    release        NULL,
    onDurationTimer      ENUMERATED {
      psf1, psf2, psf3, psf4, psf5, psf6,
      psf8, psf10, psf20, psf30, psf40,
      psf50, psf60, psf80, psf100,
      psf200},
    drx-InactivityTimer     ENUMERATED {
      psf1, psf2, psf3, psf4, psf5, psf6,
      psf8, psf10, psf20, psf30, psf40,
      psf50, psf60, psf80, psf100,
      psf200, psf300, psf500, psf750,
      psf1280, psf1920, psf2560, spare10,
      spare9, spare8, spare7, spare6,
      spare5, spare4, spare3, spare2,
      spare1},
    longDRX-CycleStartOffset  CHOICE {
      sf10, sf20, sf40, sf64, sf80, sf128,
      sf256, sf512, sf1024, sf2048,
      sf2560},
    shortDRX       SEQUENCE {
      shortDRX-Cycle      ENUMERATED {
        sf2, sf5, sf8, sf10, sf16, sf20,
        sf32, sf40, sf64, sf80, sf128, sf160,
        sf256}
    }...
}
...,
}[[ sr-ProhibitTimer-r9     INTEGER (0..7) OPTIONAL -- Need ON ]]```
<table>
<thead>
<tr>
<th>Field Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>maxHARQ-Tx</td>
<td></td>
</tr>
<tr>
<td>periodicBSR-Timer</td>
<td></td>
</tr>
<tr>
<td>retxBSR-Timer</td>
<td></td>
</tr>
<tr>
<td>ttiBundling</td>
<td></td>
</tr>
<tr>
<td>longDRX-CycleStartOffset</td>
<td></td>
</tr>
<tr>
<td>onDurationTimer</td>
<td></td>
</tr>
<tr>
<td>drx-InactivityTimer</td>
<td></td>
</tr>
<tr>
<td>drx-RetransmissionTimer</td>
<td></td>
</tr>
<tr>
<td>shortDRX-Cycle</td>
<td></td>
</tr>
<tr>
<td>drxShortCycleTimer</td>
<td></td>
</tr>
<tr>
<td>periodicPHR-Timer</td>
<td></td>
</tr>
<tr>
<td>prohibitPHR-Timer</td>
<td></td>
</tr>
<tr>
<td>dl-PathlossChange</td>
<td></td>
</tr>
<tr>
<td>sr-ProhibitTimer</td>
<td></td>
</tr>
</tbody>
</table>

**MAC-MainConfig** field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>maxHARQ-Tx</td>
<td></td>
</tr>
<tr>
<td>periodicBSR-Timer</td>
<td></td>
</tr>
<tr>
<td>retxBSR-Timer</td>
<td></td>
</tr>
<tr>
<td>ttiBundling</td>
<td></td>
</tr>
<tr>
<td>longDRX-CycleStartOffset</td>
<td></td>
</tr>
<tr>
<td>onDurationTimer</td>
<td></td>
</tr>
<tr>
<td>drx-InactivityTimer</td>
<td></td>
</tr>
<tr>
<td>drx-RetransmissionTimer</td>
<td></td>
</tr>
<tr>
<td>shortDRX-Cycle</td>
<td></td>
</tr>
<tr>
<td>drxShortCycleTimer</td>
<td></td>
</tr>
<tr>
<td>periodicPHR-Timer</td>
<td></td>
</tr>
<tr>
<td>prohibitPHR-Timer</td>
<td></td>
</tr>
<tr>
<td>dl-PathlossChange</td>
<td></td>
</tr>
<tr>
<td>sr-ProhibitTimer</td>
<td></td>
</tr>
</tbody>
</table>

The IE **PDCP-Config** is used to set the configurable PDCF parameters for data radio bearers.

**PDCP-Config** information element

```plaintext
-- ASN1START
PDCP-Config ::= SEQUENCE {
    discardTimer ENUMERATED {ms50, ms100, ms150, ms300, ms500},
    drxShortCycleTimer INTEGER (1..16) -- Need OR
}
-- ASN1STOP
```
ms750, ms1500, infinity

rlc-AM
statusReportRequired SEQUENCE {
    BOOLEAN OPTIONAL, -- Cond Setup
}

rlc-UM
pdcp-SN-Size SEQUENCE {
    ENUMERATED {len7bits, len12bits} OPTIONAL, -- Cond Rlc-AM
}

headerCompression CHOICE {
    notUsed NULL,
    rohc SEQUENCE {
        maxCID INTEGER (1..16383) DEFAULT 15,
        profiles SEQUENCE {
            profile0x0001 BOOLEAN,
            profile0x0002 BOOLEAN,
            profile0x0003 BOOLEAN,
            profile0x0004 BOOLEAN,
            profile0x0006 BOOLEAN,
            profile0x0101 BOOLEAN,
            profile0x0102 BOOLEAN,
            profile0x0103 BOOLEAN,
            profile0x0104 BOOLEAN
        }
    }
}

-- ASN1STOP

**PDCP-Config field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>discardTimer</td>
<td>Indicates the discard timer value specified in TS 36.323 [8]. Value in milliseconds. Value ms50 means 50 ms, ms100 means 100 ms and so on.</td>
</tr>
<tr>
<td>statusReportRequired</td>
<td>Indicates whether or not the UE shall send a PDCP Status Report upon re-establishment of the PDCP entity as specified in TS 36.323 [8].</td>
</tr>
<tr>
<td>pdcp-SN-Size</td>
<td>Indicates the PDCP Sequence Number length in bits. Value len7bits means that the 7-bit PDCP SN format is used and len12bits means that the 12-bit PDCP SN format is used, as specified in TS 36.323 [8].</td>
</tr>
<tr>
<td>maxCID</td>
<td>Indicates the value of the MAX_CID parameter as specified in TS 36.323 [8].</td>
</tr>
<tr>
<td>profiles</td>
<td>The profiles used by both compressor and decompressor in both UE and E-UTRAN. The field indicates which of the ROHC profiles specified in TS 36.323 [8] are supported, i.e. value ‘true’ indicates that the profile is supported. Profile 0x0000 shall always be supported when the use of ROHC is configured. If support of two ROHC profile identifiers with the same 8 LSB’s is signalled, only the profile corresponding to the highest value shall be applied.</td>
</tr>
</tbody>
</table>

**Conditional presence**

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setup</td>
<td>The field is mandatory present in case of radio bearer setup. Otherwise the field is not present.</td>
</tr>
<tr>
<td>Rlc-AM</td>
<td>The field is mandatory present upon setup of a PDCP entity for a radio bearer configured with RLC AM. The field is optional, need ON, in case of reconfiguration of a PDCP entity at handover for a radio bearer configured with RLC AM. Otherwise the field is not present.</td>
</tr>
<tr>
<td>Rlc-UM</td>
<td>The field is mandatory present upon setup of a PDCP entity for a radio bearer configured with RLC UM. Otherwise the field is not present.</td>
</tr>
</tbody>
</table>

---

**PDSCH-Config**

The IE **PDSCH-ConfigCommon** and the IE **PDSCH-ConfigDedicated** are used to specify the common and the UE specific PDSCH configuration respectively.
PDSCH-Config information element

```
-- ASN1START
PDSCH-ConfigCommon ::= SEQUENCE {
  referenceSignalPower    INTEGER {-60..50},
  p-b         INTEGER {0..3}
}

PDSCH-ConfigDedicated ::= SEQUENCE {
  p-a         ENUMERATED {
    dB-6, dB-4.77, dB-3, dB-1.77,
    dB0, dB1, dB2, dB3
  }
}
-- ASN1STOP
```

**PDSCH-Config field descriptions**

- **referenceSignalPower**
  Parameter: Reference-signal power, which provides the downlink reference-signal EPRE, see TS 36.213 [23, 5.2]. The actual value in dBm.

- **p-a**
  Parameter: \( P_a \), see TS 36.213 [23, 5.2]. Value dB-6 corresponds to -6 dB, dB-4.77 corresponds to -4.77 dB etc.

- **p-b**
  Parameter: \( P_b \), see TS 36.213 [23, Table 5.2-1].

---

PHICH-Config

The IE PHICH-Config is used to specify the PHICH configuration.

PHICH-Config information element

```
-- ASN1START
PHICH-Config ::= SEQUENCE {
  phich-Duration      ENUMERATED {normal, extended},
  phich-Resource      ENUMERATED {oneSixth, half, one, two}
}
-- ASN1STOP
```

**PHICH-Config field descriptions**

- **phich-Duration**
  Parameter: PHICH-Duration, see TS 36.211 [21, Table 6.9.3-1].

- **phich-Resource**
  Parameter: \( N_g \), see TS 36.211 [21, 6.9]. Value oneSixth corresponds to 1/6, half corresponds to 1/2 and so on.

---

PhysicalConfigDedicated

The IE PhysicalConfigDedicated is used to specify the UE specific physical channel configuration.

PhysicalConfigDedicated information element

```
-- ASN1START
PhysicalConfigDedicated ::= SEQUENCE {
  pdsch-ConfigDedicated    PDSCH-ConfigDedicated   OPTIONAL,  -- Need ON
  pucch-ConfigDedicated    PUCCH-ConfigDedicated   OPTIONAL,  -- Need ON
  pusch-ConfigDedicated    PUSCH-ConfigDedicated   OPTIONAL,  -- Need ON
  uplinkPowerControlDedicated  UplinkPowerControlDedicated OPTIONAL,  -- Need ON
  tpc-PDCCH-ConfigPUCCH    TPC-PDCCH-Config     OPTIONAL,  -- Need ON
  tpc-PDCCH-ConfigPUSCH    TPC-PDCCH-Config     OPTIONAL,  -- Need ON
  cqi-ReportConfig        CQI-ReportConfig     OPTIONAL,  -- Need ON
  soundingRS-UL-ConfigDedicated  SoundingRS-UL-ConfigDedicated OPTIONAL,  -- Need ON
  antennaInfo       CHOICE {
    explicitValue      AntennaInfoDedicated,
  }
}
-- ASN1STOP
```
defaultValue NULL
}     OPTIONAL, -- Need ON
schedulingRequestConfig SchedulingRequestConfig OPTIONAL, -- Need ON
....
[ [ 'cqi-ReportConfig-v920 CQI-ReportConfig-v920 OPTIONAL, -- Need ON
  antennaInfo-v920 AntennaInfoDedicated-v920 OPTIONAL -- Need ON
] ]
}     OPTIONAL, -- Need ON
-- ASN1STOP

PhysicalConfigDedicated field descriptions

antennaInfo
A choice is used to indicate whether the antennaInfo is signalled explicitly or set to the default antenna configuration as specified in section 9.2.4.

tpc-PDCCH-ConfigPUCCH
PDCCH configuration for power control of PUCCH using format 3/3A, see TS 36.212 [22].

tpc-PDCCH-ConfigPUSCH
PDCCH configuration for power control of PUSCH using format 3/3A, see TS 36.212 [22].

NOTE: During handover, the UE performs a MAC reset, which involves reverting to the default CQI/ SRS/ SR configuration in accordance with subclause 5.3.13 and TS 36.321 [6, 5.9 & 5.2]. Hence, for these parts of the dedicated radio resource configuration, the default configuration (rather than the configuration used in the source cell) is used as the basis for the delta signalling that is included in the message used to perform handover.

– P-Max

The IE P-Max is used to limit the UE’s uplink transmission power on a carrier frequency and is used to calculate the parameter $P_{compensation}$ defined in TS 36.304 [4]. Corresponds to parameter $P_{E_{MAX}}$ in TS 36.101 [42]. The UE transmit power shall not exceed the configured maximum UE output power determined by this value as specified in TS 36.101 [42, 6.2.5].

P-Max information element

-- ASN1START
P-Max ::= INTEGER (-30..33)
-- ASN1STOP

– PRACH-Config

The IE PRACH-ConfigSIB and IE PRACH-Config are used to specify the PRACH configuration in the system information and in the mobility control information, respectively.

PRACH-Config information elements

-- ASN1START
PRACH-ConfigSIB ::= SEQUENCE {
  rootSequenceIndex INTEGER (0..837),
  prach-ConfigInfo PRACH-ConfigInfo
}

PRACH-Config ::= SEQUENCE {
  rootSequenceIndex INTEGER (0..837),
  prach-ConfigInfo     PRACH-ConfigInfo OPTIONAL -- Need ON
}

PRACH-ConfigInfo ::= SEQUENCE {
  prach-ConfigIndex INTEGER (0..63),
  highSpeedFlag BOOLEAN,
  zeroCorrelationZoneConfig INTEGER (0..15),
  prach-FreqOffset INTEGER (0..94)
}
**PRACH-Config field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>rootSequenceIndex</td>
<td>Parameter: RACH_ROOT_SEQUENCE, see TS 36.211 [21, 5.7.1].</td>
</tr>
<tr>
<td>prach-ConfigIndex</td>
<td>Parameter: prach-ConfigurationIndex, see TS 36.211 [21, 5.7.1].</td>
</tr>
<tr>
<td>highSpeedFlag</td>
<td>Parameter: High-speed-flag, see TS 36.211, [21, 5.7.2]. TRUE corresponds to Restricted set and FALSE to Unrestricted set.</td>
</tr>
<tr>
<td>zeroCorrelationZoneConfig</td>
<td>Parameter: $N_{cs}$ configuration, see TS 36.211, [21, 5.7.2: table 5.7.2-2] for preamble format 0..3 and TS 36.211, [21, 5.7.2: table 5.7.2-3] for preamble format 4.</td>
</tr>
<tr>
<td>prach-FreqOffset</td>
<td>Parameter: prach-FrequencyOffset, see TS 36.211, [21, 5.7.1]. For TDD the value range is dependent on the value of prach-ConfigIndex.</td>
</tr>
</tbody>
</table>

---

**PresenceAntennaPort1**

The IE PresenceAntennaPort1 is used to indicate whether all the neighbouring cells use Antenna Port 1. When set to TRUE, the UE may assume that at least two cell-specific antenna ports are used in all neighbouring cells.

**PresenceAntennaPort1 information element**

```asn1
PresenceAntennaPort1 ::= BOOLEAN
```

---

**PUCCH-Config**

The IE PUCCH-ConfigCommon and IE PUCCH-ConfigDedicated are used to specify the common and the UE specific PUCCH configuration respectively.

**PUCCH-Config information elements**

```asn1
PUCCH-ConfigCommon ::= SEQUENCE {
  deltaPUCCH-Shift     ENUMERATED {ds1, ds2, ds3},
  nRB-CQI        INTEGER (0..98),
  nCS-AN        INTEGER (0..7),
  n1PUCCH-AN       INTEGER (0..2047)
}
PUCCH-ConfigDedicated ::= SEQUENCE {
  ackNackRepetition     CHOICE{
    release        NULL,
    setup        SEQUENCE {
      repetitionFactor     ENUMERATED {n2, n4, n6, spare1},
      n1PUCCH-AN-Rep      INTEGER (0..2047)
    }},
  tdd-AckNackFeedbackMode ENUMERATED {bundling, multiplexing} OPTIONAL -- Cond TDD
}
```
**PUCCH-Config field descriptions**

**deltaPUCCH-Shift**
Parameter: \( \Delta_{PUCCH} \), see 36.211, 5.4.1, where ds1 corresponds to value 1 ds2 to 2 etc.

**nRB-CQI**
Parameter: \( N_{RB}^{(2)} \), see TS 36.211 [21, 5.4].

**nCS-An**
Parameter: \( N_{ci}^{(1)} \) see TS 36.211 [21, 5.4].

**n1Pucch-AN**
Parameter: \( N_{PUCCH}^{(1)} \) see TS 36.213 [23, 10.1].

**ackNackRepetition**
Parameter indicates whether ACK/NACK repetition is configured, see TS 36.213 [23, 10.1].

**repetitionFactor**
Parameter \( N_{ANRep}^{(2)} \) see TS 36.213 [23, 10.1] where n2 corresponds to repetition factor 2, n4 to 4.

**n1Pucch-AN-Rep**
Parameter: \( N_{PUCCH,ANRep}^{(1)} \) see TS 36.213 [23, 10.1].

**tdd-AckNackFeedbackMode**
Parameter indicates one of the two TDD ACK/NACK feedback modes used, see TS 36.213 [23, 7.3]. Bundling corresponds to use of ACK/NACK bundling whereas, multiplexing corresponds to ACK/NACK multiplexing. The same value applies to both ACK/NACK feedback modes on PUCCH as well as on PUSCH. For TDD configuration 5, E-UTRAN should always set this field to bundling.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDD</td>
<td>The field is mandatory present for TDD; it is not present for FDD and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

---

**PUSCH-Config**

The IE **PUSCH-ConfigCommon** is used to specify the common PUSCH configuration and the reference signal configuration for PUSCH and PUCCH. The IE **PUSCH-ConfigDedicated** is used to specify the UE specific PUSCH configuration.

**PUSCH-Config information element**

```asn1
-- ASN1START

PUSCH-ConfigCommon ::= SEQUENCE {
pusch-ConfigBasic n-SB SEQUENCE {
hoppingMode INTEGER {1..4},
pusch-HoppingOffset ENUMERATED {interSubFrame, intraAndInterSubFrame}, enable64QAM BOOLEAN },
ul-ReferenceSignalsPUSCH UL-ReferenceSignalsPUSCH
}
PUSCH-ConfigDedicated ::= SEQUENCE {
betaOffset-ACK-Index INTEGER {0..15},
betaOffset-RI-Index INTEGER {0..15},
betaOffset-CQI-Index INTEGER {0..15}
}
UL-ReferenceSignalsPUSCH ::= SEQUENCE {
groupHoppingEnabled BOOLEAN,
groupAssignmentPUSCH INTEGER {0..29},
sequenceHoppingEnabled BOOLEAN,
cyclicShift INTEGER {0..7}
}
-- ASN1STOP
```
### PUSCH-Config field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-SB</td>
<td>Parameter: $N_{sb}$, see TS 36.211 [21, 5.3.4].</td>
</tr>
<tr>
<td>hoppingMode</td>
<td>Parameter: $Hopping-mode$, see TS 36.211 [21, 5.3.4].</td>
</tr>
<tr>
<td>pusch-hoppingOffset</td>
<td>Parameter: $N_{HO}$, see TS 36.211 [21, 5.3.4].</td>
</tr>
<tr>
<td>enable64QAM</td>
<td>See TS 36.213 [23, 8.6.1]. TRUE indicates that 64QAM is allowed while FALSE indicates that 64QAM is not allowed.</td>
</tr>
<tr>
<td>betaOffset-HARQ-ACK-Index</td>
<td>Parameter: $I^H_{HARQ-ACK, offset}$, see TS 36.213 [23, Table 8.6.3-1].</td>
</tr>
<tr>
<td>betaOffset-RI-Index</td>
<td>Parameter: $I^R_{offset}$, see TS 36.213 [23, Table 8.6.3-2].</td>
</tr>
<tr>
<td>betaOffset-CQI-Index</td>
<td>Parameter: $I^C_{QI, offset}$, see TS 36.213 [23, Table 8.6.3-3].</td>
</tr>
<tr>
<td>ul-ReferenceSignalsPUSCH</td>
<td>Used to specify parameters needed for the transmission on PUSCH (or PUCCH).</td>
</tr>
<tr>
<td>groupHoppingEnabled</td>
<td>Parameter: $Group-hopping-enabled$, see TS 36.211 [21, 5.5.1.3].</td>
</tr>
<tr>
<td>groupAssignmentPUSCH</td>
<td>Parameter: $\Delta SS$, see TS 36.211 [21, 5.5.1.3].</td>
</tr>
<tr>
<td>sequenceHoppingEnabled</td>
<td>Parameter: $Sequence-hopping-enabled$, see TS 36.211 [21, 5.5.1.4].</td>
</tr>
<tr>
<td>cyclicShift</td>
<td>Parameters: $cyclicShift$, see TS 36.211 [21, Table 5.5.2.1.1-2].</td>
</tr>
</tbody>
</table>

---

**RACH-ConfigCommon**

The IE RACH-ConfigCommon is used to specify the generic random access parameters.

**RACH-ConfigCommon information element**

```asn1
RACH-ConfigCommon ::= SEQUENCE {
    preambleInfo SEQUENCE {
        numberOfRA-Preambles ENUMERATED {
            n4, n8, n12, n16, n20, n24, n28,
            n32, n36, n40, n44, n48, n52, n56,
            n60, n64},
        preamblesGroupAConfig SEQUENCE {
            sizeOfRA-PreamblesGroupA ENUMERATED {
                n4, n8, n12, n16, n20, n24, n28,
                n32, n36, n40, n44, n48, n52, n56,
                n60},
            messageSizeGroupA ENUMERATED {b56, b144, b208, b256},
            messagePowerOffsetGroupB ENUMERATED {
                minusinfinity, dB0, dB5, dB8, dB10, dB12,
                dB15, dB18},
            ... OPTIONAL -- Need OP }
    },
    powerRampingParameters SEQUENCE {
        powerRampingStep ENUMERATED {dB0, dB2, dB4, dB6},
        preambleInitialReceivedTargetPower ENUMERATED {
            dBm-120, dBm-118, dBm-116, dBm-114, dBm-112,
            dBm-110, dBm-108, dBm-106, dBm-104, dBm-102,
            dBm-100, dBm-98, dBm-96, dBm-94,
            dBm-92, dBm-90}
    },
    ra-SupervisionInfo SEQUENCE {
        preambleTransMax ENUMERATED {
            n3, n4, n5, n6, n7, n8, n10, n20, n50,
            n100, n200},
        ra-ResponseWindowSize ENUMERATED {
            sf2, sf3, sf4, sf5, sf6, sf7,
            sf8, sf10},
    }
}
```
RACH-ConfigCommon field descriptions

- **numberOfRA-Preambles**
  Number of non-dedicated random access preambles in TS 36.321 [6]. Value is an integer. Value n4 corresponds to 4, n8 corresponds to 8 and so on.

- **preamblesGroupAConfig**
  Provides the configuration for preamble grouping in TS 36.321 [6]. If the field is not signalled, the size of the random access preambles group A [6] is equal to **numberOfRA-Preambles**.

- **sizeOfRA-PreamblesGroupA**
  Size of the random access preambles group A in TS 36.321 [6]. Value is an integer. Value n4 corresponds to 4, n8 corresponds to 8 and so on.

- **messageSizeGroupA**
  Threshold for preamble selection in TS 36.321 [6]. Value in bits. Value b56 corresponds to 56 bits, b144 corresponds to 144 bits and so on.

- **messagePowerOffsetGroupB**
  Threshold for preamble selection in TS 36.321 [6]. Value in dB. Value minusinfinity corresponds to –infinity. Value dB0 corresponds to 0 dB, dB5 corresponds to 5 dB and so on.

- **powerRampingStep**
  Power ramping factor in TS 36.321 [6]. Value in dB. Value dB0 corresponds to 0 dB, dB2 corresponds to 2 dB and so on.

- **preambleInitialReceivedTargetPower**
  Initial preamble power in TS 36.321 [6]. Value in dBm. Value dBm-120 corresponds to -120 dBm, dBm-118 corresponds to -118 dBm and so on.

- **preambleTransMax**
  Maximum number of preamble transmission in TS 36.321 [6]. Value is an integer. Value n3 corresponds to 3, n4 corresponds to 4 and so on.

- **ra-ResponseWindowSize**
  Duration of the RA response window in TS 36.321 [6]. Value in subframes. Value sf2 corresponds to 2 subframes, sf3 corresponds to 3 subframes and so on.

- **mac-ContentionResolutionTimer**
  Timer for contention resolution in TS 36.321 [6]. Value in subframes. Value sf8 corresponds to 8 subframes, sf16 corresponds to 16 subframes and so on.

- **maxHARQ-Msg3Tx**
  Maximum number of Msg3 HARQ transmissions in TS 36.321 [6], used for contention based random access. Value is an integer.

---

**RACH-ConfigDedicated**

The IE RACH-ConfigDedicated is used to specify the dedicated random access parameters.

---

RACH-ConfigDedicated information element

---

RACH-ConfigDedicated field descriptions

- **ra-PreambleIndex**

- **ra-PRACH-MaskIndex**
  Explicitly signalled PRACH Mask Index for RA Resource selection in TS 36.321 [6].
The IE RadioResourceConfigCommonSIB and IE RadioResourceConfigCommon are used to specify common radio resource configurations in the system information and in the mobility control information, respectively, e.g., the random access parameters and the static physical layer parameters.

RadioResourceConfigCommon information element

```asn1
RadioResourceConfigCommonSIB ::= SEQUENCE {
  rach-ConfigCommon     RACH-ConfigCommon,
  bcch-Config       BCCH-Config,
  pch-Config         PCCH-Config,
  prach-Config       PRACH-ConfigSIB,
  pdcsch-ConfigCommon PDSCH-ConfigCommon,
  pusch-ConfigCommon     PUSCH-ConfigCommon,
  soundingRS-UL-ConfigCommon   SoundingRS-UL-ConfigCommon,
  uplinkPowerControlCommon   UplinkPowerControlCommon,
  ul-CyclicPrefixLength    UL-CyclicPrefixLength,
  ...}

RadioResourceConfigCommon ::= SEQUENCE {
  rach-ConfigCommon     RACH-ConfigCommon     OPTIONAL, -- Need ON
  prach-Config      PRACH-Config,
  pdsch-ConfigCommon     PDSCH-ConfigCommon     OPTIONAL, -- Need ON
  pusch-ConfigCommon     PUSCH-ConfigCommon,
  phich-Config      PHICH-Config      OPTIONAL, -- Need ON
  pucch-ConfigCommon     PUCCH-ConfigCommon     OPTIONAL, -- Need ON
  soundingRS-UL-ConfigCommon   SoundingRS-UL-ConfigCommon   OPTIONAL, -- Need ON
  uplinkPowerControlCommon   UplinkPowerControlCommon   OPTIONAL, -- Need ON
  antennaInfoCommon     AntennaInfoCommon   OPTIONAL, -- Need ON
  p-Max        P-Max        OPTIONAL, -- Need ON
  tdd-Config       TDD-Config       OPTIONAL, -- Cond TDD
  ul-CyclicPrefixLength    UL-CyclicPrefixLength,
  ...}

BCCH-Config ::= SEQUENCE {
  modificationPeriodCoeff    ENUMERATED {n2, n4, n8, n16}
}

PCCH-Config ::= SEQUENCE {
  defaultPagingCycle     ENUMERATED { rf32, rf64, rf128, rf256},
  nB         ENUMERATED {
    fourT, twoT, oneT, halfT, quarterT, oneEighthT,
    oneSixteenthT, oneThirtySecondT}
}

UL-CyclicPrefixLength ::= ENUMERATED {len1, len2}
```

-- ASN1STOP
RadioResourceConfigCommon field descriptions

**p-Max**
Pmax to be used in the target cell. If absent the UE applies the maximum power according to the UE capability.

**modificationPeriodCoeff**
Actual modification period, expressed in number of radio frames= modificationPeriodCoeff * defaultPagingCycle. n2 corresponds to value 2, n4 corresponds to value 4, n8 corresponds to value 8 and n16 corresponds to value 16.

**defaultPagingCycle**
Default paging cycle, used to derive ‘T’ in TS 36.304 [4]. Value rf32 corresponds to 32 radio frames, rf64 corresponds to 64 radio frames and so on.

**nB**
Parameter: nb is used as one of parameters to derive the Paging Frame and Paging Occasion according to TS 36.304 [4]. Value in multiples of defaultPagingCycle (‘T’). A value of fourT corresponds to 4 * defaultPagingCycle, a value of twoT corresponds to 2 * defaultPagingCycle and so on.

**UL-CyclicPrefixLength**
Parameter: Uplink cyclic prefix length see 36.211 [21, 5.2.1] where len1 corresponds to normal cyclic prefix and len2 corresponds to extended cyclic prefix.

---

Conditional presence | Explanation
--- | ---
**TDD** | The field is optional for TDD, Need ON; it is not present for FDD and the UE shall delete any existing value for this field.

---

### RadioResourceConfigDedicated

The IE RadioResourceConfigDedicated is used to setup/modify/release RBs, to modify the MAC main configuration, to modify the SPS configuration and to modify dedicated physical configuration.

---

#### RadioResourceConfigDedicated information element

```asn1
-- ASN1START
RadioResourceConfigDedicated ::=  SEQUENCE {
  srb-ToAddModList     SRB-ToAddModList   OPTIONAL,   -- Cond HO-Conn
  drb-ToAddModList     DRB-ToAddModList   OPTIONAL,   -- Cond HO-
toEUTRA
  drb-ToReleaseList     DRB-ToReleaseList   OPTIONAL,   -- Need ON
  mac-MainConfig      CHOICE {
    explicitValue     MAC-MainConfig,
    defaultValue     NULL
  }  OPTIONAL,                -- Cond HO-
toEUTRA2
  sps-Config       SPS-Config      OPTIONAL,  -- Need ON
  physicalConfigDedicated    PhysicalConfigDedicated  OPTIONAL,  -- Need ON
  ...,
[[ rlf-TimersAndConstants-r9   RLF-TimersAndConstants-r9  OPTIONAL  -- Need ON ]]
}

SRB-ToAddModList ::=    SEQUENCE (SIZE (1..2)) OF SRB-ToAddMod

SRB-ToAddMod ::=    SEQUENCE {
  srb-Identity      INTEGER (1..2),
  rlc-Config       CHOICE {
    explicitValue      RLC-Config,
    defaultValue      NULL
  }  OPTIONAL,                -- Cond Setup
  logicalChannelConfig    CHOICE {
    explicitValue      LogicalChannelConfig,
    defaultValue      NULL
  }  OPTIONAL,                -- Cond Setup
}

DRB-ToAddModList ::=    SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod

DRB-ToAddMod ::=    SEQUENCE {
  eps-BearerIdentity     INTEGER (0..15) OPTIONAL,  -- Cond DRB-Setup
  drb-Identity       DRB-Identity,  
  pdcp-Config       PDCP-Config    OPTIONAL,  -- Cond PDCP
  rlc-Config       RLC-Config    OPTIONAL,  -- Cond Setup
  logicalChannelIdentity     INTEGER (3..10) OPTIONAL,  -- Cond DRB-Setup
}

-- ASN1END
```
RadioResourceConfigDedicated field descriptions

**srb-Identity**
Value 1 is applicable for SRB1 only.
Value 2 is applicable for SRB2 only.

**rlc-Config**
For SRBs a choice is used to indicate whether the RLC configuration is signalled explicitly or set to the values defined in the default RLC configuration for SRB1 in 9.2.1.1 or for SRB2 in 9.2.1.2. RLC AM is the only applicable RLC mode for SRB1 and SRB2. E-UTRAN does not reconfigure the RLC mode of DRBs except when a full configuration option is used, and may reconfigure the UM RLC SN field size only upon handover within E-UTRA or upon the first reconfiguration after RRC connection re-establishment.

**mac-MainConfig**
Although the ASN.1 includes a choice that is used to indicate whether the mac-MainConfig is signalled explicitly or set to the default MAC main configuration as specified in 9.2.2, E-UTRAN does not apply "defaultValue".

**sps-Config**
The default SPS configuration is specified in 9.2.3.

**physicalConfigDedicated**
The default dedicated physical configuration is specified in 9.2.4.

**logicalChannelConfig**
For SRBs a choice is used to indicate whether the logical channel configuration is signalled explicitly or set to the default logical channel configuration for SRB1 as specified in 9.2.1.1 or for SRB2 as specified in 9.2.1.2.

**logicalChannelIdentity**
The logical channel identity for both UL and DL.

### Conditional presence

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DRB-Setup</strong></td>
<td>The field is mandatory present if the corresponding DRB is being set up; otherwise it is not present.</td>
</tr>
<tr>
<td><strong>PDCP</strong></td>
<td>The field is mandatory present if the corresponding DRB is being setup; the field is optionally present, need ON, upon handover within E-UTRA and upon the first reconfiguration after re-establishment but in both these cases only when fullConfig is not included in the RRCConnectionReconfiguration message; otherwise it is not present.</td>
</tr>
<tr>
<td><strong>Setup</strong></td>
<td>The field is mandatory present if the corresponding SRB/DRB is being setup; otherwise the field is optionally present, need ON.</td>
</tr>
<tr>
<td><strong>HO-Conn</strong></td>
<td>The field is mandatory present in case of handover to E-UTRA or when the fullConfig is included in the RRCConnectionReconfiguration message or in case of RRC connection establishment; otherwise the field is optionally present, need ON. Upon connection establishment/ re-establishment only SRB1 is applicable.</td>
</tr>
<tr>
<td><strong>HO-toEUTRA</strong></td>
<td>The field is mandatory present in case of handover to E-UTRA or when the fullConfig is included in the RRCConnectionReconfiguration message; In case of RRC connection establishment and RRC connection re-establishment the field is not present; otherwise the field is optionally present, need ON.</td>
</tr>
<tr>
<td><strong>HO-toEUTRA2</strong></td>
<td>The field is mandatory present in case of handover to E-UTRA or when the fullConfig is included in the RRCConnectionReconfiguration message; otherwise the field is optionally present, need ON.</td>
</tr>
</tbody>
</table>

---

**RLC-Config**
The IE **RLC-Config** is used to specify the RLC configuration of SRBs and DRBs.

**RLC-Config** information element

```asn1
-- ASN1START

RLC-Config ::= CHOICE {
  am           SEQUENCE {
    ul-AM-RLC  UL-AM-RLC,
    dl-AM-RLC  DL-AM-RLC
  } ,
}

-- ASN1STOP
```
um-Bi-Directional    SEQUENCE {
      ul-UM-RLC    UL-UM-RLC,
      dl-UM-RLC    DL-UM-RLC
    },

um-Uni-Directional-UL    SEQUENCE {
      ul-UM-RLC    UL-UM-RLC
    },

um-Uni-Directional-DL    SEQUENCE {
      dl-UM-RLC    DL-UM-RLC
    },

UL-AM-RLC ::=    SEQUENCE {
      t-PollRetransmit    T-PollRetransmit,
      pollPDU    PollPDU,
      pollByte    PollByte,
      maxRetxThreshold    ENUMERATED {
        t1, t2, t3, t4, t6, t8, t16, t32
      }
    }

DL-AM-RLC ::=    SEQUENCE {
      t-Reordering    T-Reordering,
      t-StatusProhibit    T-StatusProhibit
    }

UL-UM-RLC ::=    SEQUENCE {
      sn-FieldLength    SN-FieldLength
    }

DL-UM-RLC ::=    SEQUENCE {
      sn-FieldLength    SN-FieldLength,
      t-Reordering    T-Reordering
    }

SN-FieldLength ::=    ENUMERATED {size5, size10}

T-PollRetransmit ::=    ENUMERATED {
  ms5, ms10, ms15, ms20, ms25, ms30, ms35,
  ms40, ms45, ms50, ms55, ms60, ms65, ms70,
  ms75, ms80, ms85, ms90, ms95, ms100, ms105,
  ms110, ms115, ms120, ms125, ms130, ms135,
  ms140, ms145, ms150, ms155, ms160, ms165,
  ms170, ms175, ms180, ms185, ms190, ms195,
  ms200, ms205, ms210, ms215, ms220, ms225,
  ms230, ms235, ms240, ms245, ms250, ms300,
  ms350, ms400, ms450, ms500, spare9, spare8,
  spare7, spare6, spare5, spare4, spare3,
  spare2, spare1}

PollPDU ::=    ENUMERATED {
  p4, p8, p16, p32, p64, p128, p256, pInfinity}

PollByte ::=    ENUMERATED {
  kB25, kB50, kB75, kB100, kB125, kB250, kB375,
  kB500, kB750, kB1000, kB1250, kB1500, kB2000,
  kB3000, kBInfinity, spare1}

T-Reordering ::=    ENUMERATED {
  ms0, ms5, ms10, ms15, ms20, ms25, ms30, ms35,
  ms40, ms45, ms50, ms55, ms60, ms65, ms70,
  ms75, ms80, ms85, ms90, ms95, ms100, ms105,
  ms110, ms115, ms120, ms125, ms130, ms135,
  ms140, ms145, ms150, ms155, ms160, ms165,
  ms170, ms175, ms180, ms185, ms190, ms195,
  ms200, ms205, ms210, ms215, ms220, ms225,
  ms230, ms235, ms240, ms245, ms250, ms300,
  ms350, ms400, ms450, ms500, spare9, spare8,
  spare7, spare6, spare5, spare4, spare3,
  spare2, spare1}

T-StatusProhibit ::=    ENUMERATED {
  ms0, ms5, ms10, ms15, ms20, ms25, ms30, ms35,
  ms40, ms45, ms50, ms55, ms60, ms65, ms70,
  ms75, ms80, ms85, ms90, ms95, ms100, ms105,
  ms110, ms115, ms120, ms125, ms130, ms135,
  ms140, ms145, ms150, ms155, ms160, ms165,
  ms170, ms175, ms180, ms185, ms190, ms195,
  ms200, ms205, ms210, ms215, ms220, ms225,
  ms230, ms235, ms240, ms245, ms250, ms300,
  ms350, ms400, ms450, ms500, spare8, spare7,
  spare6, spare5, spare4, spare3, spare2,
  spare1}
**RLC-Config field descriptions**

**sn-FieldLength**
Indicates the UM RLC SN field size, see TS 36.322 [7], in bits. Value size5 means 5 bits, size10 means 10 bits.

**t-PollRetransmit**
Timer for RLC AM in TS 36.322 [7], in milliseconds. Value ms5 means 5ms, ms10 means 10ms and so on.

**pollPDU**
Parameter for RLC AM in TS 36.322 [7]. Value p4 corresponds to 4 PDUs, p8 to 8 PDUs and so on. pInfinity corresponds to an infinite number of PDUs.

**pollByte**
Parameter for RLC AM in TS 36.322 [7]. Value kB25 corresponds to 25 kBytes, kB50 to 50 kBytes and so on. kBInfinity corresponds to an infinite amount of kBytes.

**maxRetxThreshold**
Parameter for RLC AM in TS 36.322 [7]. Value t1 corresponds to 1 retransmission, t2 to 2 retransmissions and so on.

**t-Reordering**
Timer for reordering in TS 36.322 [7], in milliseconds. Value ms0 means 0ms, ms5 means 5ms and so on.

**t-StatusProhibit**
Timer for status reporting in TS 36.322 [7], in milliseconds. Value ms0 means 0ms, ms5 means 5ms and so on.

---

**RLF-TimersAndConstants**

The IE RLF-TimersAndConstants contains UE specific timers and constants applicable for UEs in RRC_CONNECTED.

**RLF-TimersAndConstants information element**

```asn1
RLF-TimersAndConstants-r9 ::=   CHOICE {
    release         NULL,
    setup         SEQUENCE {
        t301-r9        ENUMERATED {
            ms100, ms200, ms300, ms400, ms600, ms1000, ms1500, 
            ms2000},
        t310-r9        ENUMERATED {
            ms0, ms50, ms100, ms200, ms500, ms1000, ms2000},
        n310-r9        ENUMERATED {
            n1, n2, n3, n4, n6, n8, n10, n20},
        t311-r9        ENUMERATED {
            ms1000, ms3000, ms5000, ms10000, ms15000, 
            ms20000, ms30000},
        n311-r9        ENUMERATED {
            n1, n2, n3, n4, n5, n6, n8, n10},
        ... }
    }
```

---

**RLF-TimersAndConstants field descriptions**

**t3xy**
Timers are described in section 7.3. Value ms0 corresponds with 0 ms, ms50 corresponds with 50 ms and so on.

**n3xy**
Constants are described in section 7.4. n1 corresponds with 1, n2 corresponds with 2 and so on.

---

**SchedulingRequestConfig**

The IE SchedulingRequestConfig is used to specify the Scheduling Request related parameters.

**SchedulingRequestConfig information element**

```asn1
SchedulingRequestConfig ::=  CHOICE {
```
SchedulingRequestConfig field descriptions

sr-PUCCH-ResourceIndex
Parameter: \( n_{\text{PUCCH,SRI}} \) · see TS 36.213 [23, 10.1].

sr-ConfigIndex
Parameter \( I_{\text{SR}} \). See TS 36.213 [23.10.1]. The values 156 and 157 are not applicable for Release 8.

dsr-TransMax
Parameter for SR transmission in TS 36.321 [6, 5.4.4]. The value n4 corresponds to 4 transmissions, n8 corresponds to 8 transmissions and so on.

—

SoundingRS-UL-Config

The IE SoundingRS-UL-Config is used to specify the uplink Sounding RS configuration.

SoundingRS-UL-Config information element

```asn1
-- ASN1START
SoundingRS-UL-ConfigCommon ::= CHOICE {
  release        NULL,
  setup        SEQUENCE {
    sr-PUCCH-ResourceIndex    INTEGER (0..2047),
    sr-ConfigIndex      INTEGER (0..157),
    dsr-TransMax      ENUMERATED {n4, n8, n16, n32, n64, spare3, spare2, spare1}
  }
}

SoundingRS-UL-ConfigDedicated ::= CHOICE{
  release        NULL,
  setup        SEQUENCE {
    srs-Bandwidth      ENUMERATED {bw0, bw1, bw2, bw3},
    srs-HoppingBandwidth    ENUMERATED {hbw0, hbw1, hbw2, hbw3},
    freqDomainPosition     INTEGER (0..23),
    duration       BOOLEAN,
    srs-ConfigIndex      INTEGER (0..1023),
    transmissionComb     INTEGER (0..1),
    cyclicShift       ENUMERATED {cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7}
  }
}

-- ASN1STOP
```
### SoundingRS-UL-Config field descriptions

**srs-BandwidthConfig**  
Parameter: SRS Bandwidth Configuration. See TS 36.211, [21, table 5.5.3.2-1, 5.5.3.2-2, 5.5.3.2-3 and 5.5.3.2-4]. Actual configuration depends on UL bandwidth. bw0 corresponds to value 0, bw1 to value 1 and so on.

**srs-SubframeConfig**  
Parameter: SRS SubframeConfiguration. See TS 36.211, [21, table 5.5.3.3-1] applies for FDD whereas TS 36.211, [21, table 5.5.3.3-2] applies for TDD. sc0 corresponds to value 0, sc1 to value 1 and so on.

**ackNackSRS-SimultaneousTransmission**  
Parameter: Simultaneous-AN-and-SRS, see TS 36.213 [23, 8.2].

**srs-Bandwidth**  
Parameter: \( R_{\text{SRS}} \), see TS 36.211 [21, tables 5.5.3.2-1, 5.5.3.2-2, 5.5.3.2-3 and 5.5.3.2-4].

**freqDomainPosition**  
Parameter: \( n_{gsc} \), see TS 36.211 [21, 5.5.3.2].

**srs-HoppingBandwidth**  
Parameter: SRS hopping bandwidth \( b_{hop} \in \{0,1,2,3\} \), see TS 36.211 [21, 5.5.3.2] where hbw0 corresponds to value 0, hbw1 to value 1 and so on.

**duration**  
Parameter: Duration. See TS 36.213 [21, 8.2]. FALSE corresponds to “single” and value TRUE to “indefinite”.

**srs-ConfigIndex**  
Parameter: \( l_{\text{SRS}} \). See TS 36.213 [23, table 8.2-1].

**transmissionComb**  
Parameter: \( k_{TC} \in \{0,1\} \), see TS 36.211 [21, 5.5.3.2].

**cyclicShift**  
Parameter: \( n_{\text{SRS}} \). See TS 36.211 [21, 5.5.3.1], where cs0 corresponds to 0 etc.

**srs-MaxUpPts**  
Parameter: srsMaxUpPts, see TS 36.211 [21, 5.5.3.2]. If this field is present, reconfiguration of \( n_{\text{SRS},0}^{\text{max}} \) applies for UpPts, otherwise reconfiguration does not apply.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDD</td>
<td>This field is optional present for TDD, need OR; it is not present for FDD and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

---

**SPS-Config**

The IE SPS-Config is used to specify the semi-persistent scheduling configuration.

**SPS-Config information element**

```asn1
-- ASN1START

SPS-Config ::= SEQUENCE {
  semiPersistSchedC-RNTI   C-RNTI     OPTIONAL,   -- Need OR
  sps-ConfigDL     SPS-ConfigDL   OPTIONAL,   -- Need ON
  sps-ConfigUL     SPS-ConfigUL   OPTIONAL   -- Need ON
}

SPS-ConfigDL ::= CHOICE{
  release          NULL,
  setup            SEQUENCE {
    semiPersistSchedIntervalDL ENUMERATED {
      sf10, sf20, sf32, sf40, sf64, sf80,
      sf128, sf160, sf320, sf640, spare6,
      spare5, spare4, spare3, spare2,
      spare1},
    numberOfConfSPS-Processes INTEGER (1..8),
    n1-PUCCH-AN-PersistentList N1-PUCCH-AN-PersistentList,
    ...}
}

SPS-ConfigUL ::= CHOICE {
  release          NULL,
  setup            SEQUENCE {
    semiPersistSchedIntervalUL ENUMERATED {
```
SPS-Config field descriptions

**semiPersistSchedC-RNTI**
Semi-persistent Scheduling C-RNTI, see TS 36.321 [6].

**semiPersistSchedIntervalDL**
Semi-persistent scheduling interval in downlink, see TS 36.321 [6]. Value in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. For TDD, the UE shall round this parameter down to the nearest integer (of 10 sub-frames), e.g. sf10 corresponds to 10 sub-frames, sf32 corresponds to 30 sub-frames, sf128 corresponds to 120 sub-frames.

**numberOfConfSPS-Processes**
The number of configured HARQ processes for Semi-Persistent Scheduling, see TS 36.321 [6].

**n1-PUCCH-AN-PersistentList**
List of parameter: $n_1^{\text{PUCCH-AN-PersistentList}}$, see TS 36.213, [23, 10.1].

**semiPersistSchedIntervalUL**
Semi-persistent scheduling interval in uplink, see TS 36.321 [6]. Value in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. For TDD, the UE shall round this parameter down to the nearest integer (of 10 sub-frames), e.g. sf10 corresponds to 10 sub-frames, sf32 corresponds to 30 sub-frames, sf128 corresponds to 120 sub-frames.

**implicitReleaseAfter**
Number of empty transmissions before implicit release, see TS 36.321 [6, 5.10.2]. Value e2 corresponds to 2 transmissions, e3 corresponds to 3 transmissions and so on.

**p0-NominalPUSCH-Persistent**
Parameter: $P_{PUSCH-NOMINAL}^{(0)}$. See TS 36.213 [23, 5.1.1.1], unit dBm step 1. This field is applicable for persistent scheduling, only. If choice ‘setup’ is used and $p0-Persistent$ is absent, apply the value of $p0-NominalPUSCH$ for $p0-NominalPUSCH-Persistent$.

**p0-UE-PUSCH-Persistent**
Parameter: $P_{PUSCH-UE}^{(0)}$. See TS 36.213 [23, 5.1.1.1], unit dB. This field is applicable for persistent scheduling, only. If choice ‘setup’ is used and $p0-Persistent$ is absent, apply the value of $p0-UE-PUSCH$ for $p0-UE-PUSCH-Persistent$.

**twoIntervalsConfig**
Trigger of two-intervals-Semi-Persistent Scheduling in uplink. See TS 36.321 [6, 5.10]. If this field is present, two-intervals-SPS is enabled for uplink. Otherwise, two-intervals-SPS is disabled.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TDD</strong></td>
<td>This field is optional present for TDD, need OR; it is not present for FDD and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

---

**TDD-Config**

The IE **TDD-Config** is used to specify the TDD specific physical channel configuration.

---

**TDD-Config** information element

---

**ASN1START**

TDD-Config ::= SEQUENCE {
  subframeAssignment ENUMERATED {sa0, sa1, sa2, sa3, sa4, sa5, sa6},
  ...}
specialSubframePatterns ENUMERATED {
    ssp0, ssp1, ssp2, ssp3, ssp4, ssp5, ssp6, ssp7, ssp8
}

-- ASN1STOP

### TDD-Config field descriptions

**subframeAssignment**
Indicates DL/UL subframe configuration where sa0 point to Configuration 0, sa1 to Configuration 1 etc. as specified in TS 36.211 [21, table 4.2.2].

**specialSubframePatterns**
Indicates Configuration as in TS 36.211 [21, table 4.2.1] where ssp0 point to Configuration 0, ssp1 to Configuration 1 etc.

---

### TimeAlignmentTimer

The IE *TimeAlignmentTimer* is used to control how long the UE is considered uplink time aligned. Corresponds to the Timer for time alignment in TS 36.321 [6]. Value in number of sub-frames. Value sf500 corresponds to 500 sub-frames, sf750 corresponds to 750 sub-frames and so on.

**TimeAlignmentTimer information element**

```asn1
TimeAlignmentTimer ::= ENUMERATED {
    sf500, sf750, sf1280, sf1920, sf2560, sf3200,
    sf5120, sf10240, infinity
}
```

---

### TPC-PDCCH-Config

The IE *TPC-PDCCH-Config* is used to specify the RNTIs and indexes for PUCCH and PUSCH power control according to TS 36.212 [22]. The power control function can either be setup or released with the IE.

**TPC-PDCCH-Config information element**

```asn1
TPC-PDCCH-Config ::= CHOICE {
    release        NULL,
    setup        SEQUENCE {
        tpc-RNTI       BIT STRING (SIZE (16)),
        tpc-Index       TPC-Index
    }
}
```

**TPC-Index ::=**

- `indexOfFormat3       INTEGER (1..15),`
- `indexOfFormat3A       INTEGER (1..31)`

---

### TPC-PDCCH-Config field descriptions

**tpc-RNTI**
RNTI for power control using DCI format 3/3A, see TS 36.212 [22].

**tpc-Index**
Index of N or M, see TS 36.212 [22, 5.3.3.1.6 and 5.3.3.1.7], where N or M is dependent on the used DCI format (i.e. format 3 or 3a).

**indexOfFormat3**
Index of N when DCI format 3 is used. See TS 36.212 [22, 5.3.3.1.6].

**indexOfFormat3A**
Index of M when DCI format 3A is used. See TS 36.212 [22, 5.3.3.1.7].
UplinkPowerControl

The IE UplinkPowerControlCommon and IE UplinkPowerControlDedicated are used to specify parameters for uplink power control in the system information and in the dedicated signalling, respectively.

UplinkPowerControl information elements

```asn1
UplinkPowerControlCommon ::= SEQUENCE {
    p0-NominalPUSCH      INTEGER (-126..24),
    alpha        ENUMERATED {al0, al04, al05, al06, al07, al08, al09, al1},
    p0-NominalPUCCH      INTEGER (-127..-96),
    deltaFList-PUCCH     DeltaFList-PUCCH,
    deltaPreambleMsg3     INTEGER (-1..6)
}

UplinkPowerControlDedicated ::= SEQUENCE {
    p0-UE-PUSCH       INTEGER (-8..7),
    deltaMCS-Enabled     ENUMERATED {en0, en1},
    accumulationEnabled     BOOLEAN,
    p0-UE-PUCCH       INTEGER (-8..7),
    pSRS-Offset       INTEGER (0..15),
    filterCoefficient     FilterCoefficient     DEFAULT fc4
}

DeltaFList-PUCCH ::= SEQUENCE {
    deltaF-PUCCH-Format1    ENUMERATED {deltaF-2, deltaF0, deltaF5},
    deltaF-PUCCH-Format1b    ENUMERATED {deltaF1, deltaF3, deltaF5},
    deltaF-PUCCH-Format2    ENUMERATED {deltaF-2, deltaF0, deltaF1, deltaF2},
    deltaF-PUCCH-Format2a    ENUMERATED {deltaF-2, deltaF0, deltaF2},
    deltaF-PUCCH-Format2b    ENUMERATED {deltaF-2, deltaF0, deltaF2}
}
```

---
### UplinkPowerControl field descriptions

**p0-NominalPUSCH**
Parameter: \( P_{O\_\text{Nominal\_PUSCH}} \) (1) See TS 36.213, 5.1.1.1, unit dBm. This field is applicable for non-persistent scheduling, only.

**alpha**
Parameter: \( \alpha \) See TS 36.213, 5.1.1.1 where \( \alpha0 \) corresponds to 0, \( \alpha04 \) corresponds to value 0.4, \( \alpha05 \) to 0.5, \( \alpha06 \) to 0.6, \( \alpha07 \) to 0.7, \( \alpha08 \) to 0.8, \( \alpha09 \) to 0.9 and \( \alpha1 \) corresponds to 1.

**p0-NominalPUCCH**
Parameter: \( P_{O\_\text{Nominal\_PUCCH}} \) See TS 36.213, 5.1.2.1, unit dBm.

**deltaF-PUCCH-FormatX**
Parameter: \( \Delta F_{\text{PUCCH}}(F) \) for the PUCCH formats 1, 1b, 2, 2a and 2b. See TS 36.213 [23, 5.1.2] where \( \Delta F_2 \) corresponds to -2 dB, \( \Delta F_0 \) corresponds to 0 dB and so on.

**p0-UE-PUSCH**
Parameter: \( P_{O\_\text{UE\_PUSCH}} \) (1) See TS 36.213 [23, 5.1.1.1], unit dB. This field is applicable for non-persistent scheduling, only.

**deltaPreambleMsg3**
Parameter: \( \Delta_{\text{PREAMBLE\_Msg3}} \) see TS 36.213 [23, 5.1.1.1]. Actual value = IE value \( \times 2 \) [dB].

**deltaMCS-Enabled**
Parameter: \( K_s \) See TS 36.213 [23, 5.1.1.1]. \( e_n0 \) corresponds to value 0 corresponding to state “disabled”. \( e_n1 \) corresponds to value 1.25 corresponding to “enabled”.

**accumulationEnabled**
Parameter: Accumulation-enabled, see TS 36.213 [23, 5.1.1.1]. TRUE corresponds to “enabled” whereas FALSE corresponds to “disabled”.

**p0-UE-PUCCH**
Parameter: \( P_{O\_\text{UE\_PUCCH}} \) See TS 36.213 [23, 5.1.2.1]. Unit dB

**pSRS-Offset**
Parameter: \( P_{\text{SRS\_OFFSET}} \) See TS 36.213 [23, 5.1.3.1]. For \( K_s=1.25 \), the actual parameter value is \( p_{\text{SRS\_Offset}} \) value – 3. For \( K_s=0 \), the actual parameter value is \( -10.5 + 1.5 \times p_{\text{SRS\_Offset}} \) value.

**filterCoefficient**
Specifies the filtering coefficient for RSRP measurements used to calculate path loss, as specified in TS 36.213 [23, 5.1.1.1]. The same filtering mechanism applies as for quantityConfig described in 5.5.3.2.

### 6.3.3 Security control information elements

**NextHopChainingCount**
The IE `NextHopChainingCount` is used to update the \( K_{\text{NiB}} \) key and corresponds to parameter NCC: See TS 33.401 [32, 7.2.8.4].

**NextHopChainingCount information element**

```
-- ASN1START
NextHopChainingCount ::= INTEGER (0..7)
-- ASN1STOP
```

**SecurityAlgorithmConfig**
The IE `SecurityAlgorithmConfig` is used to configure AS integrity protection algorithm (SRBs) and AS ciphering algorithm (SRBs and DRBs).

**SecurityAlgorithmConfig information element**

```
-- ASN1START
SecurityAlgorithmConfig ::= SEQUENCE {
  cipheringAlgorithm ENUMERATED {
    eea0, eea1, eea2, spare5, spare4, spare3,
```
SecurityAlgorithmConfig field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>integrityProtAlgorithm</td>
<td>Indicates the integrity protection algorithm to be used for SRBs, as specified in TS 33.401 [32, 5.1.4.2].</td>
</tr>
<tr>
<td>cipheringAlgorithm</td>
<td>Indicates the ciphering algorithm to be used for SRBs and DRBs, as specified in TS 33.401 [32, 5.1.3.2].</td>
</tr>
</tbody>
</table>

---

**ShortMAC-I**

The IE *ShortMAC-I* is used to identify and verify the UE at RRC connection re-establishment. The 16 least significant bits of the MAC-I calculated using the security configuration of the source cell, as specified in 5.3.7.4.

**ShortMAC-I information element**

```plaintext
ShortMAC-I ::= BIT STRING (SIZE (16))
```

6.3.4 Mobility control information elements

---

**AdditionalSpectrumEmission**

The UE requirements related to IE *AdditionalSpectrumEmission* are defined in TS 36.101 [42, table 6.2.4-1].

**AdditionalSpectrumEmission information element**

```
AdditionalSpectrumEmission ::= INTEGER (1..32)
```

---

**ARFCN-ValueCDMA2000**

The IE *ARFCN-ValueCDMA2000* is used to indicate the CDMA2000 carrier frequency within a CDMA2000 band, see C.S0002-A [12].

**ARFCN-ValueCDMA2000 information element**

```
ARFCN-ValueCDMA2000 ::= INTEGER (0..2047)
```

---

**ARFCN-ValueEUTRA**

The IE *ARFCN-ValueEUTRA* is used to indicate the ARFCN applicable for a downlink, uplink or bi-directional (TDD) E-UTRA carrier frequency, as defined in TS 36.101 [42].

**ARFCN-ValueEUTRA information element**

```
ARFCN-ValueEUTRA ::= INTEGER (0..2047)
```
-- ARFCN-ValueGERAN

The IE **ARFCN-ValueGERAN** is used to specify the ARFCN value applicable for a GERAN BCCH carrier frequency, see TS 45.005 [20].

**ARFCN-ValueGERAN information element**

```plaintext
-- ASN1START
ARFCN-ValueGERAN ::= INTEGER (0..1023)
-- ASN1STOP
```

-- ARFCN-ValueUTRA

The IE **ARFCN-ValueUTRA** is used to indicate the ARFCN applicable for a downlink (Nd, FDD) or bi-directional (Nt, TDD) UTRA carrier frequency, as defined in TS 25.331 [19].

**ARFCN-ValueUTRA information element**

```plaintext
-- ASN1START
ARFCN-ValueUTRA ::= INTEGER (0..16383)
-- ASN1STOP
```

-- BandclassCDMA2000

The IE **BandclassCDMA2000** is used to define the CDMA2000 band in which the CDMA2000 carrier frequency can be found, as defined in C.S0057-B [24, table 1.5-1].

**BandclassCDMA2000 information element**

```plaintext
-- ASN1START
BandclassCDMA2000 ::= ENUMERATED { bc0, bc1, bc2, bc3, bc4, bc5, bc6, bc7, bc8, bc9, bc10, bc11, bc12, bc13, bc14, bc15, bc16, bc17, spare14, spare13, spare12, spare11, spare10, spare9, spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1, ...}
-- ASN1STOP
```

-- BandIndicatorGERAN

The IE **BandIndicatorGERAN** indicates how to interpret an associated GERAN carrier ARFCN, see TS 45.005 [20]. More specifically, the IE indicates the GERAN frequency band in case the ARFCN value can concern either a DCS 1800 or a PCS 1900 carrier frequency. For ARFCN values not associated with one of these bands, the indicator has no meaning.

**BandIndicatorGERAN information element**

```plaintext
-- ASN1START
BandIndicatorGERAN ::= ENUMERATED {dcs1800, pcs1900}
-- ASN1STOP
```
– **CarrierFreqCDMA2000**

The IE *CarrierFreqCDMA2000* used to provide the CDMA2000 carrier information.

**CarrierFreqCDMA2000** information element

```asn1
CarrierFreqCDMA2000 ::= SEQUENCE {
  bandClass       BandclassCDMA2000,
  arfcn       ARFCN-ValueCDMA2000
}
```

– **CarrierFreqGERAN**

The IE *CarrierFreqGERAN* is used to provide an unambiguous carrier frequency description of a GERAN cell.

**CarrierFreqGERAN** information element

```asn1
CarrierFreqGERAN ::= SEQUENCE {
  arfcn       ARFCN-ValueGERAN,
  bandIndicator     BandIndicatorGERAN
}
```

**CarrierFreqGERAN** field descriptions

- **arfcn**
  GERAN ARFCN of BCCH carrier.

- **bandIndicator**
  Indicates how to interpret the ARFCN of the BCCH carrier.

– **CarrierFreqsGERAN**

The IE *CarrierFreqListGERAN* is used to provide one or more GERAN ARFCN values, as defined in TS 44.005 [43], which represents a list of GERAN BCCH carrier frequencies.

**CarrierFreqsGERAN** information element

```asn1
CarrierFreqsGERAN ::= SEQUENCE {
  startingARFCN      ARFCN-ValueGERAN,
  bandIndicator      BandIndicatorGERAN,
  followingARFCNs      choice {
    explicitListOfARFCNs    ExplicitListOfARFCNs,
    equallySpacedARFCNs     SEQUENCE {
      arfcn-Spacing      INTEGER (1..8),
      numberOfFollowingARFCNs    INTEGER (0..31)
    },
    variableBitMapOfARFCNs    OCTET STRING (SIZE (1..16))
  }
}

ExplicitListOfARFCNs ::= SEQUENCE (SIZE (0..31)) OF ARFCN-ValueGERAN
```

-- ASN1STOP
CarrierFrequences field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>startingARFCN</td>
<td>The first ARFCN value, s, in the set.</td>
</tr>
<tr>
<td>bandIndicator</td>
<td>Indicates how to interpret the ARFCN of the BCCH carrier.</td>
</tr>
<tr>
<td>followingARFCNs</td>
<td>Field containing a representation of the remaining ARFCN values in the set.</td>
</tr>
<tr>
<td>explicitListOfARFCNs</td>
<td>The remaining ARFCN values in the set are explicitly listed one by one.</td>
</tr>
<tr>
<td>arfcnSpacing</td>
<td>Space, d, between a set of equally spaced ARFCN values.</td>
</tr>
<tr>
<td>numberOfFollowingARFCNs</td>
<td>The number, n, of the remaining equally spaced ARFCN values in the set. The complete set of (n+1) ARFCN values is defined as: {s, ((s + d) mod 1024), ((s + 2*d) mod 1024) ... ((s + n*d) mod 1024)}.</td>
</tr>
<tr>
<td>variableBitmapOfARFCNs</td>
<td>Bitmap field representing the remaining ARFCN values in the set. The leading bit of the first octet in the bitmap corresponds to the ARFCN = ((s + 1) mod 1024), the next bit to the ARFCN = ((s + 2) mod 1024), and so on. If the bitmap consist of N octets, the trailing bit of octet N corresponds to ARFCN = ((s + 8*N) mod 1024). The complete set of ARFCN values consists of ARFCN = s and the ARFCN values, where the corresponding bit in the bitmap is set to &quot;1&quot;.</td>
</tr>
</tbody>
</table>

- **CDMA2000-Type**

  The IE **CDMA2000-Type** is used to describe the type of CDMA2000 network.

  **CDMA2000-Type information element**

  ```
  -- ASN1START
  CDMA2000-Type ::= ENUMERATED {type1XRTT, typeHRPD}
  -- ASN1STOP
  ```

- **CellIdentity**

  The IE **CellIdentity** is used to unambiguously identify a cell within a PLMN.

  **CellIdentity information element**

  ```
  -- ASN1START
  CellIdentity ::= BIT STRING (SIZE (28))
  -- ASN1STOP
  ```

- **CellIndexList**

  The IE **CellIndexList** concerns a list of cell indices, which may be used for different purposes.

  **CellIndexList information element**

  ```
  -- ASN1START
  CellIndexList ::= SEQUENCE (SIZE (1..maxCellMeas)) OF CellIndex
  CellIndex ::= INTEGER (1..maxCellMeas)
  -- ASN1STOP
  ```
— CellReselectionPriority

The IE CellReselectionPriority concerns the absolute priority of the concerned carrier frequency/ set of frequencies (GERAN)/ bandclass (CDMA2000), as used by the cell reselection procedure. Corresponds with parameter "priority" in TS 36.304 [4]. Value 0 means: lowest priority. The UE behaviour for the case the field is absent, if applicable, is specified in TS 36.304 [4].

CellReselectionPriority information element

```asn1
CellReselectionPriority ::= INTEGER (0..7)
```

— CSFB-RegistrationParam1XRTT

The IE CSFB-RegistrationParam1XRTT is used to indicate whether or not the UE shall perform a CDMA2000 1xRTT pre-registration if the UE does not have a valid / current pre-registration.

```asn1
CSFB-RegistrationParam1XRTT ::= SEQUENCE {
    sid         BIT STRING (SIZE (15)),
    nid         BIT STRING (SIZE (16)),
    multipleSID       BOOLEAN,
    multipleNID       BOOLEAN,
    homeReg        BOOLEAN,
    foreignSIDReg      BOOLEAN,
    foreignNIDReg      BOOLEAN,
    parameterReg      BOOLEAN,
    powerUpReg       BOOLEAN,
    registrationPeriod    BIT STRING (SIZE (7)),
    registrationZone     BIT STRING (SIZE (12)),
    totalZone         BIT STRING (SIZE (3)),
    zoneTimer         BIT STRING (SIZE (3))
}
CSFB-RegistrationParam1XRTT-v920 ::= SEQUENCE {
    powerDownReg-r9      ENUMERATED {true}
}
```
**CSFB-RegistrationParam1xRTT field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>sid</code></td>
<td>Used along with the <code>nid</code> as a pair to control when the UE should Register or Re-Register with the CDMA2000 1xRTT network.</td>
</tr>
<tr>
<td><code>nid</code></td>
<td>Used along with the <code>sid</code> as a pair to control when the UE should Register or Re-Register with the CDMA2000 1xRTT network.</td>
</tr>
<tr>
<td><code>multipleSID</code></td>
<td>The CDMA2000 1xRTT Multiple SID storage indicator.</td>
</tr>
<tr>
<td><code>multipleNID</code></td>
<td>The CDMA2000 1xRTT Multiple NID storage indicator.</td>
</tr>
<tr>
<td><code>homeReg</code></td>
<td>The CDMA2000 1xRTT Home registration indicator.</td>
</tr>
<tr>
<td><code>foreignSIDReg</code></td>
<td>The CDMA2000 1xRTT SID roamer registration indicator.</td>
</tr>
<tr>
<td><code>foreignNIDReg</code></td>
<td>The CDMA2000 1xRTT NID roamer registration indicator.</td>
</tr>
<tr>
<td><code>parameterReg</code></td>
<td>The CDMA2000 1xRTT Parameter-change registration indicator.</td>
</tr>
<tr>
<td><code>powerUpReg</code></td>
<td>The CDMA2000 1xRTT Power-up registration indicator.</td>
</tr>
<tr>
<td><code>registrationPeriod</code></td>
<td>The CDMA2000 1xRTT Registration period.</td>
</tr>
<tr>
<td><code>registrationZone</code></td>
<td>The CDMA2000 1xRTT Registration zone.</td>
</tr>
<tr>
<td><code>totalZone</code></td>
<td>The CDMA2000 1xRTT Number of registration zones to be retained.</td>
</tr>
<tr>
<td><code>zoneTimer</code></td>
<td>The CDMA2000 1xRTT Zone timer length.</td>
</tr>
<tr>
<td><code>powerDownReg</code></td>
<td>The CDMA2000 1xRTT Power-down registration indicator. If set to TRUE, the UE that has a valid / current CDMA2000 1xRTT pre-registration will perform a CDMA2000 1xRTT power down registration when it is switched off.</td>
</tr>
</tbody>
</table>

---

**CellGlobalIdEUTRA**

The IE `CellGlobalIdEUTRA` specifies the Evolved Cell Global Identifier (ECGI), the globally unique identity of a cell in E-UTRA.

**CellGlobalIdEUTRA information element**

```plaintext
-- ASN1START
CellGlobalIdEUTRA ::=     SEQUENCE {  
  plmn-identity  PLMN-Identity,  
  cellIdentity   CellIdentity }  
-- ASN1STOP
```

**CellGlobalIdEUTRA field descriptions**

- **plmn-Identity**
  - Identifies the PLMN of the cell as given by the first PLMN entry in the `plmn-IdentityList` in `SystemInformationBlockType1`.
- **cellIdentity**
  - Identity of the cell within the context of the PLMN.

---

**CellGlobalIdUTRA**

The IE `CellGlobalIdUTRA` specifies the global UTRAN Cell Identifier, the globally unique identity of a cell in UTRA.

**CellGlobalIdUTRA information element**

```plaintext
-- ASN1START
CellGlobalIdUTRA ::=     SEQUENCE {  
  plmn-Identity  PLMN-Identity,  
  cellIdentity   CellIdentity }  
-- ASN1STOP
```
CellGlobalIdUTRA field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>plmn-Identity</td>
<td>Identifies the PLMN of the cell as given by the common PLMN broadcast in the MIB, as defined in TS 25.331 [19].</td>
</tr>
<tr>
<td>cellIdentity</td>
<td>UTRA Cell Identifier which is unique within the context of the identified PLMN as defined in TS 25.331 [19].</td>
</tr>
</tbody>
</table>

CellGlobalIdGERAN

The IE CellGlobalIdGERAN specifies the Cell Global Identification (CGI), the globally unique identity of a cell in GERAN.

CellGlobalIdGERAN information element

CellGlobalIdGERAN field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>plmn-Identity</td>
<td>Identifies the PLMN of the cell, as defined in TS 23.003 [27].</td>
</tr>
<tr>
<td>locationAreaCode</td>
<td>A fixed length code identifying the location area within a PLMN as defined in TS 23.003 [27].</td>
</tr>
<tr>
<td>cellIdentity</td>
<td>Cell Identifier which is unique within the context of the GERAN location area as defined in TS 23.003 [27].</td>
</tr>
</tbody>
</table>

CellGlobalIdCDMA2000

The IE CellGlobalIdCDMA2000 specifies the Cell Global Identification (CGI), the globally unique identity of a cell in CDMA2000.

CellGlobalIdCDMA2000 information element

CellGlobalIdCDMA2000 field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cellGlobalId1XRTT</td>
<td>Unique identifier for a CDMA2000 1xRTT cell, corresponds to BASEID, SID and NID parameters (in that order) defined in C.S0005-A [25].</td>
</tr>
<tr>
<td>cellGlobalIdHRPD</td>
<td>Unique identifier for a CDMA2000 HRPD cell, corresponds to SECTOR ID parameter defined in C.S0024-A [26, 14.9].</td>
</tr>
</tbody>
</table>
— **CSG-Identity**

The IE **CSG-Identity** is used to identify a Closed Subscriber Group.

**CSG-Identity** information element

```plaintext
-- ASN1START
CSG-Identity ::= BIT STRING (SIZE (27))
-- ASN1STOP
```

— **MobilityControlInfo**

The IE **MobilityControlInfo** includes parameters relevant for network controlled mobility to/within E-UTRA.

**MobilityControlInfo** information element

```plaintext
-- ASN1START
MobilityControlInfo ::= SEQUENCE {
  targetPhysCellId     PhysCellId,
  carrierFreq         CarrierFreqEUTRA OPTIONAL,  -- Cond HO-toEUTRA
  carrierBandwidth     CarrierBandwidthEUTRA OPTIONAL,  -- Cond HO-toEUTRA
  additionalSpectrumEmission AdditionalSpectrumEmission OPTIONAL,  -- Cond HO-toEUTRA
  t304     ENUMERATED {
    ms50, ms100, ms150, ms200, ms500, ms1000, ms2000, spare1},
  newUE-Identity      C-RNTI,
  radioResourceConfigCommon RadioResourceConfigCommon,
  rach-ConfigDedicated RACH-ConfigDedicated OPTIONAL,  -- Need OP
  ...}
CarrierBandwidthEUTRA ::= SEQUENCE {
  dl-Bandwidth ENUMERATED {
    n6, n15, n25, n50, n75, n100, spare10,
    spare9, spare8, spare7, spare6, spare5,
    spare4, spare3, spare2, spare1},
  ul-Bandwidth ENUMERATED {
    n6, n15, n25, n50, n75, n100, spare10,
    spare9, spare8, spare7, spare6, spare5,
    spare4, spare3, spare2, spare1} OPTIONAL -- Need OP
}
CarrierFreqEUTRA ::= SEQUENCE {
  dl-CarrierFreq     ARFCN-ValueEUTRA,
  ul-CarrierFreq     ARFCN-ValueEUTRA OPTIONAL -- Cond FDD
}
-- ASN1STOP
```
### MobilityControlInfo field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>t304</td>
<td>Timer T304 as described in section 7.3. ms50 corresponds with 50 ms, ms100 corresponds with 100 ms and so on.</td>
</tr>
<tr>
<td>dl-Bandwidth</td>
<td>Parameter: Downlink bandwidth, see TS 36.101 [42].</td>
</tr>
<tr>
<td>ul-Bandwidth</td>
<td>Parameter: Uplink bandwidth, see TS 36.101 [42, table 5.6-1]. For TDD, the parameter is absent and it is equal to downlink bandwidth. If absent for FDD, apply the same value as applies for the downlink bandwidth.</td>
</tr>
<tr>
<td>rach-ConfigDedicated</td>
<td>The dedicated random access parameters. If absent the UE applies contention based random access as specified in TS 36.321 [6].</td>
</tr>
<tr>
<td>carrierBandwidth</td>
<td>Provides the parameters Downlink bandwidth, and Uplink bandwidth, see TS 36.101 [42].</td>
</tr>
</tbody>
</table>

#### Conditional presence

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDD</td>
<td>The field is mandatory with default value (the default duplex distance defined for the concerned band, as specified in TS 36.101 [42]) in case of “FDD”; otherwise the field is not present.</td>
</tr>
<tr>
<td>HO-toEUTRA</td>
<td>The field is mandatory present in case of inter-RAT handover to E-UTRA; otherwise the field is optionally present, need ON.</td>
</tr>
</tbody>
</table>

---

**MobilityParametersCDMA2000 (1xRTT)**

The MobilityParametersCDMA2000 contains the parameters provided to the UE for handover and (enhanced) CSFB to 1xRTT support, as defined in C.S0097 [53].

**MobilityParametersCDMA2000 information element**

```
MobilityParametersCDMA2000 ::= OCTET STRING
```

---

**MobilityStateParameters**

The IE MobilityStateParameters contains parameters to determine UE mobility state.

**MobilityStateParameters information element**

```
MobilityStateParameters ::= SEQUENCE {
  t-Evaluation          ENUMERATED {
    s30, s60, s120, s180, s240, spare3, spare2, spare1},
  t-HystNormal          ENUMERATED {
    s30, s60, s120, s180, s240, spare3, spare2, spare1},
  n-CellChangeMedium    INTEGER (1..16),
  n-CellChangeHigh      INTEGER (1..16)
}
```

---
### MobilityStateParameters field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>t-Evaluation</strong></td>
<td>The duration for evaluating criteria to enter mobility states. Corresponds to $T_{CR\text{max}}$ in TS 36.304 [4]. Value in seconds, s30 corresponds to 30 s and so on.</td>
</tr>
<tr>
<td><strong>t-HystNormal</strong></td>
<td>The additional duration for evaluating criteria to enter normal mobility state. Corresponds to $T_{CR\text{maxHyst}}$ in TS 36.304 [4]. Value in seconds, s30 corresponds to 30 s and so on.</td>
</tr>
<tr>
<td><strong>n-CellChangeMedium</strong></td>
<td>The number of cell changes to enter medium mobility state. Corresponds to $N_{CR,M}$ in TS 36.304 [4].</td>
</tr>
<tr>
<td><strong>n-CellChangeHigh</strong></td>
<td>The number of cell changes to enter high mobility state. Corresponds to $N_{CR,H}$ in TS 36.304 [4].</td>
</tr>
</tbody>
</table>

---

### PhysCellId

The IE **PhysCellId** is used to indicate the physical layer identity of the cell, as defined in TS 36.211 [21].

**PhysCellId information element**

```asn1
PhysCellId ::= INTEGER (0..503)
```

---

### PhysCellIdRange

The IE **PhysCellIdRange** is used to encode either a single or a range of physical cell identities. The range is encoded by using a `start` value and by indicating the number of consecutive physical cell identities (including `start`) in the range.

**PhysCellIdRange information element**

```asn1
PhysCellIdRange ::= SEQUENCE {
  start       PhysCellId,
  range       ENUMERATED {n4, n8, n12, n16, n24, n32, n48, n64, n84, 
                      n96, n128, n168, n252, n504, spare2, 
                      spare1} OPTIONAL -- Need OP
}
```

**PhysCellIdRange field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>start</strong></td>
<td>Indicates the lowest physical cell identity in the range.</td>
</tr>
<tr>
<td><strong>range</strong></td>
<td>Indicates the number of physical cell identities in the range (including <code>start</code>). Value n4 corresponds with 4, n8 corresponds with 8 and so on. The UE shall apply value 1 in case the field is absent, in which case only the physical cell identity value indicated by <code>start</code> applies.</td>
</tr>
</tbody>
</table>

---

### PhysCellIdRangeUTRA-FDDList

The IE **PhysCellIdRangeUTRA-FDDList** is used to encode one or more of **PhysCellIdRangeUTRA-FDD**. While the IE **PhysCellIdRangeUTRA-FDD** is used to encode either a single physical layer identity or a range of physical layer identities, i.e. primary scrambling codes. Each range is encoded by using a `start` value and by indicating the number of consecutive physical cell identities (including `start`) in the range.

**PhysCellIdRangeUTRA-FDDList information element**

```asn1
-- ASN1START
```
**PhysCellIdRangeUTRA-FDDList field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>start</strong></td>
<td>Indicates the lowest primary scrambling code in the range.</td>
</tr>
<tr>
<td><strong>range</strong></td>
<td>Indicates the number of primary scrambling codes in the range (including start). The UE shall apply value 1 in case the field is absent, in which case only the primary scrambling code value indicated by start applies.</td>
</tr>
</tbody>
</table>

---

**PhysCellIdCDMA2000**

The IE `PhysCellIdCDMA2000` identifies the PNOffset that represents the "Physical cell identity" in CDMA2000.

**PhysCellIdCDMA2000 information element**

```asn
PhysCellIdCDMA2000 ::= INTEGER (0..maxPNOffset)
```

---

**PhysCellIdGERAN**

The IE `PhysCellIdGERAN` contains the Base Station Identity Code (BSIC).

**PhysCellIdGERAN information element**

```asn
PhysCellIdGERAN ::= SEQUENCE {
  networkColourCode       BIT STRING (SIZE (3)),
  baseStationColourCode   BIT STRING (SIZE (3))
}
```

**PhysCellIdGERAN field descriptions**

- **networkColourCode**
  Network Colour Code as defined in TS 23.003 [27].
- **baseStationColourCode**
  Base station Colour Code as defined in TS 23.003 [27].

---

**PhysCellIdUTRA-FDD**

The IE `PhysCellIdUTRA-FDD` is used to indicate the physical layer identity of the cell, i.e. the primary scrambling code, as defined in TS 25.331 [19].

**PhysCellIdUTRA-FDD information element**

```asn
PhysCellIdUTRA-FDD ::= INTEGER (0..511)
```
The IE **PhysCellIdUTRA-TDD** is used to indicate the physical layer identity of the cell, i.e. the cell parameters ID (TDD), as specified in TS 25.331 [19]. Also corresponds to the Initial Cell Parameter Assignment in TS 25.223 [46].

**PhysCellIdUTRA-TDD information element**

```asn1
PhysCellIdUTRA-TDD ::= INTEGER (0..127)
```

---

**PLMN-Identity**

The IE **PLMN-Identity** identifies a Public Land Mobile Network. Further information regarding how to set the IE are specified in TS 23.003 [27].

**PLMN-Identity information element**

```asn1
PLMN-Identity ::= SEQUENCE {
mcc         MCC OPTIONAL, -- Cond MCC
mnc         MNC
}
MCC ::= SEQUENCE (SIZE (3)) OF MCC-MNC-Digit
MNC ::= SEQUENCE (SIZE (2..3)) OF MCC-MNC-Digit
MCC-MNC-Digit ::= INTEGER (0..9)
```

---

**PLMN-Identity field descriptions**

- **mcc**
  - The first element contains the first MCC digit, the second element the second MCC digit and so on. If the field is absent, it takes the same value as the mcc of the immediately preceding IE PLMN-Identity. See TS 23.003 [27].

- **mnc**
  - The first element contains the first MNC digit, the second element the second MNC digit and so on. See TS 23.003 [27].

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCC</td>
<td>This IE is mandatory when <strong>PLMN-Identity</strong> is included in <strong>CellGlobalIdEUTRA</strong>, in <strong>CellGlobalIdUTRA</strong>, in <strong>CellGlobalIdGERAN</strong> or in <strong>RegisteredMME</strong>. This IE is also mandatory in the first occurrence of the IE <strong>PLMN-Identity</strong> within the IE <strong>PLMN-IdentityList</strong>. Otherwise it is optional, need OP.</td>
</tr>
</tbody>
</table>

---

**PreRegistrationInfoHRPD**

```asn1
PreRegistrationInfoHRPD ::= SEQUENCE {
  preRegistrationAllowed BOOLEAN,  
  preRegistrationZoneId PreRegistrationZoneIdHRPD OPTIONAL, -- cond PreRegAllowed  
  secondaryPreRegistrationZoneIdList SecondaryPreRegistrationZoneIdListHRPD OPTIONAL -- Need OR
}
SecondaryPreRegistrationZoneIdListHRPD ::= SEQUENCE (SIZE (1..2)) OF PreRegistrationZoneIdHRPD
PreRegistrationZoneIdHRPD ::= INTEGER (0..255)
```
**PreRegistrationInfoHRPD field descriptions**

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>preRegistrationAllowed</strong></td>
<td>TRUE indicates that a UE shall perform a CDMA2000 HRPD pre-registration if the UE does not have a valid / current pre-registration. FALSE indicates that the UE is not allowed to perform CDMA2000 HRPD pre-registration in the current cell.</td>
</tr>
<tr>
<td><strong>preRegistrationZoneID</strong></td>
<td>ColorCode (see C.S0024-A [26], C.S0087-0 [44]) of the CDMA2000 Reference Cell corresponding to the HRPD sector under the HRPD AN that is configured for this LTE cell. It is used to control when the UE should register or re-register.</td>
</tr>
<tr>
<td><strong>secondaryPreRegistrationZoneIdList</strong></td>
<td>List of SecondaryColorCodes (see C.S0024-A [26], C.S0087-0 [44]) of the CDMA2000 Reference Cell corresponding to the HRPD sector under the HRPD AN that is configured for this LTE cell. They are used to control when the UE should re-register.</td>
</tr>
</tbody>
</table>

**Conditional presence**

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PreRegAllowed</strong></td>
<td>The field is mandatory in case the preRegistrationAllowed is set to ‘true’. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

---

**Q-QualMin**

The IE **Q-QualMin** is used to indicate for cell selection/ re-selection the required minimum received RSRQ level in the (E-UTRA) cell. Corresponds to parameter $Q_{\text{qualmin}}$ in 36.304 [4]. Actual value $Q_{\text{qualmin}} = \text{IE value} \ [\text{dB}]$.

**Q-QualMin** information element

```asciidoc
Q-QualMin-r9 ::= INTEGER (-34..-3)
```

---

**Q-RxLevMin**

The IE **Q-RxLevMin** is used to indicate for cell selection/ re-selection the required minimum received RSRP level in the (E-UTRA) cell. Corresponds to parameter $Q_{\text{rxlevmin}}$ in 36.304 [4]. Actual value $Q_{\text{rxlevmin}} = \text{IE value} \times 2 \ [\text{dBm}]$.

**Q-RxLevMin** information element

```asciidoc
Q-RxLevMin ::= INTEGER (-70..-22)
```

---

**Q-OffsetRange**

The IE **Q-OffsetRange** is used to indicate a cell or frequency specific offset to be applied when evaluating candidates for cell re-selection or when evaluating triggering conditions for measurement reporting. The value in dB. Value dB-24 corresponds to -24 dB, dB-22 corresponds to -22 dB and so on.

**Q-OffsetRange** information element

```asciidoc
Q-OffsetRange ::= ENUMERATED {
  dB-24, dB-22, dB-20, dB-18, dB-16, dB-14,
  dB-12, dB-10, dB-8, dB-6, dB-5, dB-4, dB-3,
  dB-2, dB-1, dB0, dB1, dB2, dB3, dB4, dB5,
  dB6, dB8, dB10, dB12, dB14, dB16, dB18,
  dB20, dB22, dB24
}
```


**Q-OffsetRangeInterRAT**

The IE *Q-OffsetRangeInterRAT* is used to indicate a frequency specific offset to be applied when evaluating triggering conditions for measurement reporting. The value in dB.

**Q-OffsetRangeInterRAT information element**

```
-- ASN1START
Q-OffsetRangeInterRAT ::= INTEGER {-15..15}
-- ASN1STOP
```

**ReselectionThreshold**

The IE *ReselectionThreshold* is used to indicate an Rx level threshold for cell reselection. Actual value of threshold = IE value * 2 [dB].

**ReselectionThreshold information element**

```
-- ASN1START
ReselectionThreshold ::= INTEGER {0..31}
-- ASN1STOP
```

**ReselectionThresholdQ**

The IE *ReselectionThresholdQ* is used to indicate a quality level threshold for cell reselection. Actual value of threshold = IE value [dB].

**ReselectionThresholdQ information element**

```
-- ASN1START
ReselectionThresholdQ-r9 ::= INTEGER {0..31}
-- ASN1STOP
```

**SpeedStateScaleFactors**

The IE *SpeedStateScaleFactors* concerns factors, to be applied when the UE is in medium or high speed state, used for scaling a mobility control related parameter.

**SpeedStateScaleFactors information element**

```
-- ASN1START
SpeedStateScaleFactors ::= SEQUENCE {
  sf-Medium ENUMERATED {oDot25, oDot5, oDot75, 1Dot0},
  sf-High ENUMERATED {oDot25, oDot5, oDot75, 1Dot0}
}
-- ASN1STOP
```
### SpeedStateScaleFactors field descriptions

**sf-Medium**
The concerned mobility control related parameter is multiplied with this factor if the UE is in Medium Mobility state as defined in TS 36.304 [4]. Value oDot25 corresponds to 0.25, oDot5 corresponds to 0.5, oDot75 corresponds to 0.75 and so on.

**sf-High**
The concerned mobility control related parameter is multiplied with this factor if the UE is in High Mobility state as defined in TS 36.304 [4]. Value oDot25 corresponds to 0.25, oDot5 corresponds to 0.5, oDot75 corresponds to 0.75 and so on.

---

### SystemInfoListGERAN

The IE `SystemInfoListGERAN` contains system information of a GERAN cell.

#### SystemInfoListGERAN information element

---

---

### SystemInfoListGERAN field descriptions

`SystemInfoListGERAN`
Each OCTET STRING contains one complete System Information (SI) message as defined in TS 44.018 [45, table 9.1.1] or a complete Packet System Information (PSI) message as defined in TS 44.060 [36, table 11.2.1].

---

### SystemTimeInfoCDMA2000

The IE `SystemTimeInfoCDMA2000` informs the UE about the absolute time in the current cell. The UE uses this absolute time knowledge to derive the CDMA2000 Physical cell identity, expressed as PNOffset, of neighbour CDMA2000 cells.

**NOTE:** The UE needs the CDMA2000 system time with a certain level of accuracy for performing measurements as well as for communicating with the CDMA2000 network (HRPD or 1xRTT).

#### SystemTimeInfoCDMA2000 information element

---
### SystemTimeInfoCDMA2000 field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cdma-EUTRA-Synchronisation</td>
<td>TRUE indicates that the networks are synchronised i.e. there is no drift in the timing between E-UTRA and CDMA2000. FALSE indicates that the networks are not synchronised, i.e. the timing between E-UTRA and CDMA2000 can drift.</td>
</tr>
<tr>
<td>synchronousSystemTime</td>
<td>CDMA2000 system time corresponding to the SFN boundary at or after the ending boundary of the SI-window in which SystemInformationBlockType8 is transmitted. If synchronized to CDMA2000 system time then the size is 39 bits and the unit is 10 ms based on a 1.2288 Mcps chip rate.</td>
</tr>
<tr>
<td>asynchronousSystemTime</td>
<td>The CDMA2000 system time corresponding to the SFN boundary at or after the ending boundary of the SI-Window in which SystemInformationBlockType8 is transmitted. If not synchronized then the size is 49 bits and the unit is [8 CDMA2000 chips based on 1.2288 Mcps].</td>
</tr>
</tbody>
</table>

---

**TrackingAreaCode**

The IE TrackingAreaCode is used to identify a tracking area within the scope of a PLMN, see TS 24.301 [35].

**TrackingAreaCode information element**

```
-- ASN1START
TrackingAreaCode ::=    BIT STRING (SIZE (16))
-- ASN1STOP
```

---

**T-Reselection**

The IE T-Reselection concerns the cell reselection timer TreselectionRAT for E-UTRA, UTRA, GERAN or CDMA2000. Value in seconds.

**T-Reselection information element**

```
-- ASN1START
T-Reselection ::=     INTEGER (0..7)
-- ASN1STOP
```

---

6.3.5 Measurement information elements

**AllowedMeasBandwidth**

The IE AllowedMeasBandwidth is used to indicate the maximum allowed measurement bandwidth on a carrier frequency as defined by the parameter Transmission Bandwidth Configuration "N_{RB}" TS 36.104 [47]. The values mbw6, mbw15, mbw25, mbw50, mbw75, mbw100 indicate 6, 15, 25, 50, 75 and 100 resource blocks respectively.

**AllowedMeasBandwidth information element**

```
-- ASN1START
AllowedMeasBandwidth ::=    ENUMERATED {mbw6, mbw15, mbw25, mbw50, mbw75, mbw100}
-- ASN1STOP
```

---

**Hysteresis**

The IE Hysteresis is a parameter used within the entry and leave condition of an event triggered reporting condition. The actual value is IE value * 0.5 dB.
**Hysteresis** information element

```
Hysteresis ::= INTEGER (0..30)
```

**MeasConfig**

The IE MeasConfig specifies measurements to be performed by the UE, and covers intra-frequency, inter-frequency and inter-RAT mobility as well as configuration of measurement gaps.

**MeasConfig** information element

```
MeasConfig ::= SEQUENCE {
  -- Measurement objects
 _measObjectToRemoveList MeasObjectToRemoveList OPTIONAL, -- Need ON
  _measObjectToAddModList MeasObjectToAddModList OPTIONAL, -- Need ON
  -- Reporting configurations
  _reportConfigToRemoveList ReportConfigToRemoveList OPTIONAL, -- Need ON
  _reportConfigToAddModList ReportConfigToAddModList OPTIONAL, -- Need ON
  -- Measurement identities
  _measIdToRemoveList MeasIdToRemoveList OPTIONAL, -- Need ON
  _measIdToAddModList MeasIdToAddModList OPTIONAL, -- Need ON
  -- Other parameters
  _quantityConfig QuantityConfig OPTIONAL, -- Need ON
  _measGapConfig MeasGapConfig OPTIONAL, -- Need ON
  _s-Measure RSRP-Range OPTIONAL, -- Need ON
  _preRegistrationInfoHRPD PreRegistrationInfoHRPD OPTIONAL, -- Need ON
  _speedStatePars CHOICE {
    release NULL,
    setup SEQUENCE {
      mobilityStateParameters MobilityStateParameters,
      timeToTrigger-SF SpeedStateScaleFactors
    }
  } OPTIONAL, -- Need ON
  ...
}
```

**MeasConfig field descriptions**

- ** measObjectToRemoveList**
  List of measurement objects to remove.

- ** reportConfigToRemoveList**
  List of measurement reporting configurations to remove.

- ** measIdToRemoveList**
  List of measurement identities to remove.

- ** measGapConfig**
  Used to setup and release measurement gaps.

- ** s-Measure**
  Serving cell quality threshold controlling whether or not the UE is required to perform measurements of intra-frequency, inter-frequency and inter-RAT neighbouring cells. Value "0" indicates to disable s-Measure.

- ** preRegistrationInfoHRPD**
  The CDMA2000 HRPD Pre-Registration Information tells the UE if it should pre-register with the CDMA2000 HRPD network and identifies the Pre-registration zone to the UE.

- ** timeToTrigger-SF**
  The timeToTrigger in ReportConfigEUTRA and in ReportConfigInterRAT are multiplied with the scaling factor applicable for the UE’s speed state.
– **MeasGapConfig**

The IE **MeasGapConfig** specifies the measurement gap configuration and controls setup/ release of measurement gaps.

**MeasGapConfig information element**

```asn1
MeasGapConfig ::=     CHOICE {
    release        NULL,
    setup        SEQUENCE {
        gapOffset       CHOICE {
            gp0         INTEGER (0..39),
            gp1         INTEGER (0..79),
            ...
        }
    }
}
```

**MeasGapConfig field descriptions**

- **gapOffset**
  
  Value `gapOffset` of `gp0` corresponds to gap offset of Gap Pattern Id “0” with MGRP = 40ms. `gapOffset` of `gp1` corresponds to gap offset of Gap Pattern Id “1” with MGRP = 80ms. Also used to specify the measurement gap pattern to be applied, as defined in TS 36.133 [16].

– **MeasId**

The IE **MeasId** is used to identify a measurement configuration, i.e., linking of a measurement object and a reporting configuration.

**MeasId information element**

```asn1
MeasId ::=       INTEGER (1..maxMeasId)
```

– **MeasIdToAddModList**

The IE **MeasIdToAddModList** concerns a list of measurement identities to add or modify, with for each entry the `measId`, the associated `measObjectId` and the associated `reportConfigId`.

**MeasIdToAddModList information element**

```asn1
MeasIdToAddModList ::=    SEQUENCE (SIZE (1..maxMeasId)) OF MeasIdToAddMod
MeasIdToAddMod ::= SEQUENCE {
    measId        MeasId,
    measObjectId      MeasObjectId,
    reportConfigId      ReportConfigId
}
```

– **MeasObjectCDMA2000**

The IE **MeasObjectCDMA2000** specifies information applicable for inter-RAT CDMA2000 neighbouring cells.
MeasObjectCDMA2000 information element

-- ASN1START
MeasObjectCDMA2000 ::= SEQUENCE {
cdma2000-Type CDMA2000-Type,
carrierFreq CarrierFreqCDMA2000,
searchWindowSize INTEGER (0..15) OPTIONAL, -- Need ON
offsetFreq Q-OffsetRangeInterRAT DEFAULT 0,
cellsToRemoveList CellIndexList OPTIONAL, -- Need ON
cellsToAddModList CellsToAddModListCDMA2000 OPTIONAL, -- Need ON
cellForWhichToReportCGI PhysCellIdCDMA2000 OPTIONAL, -- Need ON
...}

CellsToAddModListCDMA2000 ::= SEQUENCE (SIZE (1..maxCellMeas)) OF CellsToAddModCDMA2000

CellsToAddModCDMA2000 ::= SEQUENCE {
cellIndex INTEGER (1..maxCellMeas),
physCellId PhysCellIdCDMA2000
}

-- ASN1STOP

MeasObjectCDMA2000 field descriptions

cdma2000-Type
The type of CDMA2000 network: CDMA2000 1xRTT or CDMA2000 HRPD.

carrierInfo
Identifies CDMA2000 carrier frequency for which this configuration is valid.

searchWindowSize
Provides the search window size to be used by the UE for the neighbouring pilot, see C.S0005-A [25].

cellsToRemoveList
List of cells to remove from the neighbouring cell list.

cellsToAddModList
List of cells to add/ modify in the neighbouring cell list.

cellIndex
Entry index in the neighbouring cell list.

physCellId
CDMA2000 Physical cell identity of a cell in neighbouring cell list expressed as PNOffset.

-- MeasObjectEUTRA

The IE MeasObjectEUTRA specifies information applicable for intra-frequency or inter-frequency E-UTRA cells.

MeasObjectEUTRA information element

-- ASN1START
MeasObjectEUTRA ::= SEQUENCE {
carrierFreq ARFCN-ValueEUTRA,
allowedMeasBandwidth AllowedMeasBandwidth,
presenceAntennaPort1 PresenceAntennaPort1,
neighCellConfig NeighCellConfig,
offsetFreq Q-OffsetRange DEFAULT dB0,
-- Cell list
cellsToRemoveList CellIndexList OPTIONAL, -- Need ON
cellsToAddModList CellsToAddModList OPTIONAL, -- Need ON
-- Black list
blackCellsToRemoveList CellIndexList OPTIONAL, -- Need ON
blackCellsToAddModList BlackCellsToAddModList OPTIONAL, -- Need ON
cellForWhichToReportCGI PhysCellId OPTIONAL, -- Need ON
...}

CellsToAddModList ::= SEQUENCE (SIZE (1..maxCellMeas)) OF CellsToAddMod

CellsToAddMod ::= SEQUENCE {
cellIndex INTEGER (1..maxCellMeas),
physCellId PhysCellId,
cellIndividualOffset Q-OffsetRange
}
MeasObjectEUTRA field descriptions

carrierFreq
Identifies E-UTRA carrier frequency for which this configuration is valid.

offsetFreq
Offset value applicable to the carrier frequency. Value dB-24 corresponds to -24 dB, dB-22 corresponds to -22 dB and so on.

cellsToRemoveList
List of cells to remove from the cell list.

cellsToAddModList
List of cells to add/ modify in the cell list.

cellIndex
Entry index in the cell list. An entry may concern a range of cells, in which case this value applies to the entire range.

physCellId
Physical cell identity of a cell in the cell list.

cellIndividualOffset
Cell individual offset applicable to a specific cell. Value dB-24 corresponds to -24 dB, dB-22 corresponds to -22 dB and so on.

blackCellsToRemoveList
List of cells to remove from the black list of cells.

blackCellsToAddModList
List of cells to add/ modify in the black list of cells.

physCellIdRange
Physical cell identity or a range of physical cell identities of cells in the black list.

MeasObjectGERAN

The IE MeasObjectGERAN specifies information applicable for inter-RAT GERAN neighbouring frequencies.

MeasObjectGERAN information element

MeasObjectGERAN field descriptions

ncc-Permitted
Field encoded as a bit map, where bit N is set to "0" if a BCCH carrier with NCC = N-1 is not permitted for monitoring and set to "1" if a BCCH carrier with NCC = N-1 is permitted for monitoring; N = 1 to 8; bit 1 of the bitmap is the leading bit of the bit string.

MeasObjectId

The IE MeasObjectId used to identify a measurement object configuration.
MeasObjectId information element

```asn1
MeasObjectId ::= INTEGER (1..maxObjectId)
```

MeasObjectToAddModList information element

The IE `MeasObjectToAddModList` concerns a list of measurement objects to add or modify

```asn1
MeasObjectToAddModList ::= SEQUENCE (SIZE (1..maxObjectId)) OF MeasObjectToAddMod
MeasObjectToAddMod ::= SEQUENCE {
  measObjectId      MeasObjectId,
  measObject        CHOICE {
    measObjectEUTRA      MeasObjectEUTRA,
    measObjectUTRA      MeasObjectUTRA,
    measObjectGERAN      MeasObjectGERAN,
    measObjectCDMA2000    MeasObjectCDMA2000,
    ...
  }
}
```

MeasObjectUTRA information element

The IE `MeasObjectUTRA` specifies information applicable for inter-RAT UTRA neighbouring cells.

```asn1
MeasObjectUTRA ::= SEQUENCE {
  carrierFreq       ARFCN-ValueUTRA,
  offsetFreq        Q-OffsetRangeInterRAT  DEFAULT 0,
  cellsToRemoveList  CellIndexList    OPTIONAL,  -- Need ON
  cellsToAddModList  CHOICE {
    cellsToAddModListUTRA-FDD   CellsToAddModListUTRA-FDD,
    cellsToAddModListUTRA-TDD   CellsToAddModListUTRA-TDD
  }                OPTIONAL,  -- Need ON
  cellForWhichToReportCGI  CHOICE {
    utra-FDD       PhysCellIdUTRA-FDD,
    utra-TDD       PhysCellIdUTRA-TDD
  }                OPTIONAL,  -- Need ON
  ...,
  [[ csg-allowedReportingCells-v930   CSG-AllowedReportingCells-r9 OPTIONAL -- Need ON ]]
}
CellsToAddModListUTRA-FDD ::= SEQUENCE (SIZE (1..maxCellMeas)) OF CellsToAddModUTRA-FDD
CellsToAddModUTRA-FDD ::= SEQUENCE {
  cellIndex       INTEGER (1..maxCellMeas),
  physCellId       PhysCellIdUTRA-FDD
}
CellsToAddModListUTRA-TDD ::= SEQUENCE (SIZE (1..maxCellMeas)) OF CellsToAddModUTRA-TDD
CellsToAddModUTRA-TDD ::= SEQUENCE {
  cellIndex       INTEGER (1..maxCellMeas),
  physCellId       PhysCellIdUTRA-TDD
}```
MeasObjectUTRA field descriptions

carrierFreq
Identifies UTRA carrier frequency for which this configuration is valid.
cellsToRemoveList
List of cells to remove from the neighbouring cell list.
cellsToAddModListUTRA-FDD
List of UTRA FDD cells to add/modify in the neighbouring cell list.
cellsToAddModListUTRA-TDD
List of UTRA TDD cells to add/modify in the neighbouring cell list.
cellIndex
Entry index in the neighbouring cell list.
csg-allowedReportingCells
One or more ranges of physical cell identities for which UTRA-FDD reporting is allowed.

MeasResults
The IE MeasResults covers measured results for intra-frequency, inter-frequency and inter-RAT mobility.

MeasResults information element

-- ASN1START
MeasResults ::= SEQUENCE {
    measId          MeasId,
    measResultServCell       SEQUENCE {
        rscpResult       RSCP-Range,
        rsrqResult       RSRQ-Range,
    },
    measResultNeighCells     CHOICE {
        measResultListEUTRA     MeasResultListEUTRA,
        measResultListUTRA     MeasResultListUTRA,
        measResultListGERAN     MeasResultListGERAN,
        measResultsCDMA2000     MeasResultsCDMA2000,
    } OPTIONAL,
    ...,
    [[ measResultForECID-r9    MeasResultForECID-r9    OPTIONAL
    ]]
}

MeasResultListEUTRA ::= SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultEUTRA

MeasResultEUTRA ::= SEQUENCE {
    physCellId       PhysCellId,
    cgi-Info         SEQUENCE {
        cellGlobalId       CellGlobalIdEUTRA,
        trackingAreaCode    TrackingAreaCode,
        plmn-IdentityList   PLMN-IdentityList2     OPTIONAL
    } OPTIONAL,
    measResult       SEQUENCE {
        rscpResult       RSCP-Range     OPTIONAL,
        rsrqResult       RSRQ-Range     OPTIONAL,
        ...,
        [[ additionalSI-Info-r9    AdditionalSI-Info-r9    OPTIONAL
        ]]
    }
}

MeasResultListUTRA ::= SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultUTRA

MeasResultUTRA ::= SEQUENCE {
    physCellId       CHOICE {
        fdd         PhysCellIdUTRA-FDD,
        tdd         PhysCellIdUTRA-TDD
    },
    cgi-Info         SEQUENCE {
        ...,
    }
}
cellGlobalId
locationAreaCode
routingAreaCode
plmn-IdentityList
  ]\[
measResult
  ]\[
    SEQUENCE {
      utra-RSCP
      utra-EcNo
      . . .
      }\[
      \[ additionalSI-Info-r9
      AdditionalSI-Info-r9
    ]\[
  ]\[
}
MeasResultListGERAN ::= SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultGERAN
MeasResultGERAN ::= SEQUENCE {
  carrierFreq
  physCellId
  cgi-Info
    SEQUENCE {
      cellGlobalId
      routingAreaCode
    ]\[
    ]\[
measResult
  rssi
  . . .
  ]\[
}
MeasResultsCDMA2000 ::= SEQUENCE {
  preRegistrationStatusHRPD
  measResultListCDMA2000
  ]\[
}
MeasResultListCDMA2000 ::= SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultCDMA2000
MeasResultCDMA2000 ::= SEQUENCE {
  physCellId
  cgi-Info
    ]\[
  measResult
    ]\[
    ]\[
  pilotPnPhase
  pilotStrength
  . . .
  ]\[
}
MeasResultForECID-r9 ::= SEQUENCE {
  ue-RxTxTimeDiffResult-r9
  currentSFN-r9
  ]\[
PLMN-IdentityList2 ::= SEQUENCE (SIZE (1..5)) OF PLMN-Identity
AdditionalSI-Info-r9 ::= SEQUENCE {
  csg-MemberStatus-r9
  csg-Identity-r9
  ]\[
}
### MeasResults field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>measId</td>
<td>Identifies the measurement identity for which the reporting is being performed.</td>
</tr>
<tr>
<td>measResultServCell</td>
<td>Measured result of the serving cell.</td>
</tr>
<tr>
<td>measResultListEUTRA</td>
<td>List of measured results for the maximum number of reported best cells for an E-UTRA measurement identity.</td>
</tr>
<tr>
<td>rsrpResult</td>
<td>Measured RSRP result of an E-UTRA cell. The rsrpResult is only reported if configured by the eNB.</td>
</tr>
<tr>
<td>rsrqResult</td>
<td>Measured RSRQ result of an E-UTRA cell. The rsrqResult is only reported if configured by the eNB.</td>
</tr>
<tr>
<td>measResultListUTRA</td>
<td>List of measured results for the maximum number of reported best cells for a UTRA measurement identity.</td>
</tr>
<tr>
<td>measResultListGERAN</td>
<td>List of measured results for the maximum number of reported best cells or frequencies for a GERAN measurement identity.</td>
</tr>
<tr>
<td>measResultsCDMA2000</td>
<td>Contains the CDMA2000 HRPD pre-registration status and the list of CDMA2000 measurements.</td>
</tr>
<tr>
<td>preRegistrationStatusHRPD</td>
<td>Set to TRUE if the UE is currently pre-registered with CDMA2000 HRPD. Otherwise set to FALSE. This can be ignored by the eNB for CDMA2000 1xRTT.</td>
</tr>
<tr>
<td>measResultListCDMA2000</td>
<td>List of measured results for the maximum number of reported best cells for a CDMA2000 measurement identity.</td>
</tr>
<tr>
<td>utra-EcN0</td>
<td>According to CPICH_Ec/No in TS 25.133 [29] for FDD. Fourteen spare values. The field is not present for TDD.</td>
</tr>
<tr>
<td>rssi</td>
<td>GERAN Carrier RSSI. RXLEV is mapped to a value between 0 and 63, TS 45.008 [28]. When mapping the RXLEV value to the RSSI bit string, the first/leftmost bit of the bit string contains the most significant bit.</td>
</tr>
<tr>
<td>locationAreaCode</td>
<td>A fixed length code identifying the location area within a PLMN, as defined in TS 23.003 [27].</td>
</tr>
<tr>
<td>routingAreaCode</td>
<td>The RAC identity read from broadcast information, as defined in TS 23.003 [27].</td>
</tr>
<tr>
<td>plmn-IdentityList</td>
<td>The list of PLMN Identity read from broadcast information when the multiple PLMN Identities are broadcast. This field contains the list of identities starting from the second entry of PLMN Identities in the broadcast information.</td>
</tr>
<tr>
<td>pilotPnPhase</td>
<td>Indicates the arrival time of a CDMA2000 pilot, measured relative to the UE’s time reference in units of PN chips, see C.S0005-A [25]. This information is used in either SRVCC handover or enhanced 1xRTT CS fallback procedure to CDMA2000 1xRTT.</td>
</tr>
<tr>
<td>csg-MemberStatus</td>
<td>Indicates whether or not the UE is a member of the CSG of the neighbour cell.</td>
</tr>
<tr>
<td>ue-RxTxTimeDiffResult</td>
<td>UE Rx-Tx time difference measurement result of the serving cell, provided by lower layers. According to UE Rx-Tx time difference report mapping in TS 36.133 [16].</td>
</tr>
<tr>
<td>currentSFN</td>
<td>Indicates the current system frame number when receiving the UE Rx-Tx time difference measurement results from lower layer.</td>
</tr>
</tbody>
</table>
---

**QuantityConfig**

The IE *QuantityConfig* specifies the measurement quantities and layer 3 filtering coefficients for E-UTRA and inter-RAT measurements.

**QuantityConfig** information element

```asn1
-- ASN1START
QuantityConfig ::= SEQUENCE {
  quantityConfigEUTRA     QuantityConfigEUTRA     OPTIONAL, -- Need ON
  quantityConfigUTRA     QuantityConfigUTRA     OPTIONAL, -- Need ON
  quantityConfigGERAN     QuantityConfigGERAN     OPTIONAL, -- Need ON
  quantityConfigCDMA2000     QuantityConfigCDMA2000     OPTIONAL, -- Need ON
  ...
}

QuantityConfigEUTRA ::= SEQUENCE {
  filterCoefficientRSRP    FilterCoefficient     DEFAULT fc4,
  filterCoefficientRSRQ    FilterCoefficient     DEFAULT fc4
}

QuantityConfigUTRA ::= SEQUENCE {
  measQuantityUTRA-FDD    ENUMERATED {cpich-RSCP, cpich-EcN0},
  measQuantityUTRA-TDD    ENUMERATED {pccpch-RSCP},
  filterCoefficient     FilterCoefficient     DEFAULT fc4
}

QuantityConfigGERAN ::= SEQUENCE {
  measQuantityGERAN     ENUMERATED {rssi},
  filterCoefficient     FilterCoefficient     DEFAULT fc2
}

QuantityConfigCDMA2000 ::= SEQUENCE {
  measQuantityCDMA2000    ENUMERATED {pilotStrength, pilotPnPhaseAndPilotStrength}
}

-- ASN1STOP
```

**QuantityConfig field descriptions**

- **quantityConfigEUTRA**
  Specifies filter configurations for E-UTRA measurements.

- **quantityConfigUTRA**
  Specifies quantity and filter configurations for UTRA measurements.

- **measQuantityUTRA**
  Measurement quantity used for UTRA measurements.

- **quantityConfigGERAN**
  Specifies quantity and filter configurations for GERAN measurements.

- **measQuantityGERAN**
  Measurement quantity used for GERAN measurements.

- **quantityConfigCDMA2000**
  Specifies quantity configurations for CDMA2000 measurements.

- **measQuantityCDMA2000**
  Measurement quantity used for CDMA2000 measurements. *pilotPhaseAndPilotStrength* is only applicable for *MeasObjectCDMA2000 of cdma2000-Type = type1XRTT.*

- **filterCoefficientRSRP**
  Specifies the filtering coefficient used for RSRP.

- **filterCoefficientRSRQ**
  Specifies the filtering coefficient used for RSRQ.

---

**ReportConfigEUTRA**

The IE *ReportConfigEUTRA* specifies criteria for triggering of an E-UTRA measurement reporting event. The E-UTRA measurement reporting events are labelled AN with N equal to 1, 2 and so on.
Event A1: Serving becomes better than absolute threshold;
Event A2: Serving becomes worse than absolute threshold;
Event A3: Neighbour becomes amount of offset better than serving;
Event A4: Neighbour becomes better than absolute threshold;
Event A5: Serving becomes worse than absolute threshold1 AND Neighbour becomes better than another absolute threshold2.

**ReportConfigEUTRA** information element

```asn1
ReportConfigEUTRA ::= SEQUENCE {
  triggerType CHOICE {
    event SEQUENCE {
      eventId CHOICE {
        eventA1 SEQUENCE {
          a1-Threshold ThresholdEUTRA
        },
        eventA2 SEQUENCE {
          a2-Threshold ThresholdEUTRA
        },
        eventA3 SEQUENCE {
          a3-Offset INTEGER (-30..30),
          reportOnLeave BOOLEAN
        },
        eventA4 SEQUENCE {
          a4-Threshold ThresholdEUTRA
        },
        eventA5 SEQUENCE {
          a5-Threshold1 ThresholdEUTRA,
          a5-Threshold2 ThresholdEUTRA
        },
        ...
      },
      hysteresis Hysteresis,
      timeToTrigger TimeToTrigger
    },
    periodical SEQUENCE {
      purpose ENUMERATED {reportStrongestCells, reportCGI}
    },
  },
  triggerQuantity ENUMERATED {rsrp, rsrq},
  reportQuantity ENUMERATED {sameAsTriggerQuantity, both},
  maxReportCells INTEGER {1..maxCellReport},
  reportInterval ReportInterval,
  reportAmount ENUMERATED {r1, r2, r4, r8, r16, r32, r64, infinity},
  
  [[ si-RequestForHO-r9 ENUMERATED {setup} OPTIONAL, -- Cond reportCGI
    ue-RxTxTimeDiffPeriodical-r9 ENUMERATED {setup} OPTIONAL -- Need OR
  ]]}

ThresholdEUTRA ::= CHOICE{
  threshold-RSRP RSRP-Range,
  threshold-RSRQ RSRQ-Range
}
```

---
ReportConfigEUTRA field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>eventId</td>
<td>Choice of E-UTRA event triggered reporting criteria.</td>
</tr>
<tr>
<td>aN-ThresholdM</td>
<td>Threshold to be used in EUTRA measurement report triggering condition for event number aN. If multiple thresholds are defined for event number aN, the thresholds are differentiated by M.</td>
</tr>
<tr>
<td>a3-Offset</td>
<td>Offset value to be used in EUTRA measurement report triggering condition for event a3. The actual value is IE value * 0.5 dB.</td>
</tr>
<tr>
<td>reportOnLeave</td>
<td>Indicates whether or not the UE shall initiate the measurement reporting procedure when the leaving condition is met for a cell in cellsTriggeredList, as specified in 5.5.4.1.</td>
</tr>
<tr>
<td>triggerQuantity</td>
<td>The quantities used to evaluate the triggering condition for the event. The values rSrP and rSrQ correspond to Reference Signal Received Power (RSRP) and Reference Signal Received Quality (RSRQ), see TS 36.214 [48].</td>
</tr>
<tr>
<td>timeToTrigger</td>
<td>Time during which specific criteria for the event needs to be met in order to trigger a measurement report.</td>
</tr>
<tr>
<td>reportQuantity</td>
<td>The quantities to be included in the measurement report. The value both means that both the rSrP and rSrQ quantities are to be included in the measurement report.</td>
</tr>
<tr>
<td>maxReportCells</td>
<td>Max number of cells, excluding the serving cell, to include in the measurement report.</td>
</tr>
<tr>
<td>reportAmount</td>
<td>Number of measurement reports applicable for triggerType ‘event’ as well as for triggerType ‘periodical’. In case purpose is set to ‘reportCGI’ only value 1 applies.</td>
</tr>
<tr>
<td>ThresholdEUTRA</td>
<td>For RSRP: RSRP based threshold for event evaluation. The actual value is IE value – 140 dBm. For RSRQ: RSRQ based threshold for event evaluation. The actual value is (IE value – 40)/2 dB.</td>
</tr>
<tr>
<td>si-RequestForHO</td>
<td>The field applies to the ‘reportCGI’ functionality, and when the field is included, the UE is allowed to use autonomous gaps in acquiring system information from the neighbour cell, applies a different value for T321, and includes different fields in the measurement report.</td>
</tr>
<tr>
<td>ue-RxTxTimeDiffPeriodical</td>
<td>If this field is present, the UE shall perform UE Rx-Tx time difference measurement reporting and ignore the fields triggerQuantity, reportQuantity and maxReportCells. If the field is present, the only applicable values for the corresponding triggerType and purpose are ‘periodical’ and ‘reportStrongestCells’ respectively.</td>
</tr>
</tbody>
</table>

---

**ReportConfigId**

The IE ReportConfigId is used to identify a measurement reporting configuration.

**ReportConfigId information element**

```asn1
-- ASN1START
ReportConfigId ::= INTEGER (1..maxReportConfigId)
-- ASN1STOP
```

---

**ReportConfigInterRAT**

The IE ReportConfigInterRAT specifies criteria for triggering of an inter-RAT measurement reporting event. The inter-RAT measurement reporting events are labelled BN with N equal to 1, 2 and so on.
Event B1: Neighbour becomes better than absolute threshold;

Event B2: Serving becomes worse than absolute threshold1 AND Neighbour becomes better than another absolute threshold2.

The b1 and b2 event thresholds for CDMA2000 are the CDMA2000 pilot detection thresholds are expressed as an unsigned binary number equal to \([-2 \times 10 \log_{10} Ec/Io]\) in units of 0.5dB, see C.S0005-A [25] for details.

**ReportConfigInterRAT information element**

```
-- ASN1START
ReportConfigInterRAT ::= SEQUENCE {
  triggerType       CHOICE {
    event        SEQUENCE {
      eventId        CHOICE {
        eventB1        SEQUENCE {
          b1-Threshold      CHOICE {
            b1-ThresholdUTRA     ThresholdUTRA,
            b1-ThresholdGERAN     ThresholdGERAN,
            b1-ThresholdCDMA2000    ThresholdCDMA2000
          }
        },
        eventB2        SEQUENCE {
          b2-Threshold1      ThresholdEUTRA,
          b2-Threshold2      CHOICE {
            b2-Threshold2UTRA     ThresholdUTRA,
            b2-Threshold2GERAN     ThresholdGERAN,
            b2-Threshold2CDMA2000    ThresholdCDMA2000
          }
        }
      },
      hysteresis      Hysteresis,
      timeToTrigger     TimeToTrigger
    },
    periodical        SEQUENCE {
      purpose         ENUMERATED {
        reportStrongestCells,
        reportStrongestCellsForSON,
        reportCGI
      }
    }
  },
  maxReportCells      INTEGER (1..maxCellReport),
  reportInterval      ReportInterval,
  reportAmount      ENUMERATED {r1, r2, r4, r8, r16, r32, r64, infinity},
  ...,
  [[ si-RequestForHO-r9     ENUMERATED {setup}  OPTIONAL -- Cond reportCGI ]]
}
ThresholdUTRA ::= CHOICE{
  utra-RSCP       INTEGER (-5..91),
  utra-EcN0       INTEGER (0..49)
}
ThresholdGERAN ::= INTEGER (0..63)
ThresholdCDMA2000 ::= INTEGER (0..63)
-- ASN1STOP
```
ReportConfigInterRAT field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>eventId</td>
<td>Choice of inter-RAT event triggered reporting criteria.</td>
</tr>
<tr>
<td>bN-ThresholdM</td>
<td>Threshold to be used in inter RAT measurement report triggering condition for event number bN. If multiple thresholds are defined for event number bN, the thresholds are differentiated by M.</td>
</tr>
<tr>
<td>timeToTrigger</td>
<td>Time during which specific criteria for the event needs to be met in order to trigger a measurement report.</td>
</tr>
<tr>
<td>Purpose</td>
<td>reportStrongestCellsForSON applies only in case reportConfig is linked to a measObject set to 'measObjectUTRA' or 'measObjectCDMA2000'.</td>
</tr>
<tr>
<td>maxReportCells</td>
<td>Max number of cells, excluding the serving cell, to include in the measurement report. In case purpose is set to 'reportStrongestCellsForSON' only value 1 applies.</td>
</tr>
<tr>
<td>reportAmount</td>
<td>Number of measurement reports applicable for triggerType 'event' as well as for triggerType 'periodical'. In case purpose is set to 'reportCGI' or 'reportStrongestCellsForSON' only value 1 applies.</td>
</tr>
</tbody>
</table>

ReportConfigToAddModList

The IE ReportConfigToAddModList concerns a list of reporting configurations to add or modify

ReportConfigToAddModList information element

```
-- ASN1START
ReportConfigToAddModList ::= SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod

ReportConfigToAddMod ::= SEQUENCE {
    reportConfigId      ReportConfigId,
    reportConfig      CHOICE {
        reportConfigEUTRA     ReportConfigEUTRA,
        reportConfigInterRAT    ReportConfigInterRAT
    }
}

-- ASN1STOP
```

ReportInterval

The ReportInterval indicates the interval between periodical reports. The ReportInterval is applicable if the UE performs periodical reporting (i.e. when reportAmount exceeds 1), for triggerType 'event' as well as for triggerType 'periodical'. Value ms120 corresponds with 120 ms, ms240 corresponds with 240 ms and so on, while value min1 corresponds with 1 min, min6 corresponds with 6 min and so on.

ReportInterval information element

```
-- ASN1START
```
RSRP-Range

The IE **RSRP-Range** specifies the value range used in RSRP measurements and thresholds. Integer value for RSRP measurements according to mapping table in TS 36.133 [16].

**RSRP-Range information element**

```asn1
RSRP-Range ::= INTEGER(0..97)
```

RSRQ-Range

The IE **RSRQ-Range** specifies the value range used in RSRQ measurements and thresholds. Integer value for RSRQ measurements according to mapping table in TS 36.133 [16].

**RSRQ-Range information element**

```asn1
RSRQ-Range ::= INTEGER(0..34)
```

TimeToTrigger

The IE **TimeToTrigger** specifies the value range used for time to trigger parameter, which concerns the time during which specific criteria for the event needs to be met in order to trigger a measurement report. Value ms0 corresponds to 0 ms, ms40 corresponds to 40 ms, and so on.

**TimeToTrigger information element**

```asn1
TimeToTrigger ::= ENUMERATED {
    ms0, ms40, ms64, ms80, ms100, ms128, ms160, ms256,
    ms320, ms480, ms512, ms640, ms1024, ms1280, ms2560,
    ms5120}
```

### 6.3.6 Other information elements

#### C-RNTI

The IE **C-RNTI** identifies a UE having a RRC connection within a cell.

**C-RNTI information element**

```asn1
C-RNTI ::= BIT STRING (SIZE (16))
```
– **DedicatedInfoCDMA2000**

The *DedicatedInfoCDMA2000* is used to transfer UE specific CDMA2000 information between the network and the UE. The RRC layer is transparent for this information.

**DedicatedInfoCDMA2000 information element**

---

DedicatedInfoCDMA2000 ::= OCTET STRING

---

– **DedicatedInfoNAS**

The IE *DedicatedInfoNAS* is used to transfer UE specific NAS layer information between the network and the UE. The RRC layer is transparent for this information.

**DedicatedInfoNAS information element**

---

DedicatedInfoNAS ::= OCTET STRING

---

– **FilterCoefficient**

The IE *FilterCoefficient* specifies the measurement filtering coefficient. Value $fc0$ corresponds to $k = 0$, $fc1$ corresponds to $k = 1$, and so on.

**FilterCoefficient information element**

---

FilterCoefficient ::= ENUMERATED {
  fc0, fc1, fc2, fc3, fc4, fc5,
  fc6, fc7, fc8, fc9, fc11, fc13,
  fc15, fc17, fc19, spare1, ...}

---

– **MMEC**

The IE *MMEC* identifies an MME within the scope of an MME Group within a PLMN, see TS 23.003 [27].

**MMEC information element**

---

MMEC ::= BIT STRING {SIZE (8)}

---

– **NeighCellConfig**

The IE *NeighCellConfig* is used to provide the information related to MBSFN and TDD UL/DL configuration of neighbour cells.
**NeighCellConfig** information element

```
NeighCellConfig ::=   BIT STRING (SIZE (2))
```

**NeighCellConfig** field descriptions

`neighCellConfig` Provides information related to MBSFN and TDD UL/DL configuration of neighbour cells of this frequency

00: Not all neighbour cells have the same MBSFN subframe allocation as serving cell
10: The MBSFN subframe allocations of all neighbour cells are identical to or subsets of that in the serving cell
01: No MBSFN subframes are present in all neighbour cells
11: Different UL/DL allocation in neighbouring cells for TDD compared to the serving cell

For TDD, 00, 10 and 01 are only used for same UL/DL allocation in neighbouring cells compared to the serving cell.

**OtherConfig**

The IE *OtherConfig* contains configuration related to other configuration

**OtherConfig** information element

```
OtherConfig-r9 ::= SEQUENCE {
   reportProximityConfig-r9   ReportProximityConfig-r9  OPTIONAL,   -- Need ON
   ...                   }
ReportProximityConfig-r9 ::= SEQUENCE {
   proximityIndicationEUTRA-r9  ENUMERATED {enabled}   OPTIONAL,   -- Need OR
   proximityIndicationUTRA-r9  ENUMERATED {enabled}   OPTIONAL  -- Need OR
}
```

**OtherConfig** field descriptions

`reportProximityConfig` Indicates, for each of the applicable RATs (EUTRA, UTRA), whether or not proximity indication is enabled for cells of the concerned RAT whose CSG IDs are in the UEs CSG whitelist. Note.

**NOTE:** Enabling/ disabling of proximity indication includes enabling/ disabling of the related functionality e.g. autonomous search in connected mode.

**RAND-CDMA2000 (1xRTT)**

The *RAND-CDMA2000* concerns a random value, generated by the eNB, to be passed to the CDMA2000 upper layers.

**RAND-CDMA2000** information element

```
RAND-CDMA2000 ::=   BIT STRING (SIZE (32))
```

**RAT-Type**

The IE *RAT-Type* is used to indicate the radio access technology (RAT), including E-UTRA, of the requested/ transferred UE capabilities.
**RAT-Type** information element

```
RAT-Type ::= ENUMERATED {
    eutra, utra, geran-cs, geran-ps, cdma2000-1XRTT,
    spare3, spare2, spare1, ...}
```

**RRC-TransactionIdentifier**

The IE **RRC-TransactionIdentifier** is used, together with the message type, for the identification of an RRC procedure (transaction).

```
RRC-TransactionIdentifier ::= INTEGER (0..3)
```

**S-TMSI**

The IE **S-TMSI** contains an S-Temporary Mobile Subscriber Identity, a temporary UE identity provided by the EPC which uniquely identifies the UE within the tracking area, see TS 23.003 [27].

```
S-TMSI ::= SEQUENCE {
    mmec        MMEC,
    m-TMSI        BIT STRING (SIZE (32))
}
```

**S-TMSI field descriptions**

`m-TMSI`  
The first/leftmost bit of the bit string contains the most significant bit of the M-TMSI.

**UE-CapabilityRAT-ContainerList**

The IE **UE-CapabilityRAT-ContainerList** contains list of containers, one for each RAT for which UE capabilities are transferred, if any.

```
UE-CapabilityRAT-ContainerList ::=SEQUENCE (SIZE (0..maxRAT-Capabilities)) OF UE-CapabilityRAT-Container
UE-CapabilityRAT-Container ::= SEQUENCE {
    rat-Type       RAT-Type,
    ueCapabilityRAT-Container   OCTET STRING
}
```
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**UECapabilityRAT-Container**

Container for the UE capabilities of the indicated RAT. The encoding is defined in the specification of each RAT:

For E-UTRA: the encoding of UE capabilities is defined in IE **UE-EUTRA-Capability**.

For UTRA: the octet string contains the INTER RAT HANDOVER INFO message defined in TS 25.331 [19]. For GERAN CS: the octet string contains the concatenated string of the Mobile Station Classmark 2 and Mobile Station Classmark 3. The first 5 octets correspond to Mobile Station Classmark 2 and the following octets correspond to Mobile Station Classmark 3. The Mobile Station Classmark 2 is formatted as ‘TLV’ and is coded in the same way as the Mobile Station Classmark 2 information element in TS 24.008 [49]. The first octet is the Mobile station classmark 2 IEI and its value shall be set to 33H. The second octet is the Length of mobile station classmark 2 and its value shall be set to 3. The octet 3 contains the first octet of the value part of the Mobile Station Classmark 2 information element, the octet 4 contains the second octet of the value part of the Mobile Station Classmark 2 information element and so on. For each of these octets, the first/ leftmost/ most significant bit of the octet contains b8 of the corresponding octet of the Mobile Station Classmark 2. The Mobile Station Classmark 3 is formatted as ‘V’ and is coded in the same way as the value part in the Mobile station classmark 3 information element in TS 24.008 [49]. The sixth octet of this octet string contains octet 1 of the value part of Mobile station classmark 3, the seventh octet of this octet string contains octet 2 of the value part of Mobile station classmark 3 and so on. Note.

For GERAN PS: the encoding of UE capabilities is formatted as ‘V’ and is coded in the same way as the value part in the MS Radio Access Capability information element in TS 24.008 [49].

For CDMA2000-1XRTT: the octet string contains the A21 Mobile Subscription Information and the encoding of this is defined in A.S0008 [33]. The A21 Mobile Subscription Information contains the supported CDMA2000 1xRTT band class and band sub-class information. NOTE: The value part is specified by means of CSN.1, which encoding results in a bit string, to which final padding may be appended up to the next octet boundary TS 24.008 [49]. The first/ leftmost bit of the CSN.1 bit string is placed in the first/ leftmost/ most significant bit of the first octet. This continues until the last bit of the CSN.1 bit string, which is placed in the last/ rightmost/ least significant bit of the last octet.

-- **UE-EUTRA-Capability**

The IE **UE-EUTRA-Capability** is used to convey the E-UTRA UE Radio Access Capability Parameters, see TS 36.306 [5], and the Feature Group Indicators for mandatory features (defined in Annex B.1) to the network. The IE **UE-EUTRA-Capability** is transferred in E-UTRA or in another RAT.

**UE-EUTRA-Capability information element**

```
UE-EUTRA-Capability ::= SEQUENCE {
    accessStratumRelease   AccessStratumRelease,
    ue-Category       INTEGER (1..5),
    pdcp-Parameters      PDCP-Parameters,
    phyLayerParameters     PhyLayerParameters,
    rf-Parameters      RF-Parameters,
    measParameters      MeasParameters,
    featureGroupIndicators    BIT STRING (SIZE (32))    OPTIONAL,
    interRAT-Parameters    SEQUENCE {
        utraFDD        IRAT-ParametersUTRA-FDD    OPTIONAL,
        utraTDD128       IRAT-ParametersUTRA-TDD128    OPTIONAL,
        utraTDD384       IRAT-ParametersUTRA-TDD384    OPTIONAL,
        utraTDD768       IRAT-ParametersUTRA-TDD768    OPTIONAL,
        geran       IRAT-ParametersGERAN     OPTIONAL,
        cdma2000-HRPD      IRAT-ParametersCDMA2000-HRPD   OPTIONAL,
        cdma2000-1xRTT     IRAT-ParametersCDMA2000-1xRTT   OPTIONAL
    },
    nonCriticalExtension    UE-EUTRA-Capability-v920-IEs  OPTIONAL
}

UE-EUTRA-Capability-v920-IEs ::= SEQUENCE {
    phyLayerParameters-v920    PhyLayerParameters-v920,
    interRAT-ParametersGERAN-v920    IRAT-ParametersGERAN-v920,
    interRAT-ParametersUTRA-v920    IRAT-ParametersUTRA-v920,
    interRAT-ParametersCDMA2000-v920    IRAT-ParametersCDMA2000-v920,
    deviceType-r9    ENUMERATED {noBenFromBatConsumpOpt} OPTIONAL,
    csg-ProximityIndicationParameters-r9    CSG-ProximityIndicationParameters-r9,
    neighCellSI-AcquisitionParameters-r9    NeighCellSI-AcquisitionParameters-r9,
    son-Parameters-r9    SON-Parameters-r9,
    nonCriticalExtension    UE-EUTRA-Capability-v940-IEs  OPTIONAL
}

UE-EUTRA-Capability-v940-IEs ::= SEQUENCE {
    ...
}
```
AccessStratumRelease ::= ENUMERATED {
  rel8, rel9, spare6, spare5, spare4, spare3,
  spare2, spare1, ...}

PDCP-Parameters ::= SEQUENCE {
  supportedROHC-Profiles    SEQUENCE {
    profile0x0001      BOOLEAN,
    profile0x0002      BOOLEAN,
    profile0x0003      BOOLEAN,
    profile0x0004      BOOLEAN,
    profile0x0006      BOOLEAN,
    profile0x0101      BOOLEAN,
    profile0x0102      BOOLEAN,
    profile0x0103      BOOLEAN,
    profile0x0104      BOOLEAN
  },
  maxNumberROHC-ContextSessions  ENUMERATED {
    cs2, cs4, cs8, cs12, cs16, cs24, cs32,
    cs48, cs64, cs128, cs256, cs512, cs1024,
    cs16384, spare2, spare1}
}

PhyLayerParameters ::= SEQUENCE {
  ue-TxAntennaSelectionSupported  BOOLEAN,
  ue-SpecificRefSigsSupported  BOOLEAN
}

PhyLayerParameters-v920 ::= SEQUENCE {
  enhancedDualLayerFDD-r9   ENUMERATED {supported}   OPTIONAL,
  enhancedDualLayerTDD-r9   ENUMERATED {supported}   OPTIONAL
}

RF-Parameters ::=     SEQUENCE {
  supportedBandListEUTRA    SupportedBandListEUTRA
}

SupportedBandListEUTRA ::=   SEQUENCE (SIZE (1..maxBands)) OF SupportedBandEUTRA

SupportedBandEUTRA ::=    SEQUENCE {
  bandEUTRA       INTEGER (1..64),
  halfDuplex       BOOLEAN
}

MeasParameters ::=     SEQUENCE {
  bandListEUTRA      BandListEUTRA
}

BandListEUTRA ::=     SEQUENCE (SIZE (1..maxBands)) OF BandInfoEUTRA

BandInfoEUTRA ::=     SEQUENCE {
  interFreqBandList     InterFreqBandList,
  interRAT-BandList     InterRAT-BandList
}

InterFreqBandList ::=  SEQUENCE (SIZE (1..maxBands)) OF InterFreqBandInfo

InterFreqBandInfo ::=    SEQUENCE {
  interFreqNeedForGaps    BOOLEAN
}

InterRAT-BandList ::=  SEQUENCE (SIZE (1..maxBands)) OF InterRAT-BandInfo

InterRAT-BandInfo ::=    SEQUENCE {
  interRAT-NeedForGaps    BOOLEAN
}

IRAT-ParametersUTRA-FDD ::=  SEQUENCE {
  supportedBandListUTRA-FDD   SupportedBandListUTRA-FDD
}

IRAT-ParametersUTRA-v920 ::=  SEQUENCE {
  e-RedirectionUTRA-r9   ENUMERATED {supported}
IRAT-ParametersUTRA-TDD128 ::= SEQUENCE {
  supportedBandListUTRA-TDD128  SupportedBandListUTRA-TDD128
}

SupportedBandListUTRA-TDD128 ::= SEQUENCE (SIZE (1..maxBands)) OF SupportedBandUTRA-TDD128

IRAT-ParametersUTRA-TDD384 ::= SEQUENCE {
  supportedBandListUTRA-TDD384  SupportedBandListUTRA-TDD384
}

SupportedBandListUTRA-TDD384 ::= SEQUENCE (SIZE (1..maxBands)) OF SupportedBandUTRA-TDD384

IRAT-ParametersUTRA-TDD768 ::= SEQUENCE {
  supportedBandListUTRA-TDD768  SupportedBandListUTRA-TDD768
}

SupportedBandListUTRA-TDD768 ::= SEQUENCE (SIZE (1..maxBands)) OF SupportedBandUTRA-TDD768

IRAT-ParametersGERAN ::= SEQUENCE {
  supportedBandListGERAN    SupportedBandListGERAN,
  interRAT-PS-HO-ToGERAN    BOOLEAN
}

SupportedBandListGERAN ::= SEQUENCE (SIZE (1..maxBands)) OF SupportedBandGERAN

IRAT-ParametersCDMA2000-HRPD ::= SEQUENCE {
  supportedBandListHRPD    SupportedBandListHRPD,
  tx-ConfigHRPD      ENUMERATED {single, dual}.
  rx-ConfigHRPD      ENUMERATED {single, dual}
}

SupportedBandListHRPD ::= SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF BandclassCDMA2000

IRAT-ParametersCDMA2000-1XRTT ::= SEQUENCE {
  supportedBandList1XRTT    SupportedBandList1XRTT,
  tx-Config1XRTT      ENUMERATED {single, dual}.
  rx-Config1XRTT      ENUMERATED {single, dual}
}

SupportedBandList1XRTT ::= SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF BandclassCDMA2000

IRAT-ParametersCDMA2000-1XRTT-v920 ::= SEQUENCE {
  e-CSFB-1XRTT-r9      ENUMERATED {supported}.
  e-CSFB-ConcPS-Mob1XRTT-r9   ENUMERATED {supported}   OPTIONAL
}

SupportedBand1XRTT ::= SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF BandclassCDMA2000
SupportedBandList1XRTT ::= SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF BandclassCDMA2000

CSG-ProximityIndicationParameters-r9 ::= SEQUENCE {
  intraFreqProximityIndication-r9 ENUMERATED {supported} OPTIONAL,
  interFreqProximityIndication-r9 ENUMERATED {supported} OPTIONAL,
  utran-ProximityIndication-r9 ENUMERATED {supported} OPTIONAL
}

NeighCellSI-AcquisitionParameters-r9 ::= SEQUENCE {
  intraFreqSI-AcquisitionForHO-r9 ENUMERATED {supported} OPTIONAL,
  interFreqSI-AcquisitionForHO-r9 ENUMERATED {supported} OPTIONAL,
  utran-SI-AcquisitionForHO-r9 ENUMERATED {supported} OPTIONAL
}

SON-Parameters-r9 ::= SEQUENCE {
  rach-Report-r9 ENUMERATED {supported} OPTIONAL
}

-- ASN1STOP
### UE-EUTRA-Capability field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>accessStratumRelease</strong></td>
<td>Set to rel9 in this version of the specification.</td>
</tr>
<tr>
<td><strong>maxNumberROHC-ContextSessions</strong></td>
<td>Set to the maximum number of concurrently active ROHC contexts supported by the UE. cs2 corresponds with 2 (context sessions), cs4 corresponds with 4 and so on.</td>
</tr>
<tr>
<td><strong>ue-Category</strong></td>
<td>UE category as defined in TS 36.306 [5]. Set to values 1 to 5 in this version of the specification.</td>
</tr>
<tr>
<td><strong>bandEUTRA</strong></td>
<td>E-UTRA band as defined in TS 36.101 [42].</td>
</tr>
<tr>
<td><strong>ue-TxAntennaSelectionSupported</strong></td>
<td>TRUE indicates that the UE is capable of supporting UE transmit antenna selection as described in TS 36.213 [23, 8.7].</td>
</tr>
<tr>
<td><strong>halfDuplex</strong></td>
<td>If halfDuplex is set to true, only half duplex operation is supported for the band, otherwise full duplex operation is supported.</td>
</tr>
<tr>
<td><strong>bandListEUTRA</strong></td>
<td>One entry corresponding to each supported E-UTRA band listed in the same order as in supportedBandListEUTRA.</td>
</tr>
<tr>
<td><strong>interFreqBandList</strong></td>
<td>One entry corresponding to each supported E-UTRA band listed in the same order as in supportedBandListEUTRA.</td>
</tr>
<tr>
<td><strong>interFreqNeedForGaps</strong></td>
<td>Indicates need for measurement gaps when operating on the E-UTRA band given by the entry in bandListEUTRA and measuring on the E-UTRA band given by the entry in interFreqBandList.</td>
</tr>
<tr>
<td><strong>interRAT-BandList</strong></td>
<td>One entry corresponding to each supported band of another RAT listed in the same order as in the interRAT-Parameters.</td>
</tr>
<tr>
<td><strong>interRAT-NeedForGaps</strong></td>
<td>Indicates need for DL measurement gaps when operating on the E-UTRA band given by the entry in bandListEUTRA and measuring on the inter-RAT band given by the entry in the interRAT-BandList.</td>
</tr>
<tr>
<td><strong>SupportedBandUTRA-FDD</strong></td>
<td>UTRA band as defined in TS 25.101 [17].</td>
</tr>
<tr>
<td><strong>SupportedBandUTRA-TDD128</strong></td>
<td>UTRA band as defined in TS 25.102 [18].</td>
</tr>
<tr>
<td><strong>SupportedBandUTRA-TDD384</strong></td>
<td>UTRA band as defined in TS 25.102 [18].</td>
</tr>
<tr>
<td><strong>SupportedBandUTRA-TDD768</strong></td>
<td>UTRA band as defined in TS 25.102 [18].</td>
</tr>
<tr>
<td><strong>SupportedBandGERAN</strong></td>
<td>GERAN band as defined in TS 45.005 [20].</td>
</tr>
<tr>
<td><strong>dtm</strong></td>
<td>Indicates whether the UE supports DTM in GERAN.</td>
</tr>
<tr>
<td><strong>SupportedBandListHRPD</strong></td>
<td>One entry corresponding to each supported CDMA2000 HRPD band class.</td>
</tr>
<tr>
<td><strong>SupportedBandList1XRTT</strong></td>
<td>One entry corresponding to each supported CDMA2000 1xRTT band class.</td>
</tr>
<tr>
<td><strong>interRAT-PS-HO-ToGERAN</strong></td>
<td>Indicates whether the UE supports inter-RAT PS handover to GERAN or not.</td>
</tr>
<tr>
<td><strong>featureGroupIndicators</strong></td>
<td>The definitions of the bits in the bit string are described in Annex B.</td>
</tr>
<tr>
<td><strong>e-CSFB-1XRTT</strong></td>
<td>Indicates whether the UE supports enhanced CS fallback to CDMA2000 1xRTT or not.</td>
</tr>
<tr>
<td><strong>e-CSFB-ConcPS-Mob1XRTT</strong></td>
<td>Indicates whether the UE supports concurrent enhanced CS fallback to CDMA2000 1xRTT and PS handover/redirection to CDMA2000 HRPD.</td>
</tr>
<tr>
<td><strong>enhancedDualLayerTDD-Supported</strong></td>
<td>Indicates whether the UE supports enhanced dual layer (PDSCH transmission mode 8) for TDD or not. This bit shall be set to “TRUE” by a Rel-9 TDD UE when the functionality has been IOT tested.</td>
</tr>
<tr>
<td><strong>deviceType</strong></td>
<td>UE may set the value to &quot;noBenFromBatConsumpOpt&quot; when it does not foresee to particularly benefit from NW-based battery consumption optimisation. Absence of this value means that the device does benefit from NW-based battery consumption optimisation.</td>
</tr>
</tbody>
</table>

NOTE: The IE **UE-EUTRA-Capability** does not include AS security capability information, since these are the same as the security capabilities that are signalled by NAS. Consequently AS need not provide "man-in-the-middle" protection for the security capabilities.
– **UE-TimersAndConstants**

The IE **UE-TimersAndConstants** contains timers and constants used by the UE in either RRC_CONNECTED or RRC_IDLE.

**UE-TimersAndConstants information element**

```asn1
UE-TimersAndConstants ::= SEQUENCE {
  t300        ENUMERATED {
    ms100, ms200, ms300, ms400, ms600, ms1000, ms1500, ms2000},
  t301        ENUMERATED {
    ms100, ms200, ms300, ms400, ms600, ms1000, ms1500, ms2000},
  t310        ENUMERATED {
    ms0, ms50, ms100, ms200, ms500, ms1000, ms2000},
  n310        ENUMERATED {
    n1, n2, n3, n4, n6, n8, n10, n20},
  t311        ENUMERATED {
    ms1000, ms3000, ms5000, ms10000, ms15000, ms20000, ms30000},
  n311        ENUMERATED {
    n1, n2, n3, n4, n5, n6, n8, n10},
  ...
}
```

**UE-TimersAndConstants field descriptions**

<table>
<thead>
<tr>
<th>t3xy</th>
<th>Timers are described in section 7.3. Value ms0 corresponds with 0 ms, ms50 corresponds with 50 ms and so on.</th>
</tr>
</thead>
<tbody>
<tr>
<td>n3xy</td>
<td>Constants are described in section 7.4. n1 corresponds with 1, n2 corresponds with 2 and so on.</td>
</tr>
</tbody>
</table>

6.3.7 **MBMS information elements**

– **MBMS-NotificationConfig**

The IE **MBMS-NotificationConfig** specifies the MBMS notification related configuration parameters, that are applicable for all MBSFN areas.

**MBMS-NotificationConfig information element**

```asn1
MBMS-NotificationConfig-r9 ::= SEQUENCE {
  notificationRepetitionCoeff-r9  ENUMERATED {n2, n4},
  notificationOffset-r9    INTEGER (0..10),
  notificationSF-Index-r9    INTEGER (1..6)
}
```

---
**MBMS-NotificationConfig field descriptions**

**notificationRepetitionCoeff**
Actual change notification repetition period common for all MCCHs that are configured= shortest modification period/ notificationRepetitionCoeff. The ‘shortest modification period’ corresponds with the lowest value of mcch-ModificationPeriod of all MCCHs that are configured. Value n2 corresponds to coefficient 2, and so on.

**notificationOffset**
Indicates, together with the notificationRepetitionCoeff, the radio frames in which the MCCH information change notification is scheduled i.e. the MCCH information change notification is scheduled in radio frames for which: SFN mod notification repetition period = notificationOffset

**notificationSF-Index**
Indicates the subframe used to transmit MCCH change notifications on PDCCH.
FDD: Value 1, 2, 3, 4, 5 and 6 correspond with subframe #1, #2, #3 #6, #7, and #8 respectively.
TDD: Value 1, 2, 3, 4, and 5 correspond with subframe #3, #4, #7, #8, and #9 respectively.

---

**MBSFN-AreaInfoList**

The IE MBSFN-AreaInfoList contains the information required to acquire the MBMS control information associated with one or more MBSFN areas.

**MBSFN-AreaInfoList information element**

```plaintext
-- ASN1START
MBSFN-AreaInfoList-r9 ::=   SEQUENCE (SIZE(1..maxMBSFN-Area)) OF MBSFN-AreaInfo-r9
MBSFN-AreaInfo-r9 ::=    SEQUENCE {
  mbsfn-AreaId-r9      INTEGER (0..255),
  non-MBSFNregionLength    ENUMERATED {s1, s2},
  notificationIndicator-r9    INTEGER (0..7),
  mcch-Config-r9      SEQUENCE {
    mcch-RepetitionPeriod-r9   ENUMERATED {rf32, rf64, rf128, rf256},
    mcch-Offset-r9      INTEGER (0..10),
    mcch-ModificationPeriod-r9   ENUMERATED {rf512, rf1024},
    sf-AllocInfo-r9      BIT STRING (SIZE(6)),
    signallingMCS-r9     ENUMERATED {n2, n7, n13, n19}
  },
  ...}
-- ASN1STOP
```
<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mbsfn-AreaId</td>
<td>Indicates the MBSFN area ID, parameter ( N_0^{\text{MBSFN}} ) in TS 36.211 [21, 6.10.2.1].</td>
</tr>
<tr>
<td>signallingMCS</td>
<td>Indicates the Modulation and Coding Scheme (MCS) applicable for the subframes indicated by the field ( sf-\text{AllocInfo} ) and for the first subframe of each MCH scheduling period (which may contain the MCH scheduling information provided by MAC). Value ( n2 ) corresponds with the value 2 for parameter ( I_{\text{MCS}} ) in TS 36.213 [23, Table 7.1.7.1-1], and so on.</td>
</tr>
<tr>
<td>non-MBSFNregionLength</td>
<td>Indicates how many symbols from the beginning of the subframe constitute the non-MBSFN region. This value applies in all subframes of the MBSFN area used for PMCH transmissions as indicated in the MSI. The values ( s1 ) and ( s2 ) correspond with 1 and 2 symbols, respectively: see TS 36.211 [21, Table 6.7-1].</td>
</tr>
<tr>
<td>notificationIndicator</td>
<td>Indicates which PDCCH bit is used to notify the UE about change of the MCCH applicable for this MBSFN area. Value 0 corresponds with the least significant bit as defined in TS 36.212 [22, Section 5.3.3.1] and so on.</td>
</tr>
<tr>
<td>mcch-RepetitionPeriod</td>
<td>Defines the interval between transmissions of MCCH information, in radio frames, Value ( rf32 ) corresponds to 32 radio frames, ( rf64 ) corresponds to 64 radio frames and so on.</td>
</tr>
<tr>
<td>mcch-Offset</td>
<td>Indicates, together with the ( mcch-\text{RepetitionPeriod} ), the radio frames in which MCCH is scheduled i.e. MCCH is scheduled in radio frames for which: SFN mod ( mcch-\text{RepetitionPeriod} ) = ( mcch-\text{Offset} ).</td>
</tr>
<tr>
<td>mcch-ModificationPeriod</td>
<td>Defines periodically appearing boundaries, i.e. radio frames for which SFN mod ( mcch-\text{ModificationPeriod} ) = 0. The contents of different transmissions of MCCH information can only be different if there is at least one such boundary in-between them.</td>
</tr>
<tr>
<td>sf-AllocInfo</td>
<td>Indicates the subframes of the radio frames indicated by the ( mcch-\text{RepetitionPeriod} ) and the ( mcch-\text{Offset} ), that may carry MCCH. Value “1” indicates that the corresponding subframe is allocated. The following mapping applies: FDD: The first/ leftmost bit defines the allocation for subframe #1 of the radio frame indicated by ( mcch-\text{RepetitionPeriod} ) and ( mcch-\text{Offset} ), the second bit for #2, the third bit for #3, the fourth bit for #6, the fifth bit for #7 and the sixth bit for #8. TDD: The first/leftmost bit defines the allocation for subframe #3 of the radio frame indicated by ( mcch-\text{RepetitionPeriod} ) and ( mcch-\text{Offset} ), the second bit for #4, third bit for #7, fourth bit for #8, fifth bit for #9. Uplink subframes are not allocated. The last bit is not used.</td>
</tr>
</tbody>
</table>

### MBSFN-SubframeConfig

The IE \( MBSFN-\text{SubframeConfig} \) defines subframes that are reserved for MBSFN in downlink.

### MBSFN-SubframeConfig information element

```asn1
MBSFN-SubframeConfig ::= SEQUENCE {
  radioframeAllocationPeriod ENUMERATED {n1, n2, n4, n8, n16, n32},
  radioframeAllocationOffset INTEGER {0..7},
  subframeAllocation CHOICE {
    oneFrame BIT STRING {SIZE(6)},
    fourFrames BIT STRING {SIZE(24)}
  }
}
```

---
MBSFN-SubframeConfig field descriptions

radioFrameAllocationPeriod, radioFrameAllocationOffset
Radio-frames that contain MBSFN subframes occur when equation $\text{SFN} \mod \text{radioFrameAllocationPeriod} = \text{radioFrameAllocationOffset}$ is satisfied. Value $n_1$ for radioFrameAllocationPeriod denotes value 1, $n_2$ denotes value 2, and so on. When fourFrames is used for subframeAllocation, the equation defines the first radio frame referred to in the description below. Values $n_1$ and $n_2$ are not applicable when fourFrames is used.

subframeAllocation
Defines the subframes that are allocated for MBSFN within the radio frame allocation period defined by the radioFrameAllocationPeriod and the radioFrameAllocationOffset.

oneFrame
“1” denotes that the corresponding subframe is allocated for MBSFN. The following mapping applies:
FDD: The first/leftmost bit defines the MBSFN allocation for subframe #1, the second bit for #2, third bit for #3, fourth bit for #6, fifth bit for #7, sixth bit for #8.
TDD: The first/leftmost bit defines the allocation for subframe #3, the second bit for #4, third bit for #7, fourth bit for #8, fifth bit for #9. Uplink subframes are not allocated. The last bit is not used.

fourFrames
A bit-map indicating MBSFN subframe allocation in four consecutive radio frames, “1” denotes that the corresponding subframe is allocated for MBSFN. The bitmap is interpreted as follows:
FDD: Starting from the first radioframe and from the first/leftmost bit in the bitmap, the allocation applies to subframes #1, #2, #3, #6, #7, and #8 in the sequence of the four radio-frames.
TDD: Starting from the first radioframe and from the first/leftmost bit in the bitmap, the allocation applies to subframes #3, #4, #7, #8, and #9 in the sequence of the four radio-frames. The last four bits are not used. Uplink subframes are not allocated.

-- PMCH-InfoList

The IE PMCH-InfoList specifies configuration of all PMCHs of an MBSFN area. The information provided for an individual PMCH includes the configuration parameters of the sessions that are carried by the concerned PMCH.

PMCH-InfoList information element

-- ASN1START
PMCH-InfoList-r9 ::= SEQUENCE (SIZE (0..maxPMCH-PerMBSFN)) OF PMCH-Info-r9
PMCH-Info-r9 ::= SEQUENCE {
  pmch-Config-r9        PMCH-Config-r9,
  mbms-SessionInfoList-r9   MBMS-SessionInfoList-r9,
  ...
}
MBMS-SessionInfoList-r9 ::= SEQUENCE (SIZE (0..maxSessionPerPMCH)) OF MBMS-SessionInfo-r9
MBMS-SessionInfo-r9 ::= SEQUENCE {
  tmgi-r9        TMGI-r9,
  sessionId-r9      OCTET STRING (SIZE (1))   OPTIONAL,  -- Need OR
  logicalChannelIdentity-r9   INTEGER (0..maxSessionPerPMCH-1),
  ...
}
PMCH-Config-r9 ::= SEQUENCE {
  sf-AllocEnd-r9       INTEGER (0..1535),
  dataMCS-r9        INTEGER (0..28),
  mch-SchedulingPeriod-r9   ENUMERATED {
    rf8, rf16, rf32, rf64, rf128, rf256, rf512, rf1024,
  }
  ...
}
TMGI-r9 ::= SEQUENCE {
  plmn-Id-r9        CHOICE {
    plmn-Index-r9   INTEGER (1..6),
    explicitValue-r9     PLMN-Identity
  },
  sessionId-r9      OCTET STRING (SIZE (3))
}
-- ASN1STOP
**PMCH-InfoList field descriptions**

**sessionId**
Indicates the optional MBMS Session Identity, which together with TMGI identifies a transmission or a possible retransmission of a specific MBMS session: see TS 29.061 [51, Sections 20.5, 17.7.11, 17.7.15]. The field is included whenever upper layers have assigned a session identity i.e. one is available for the MBMS session in E-UTRAN.

**sf-AllocEnd**
Indicates the last subframe allocated to this (P)MCH within a period identified by field commonSF-AllocPeriod. The subframes allocated to (P)MCH corresponding with the n<sup>th</sup> entry in pmch-InfoList are the subsequent subframes starting from either the subframe identified by sf-AllocEnd of the (n-1)<sup>th</sup> listed (P)MCH or, for n=1, the first subframe, through the subframe identified by sf-AllocEnd of the n<sup>th</sup> listed (P)MCH. Value 0 corresponds with the first subframe defined by field commonSF-Alloc.

**mch-SchedulingPeriod**
Indicates the MCH scheduling period i.e. the periodicity used for providing MCH scheduling information at lower layers (MAC) applicable for an MCH. Value rf8 corresponds to 8 radio frames, rf16 corresponds to 16 radio frames and so on.

**dataMCS**
Indicates the value for parameter <sup>1</sup>MCS in TS 36.213 [23, Table 7.1.7.1-1], which defines the Modulation and Coding Scheme (MCS) applicable for the subframes of this (P)MCH as indicated by the field commonSF-Alloc. The MCS does however neither apply to the subframes that may carry MCCH i.e. the subframes indicated by the field sf-AllocInfo within SystemInformationBlockType13 nor for the first subframe of each MCH scheduling period (which may contain the MCH scheduling information provided by MAC).

**plmn-Index**
Index of the entry in field plmn-IdentityList within SystemInformationBlockType1.

**sessionId**
Identifies the identity of a session of an MBMS service.

**serviceId**
Uniquely identifies the identity of an MBMS service within a PLMN. The field contains octet 3-5 of the IE Temporary Mobile Group Identity (TMGI) as defined in TS 24.008 [49]. The first octet contains the third octet of the TMGI, the second octet contains the fourth octet of the TMGI and so on.

## 6.4 RRC multiplicity and type constraint values

### Multiplicity and type constraint definitions

```
-- ASN1START

maxBands INTEGER ::= 64 -- Maximum number of bands listed in EUTRA UE caps
maxCDMA-BandClass INTEGER ::= 32 -- Maximum value of the CDMA band classes
maxCellBlack INTEGER ::= 16 -- Maximum number of blacklisted cells
-- listed in SIB type 4 and 5
maxCellInfoGERAN-r9 INTEGER ::= 32 -- Maximum number of GERAN cells for which system in-
-- formation can be provided as redirection assistance
maxCellInfoUTRA-r9 INTEGER ::= 16 -- Maximum number of UTRA cells for which system
-- information can be provided as redirection assistance
maxCellInter INTEGER ::= 16 -- Maximum number of neighbouring inter-frequency
-- cells listed in SIB type 5
maxCellIntra INTEGER ::= 16 -- Maximum number of neighbouring intra-frequency
-- cells listed in SIB type 4
maxCellMeas INTEGER ::= 32 -- Maximum number of entries in each of the
-- cell lists in a measurement object
maxCellReport INTEGER ::= 8 -- Maximum number of reported cells
maxDRB INTEGER ::= 11 -- Maximum number of Data Radio Bearers
maxEARFCN INTEGER ::= 65535 -- Maximum value of EUTRA carrier frequency
maxFreq INTEGER ::= 8 -- Maximum number of EUTRA carrier frequencies
maxGERAN-SI INTEGER ::= 10 -- Maximum number of GERAN SI blocks that can be
-- provided as part of NACC information
maxGNFG INTEGER ::= 16 -- Maximum number of GERAN neighbour freq groups
maxMBSPN-Allocations INTEGER ::= 8 -- Maximum number of MBSPN frame allocations with
-- different offset
maxMBSPN-Area INTEGER ::= 8
maxMeasId INTEGER ::= 32
maxObjectId INTEGER ::= 32
maxPageRec INTEGER ::= 16
maxPhysCellId-r9 INTEGER ::= 4 -- Maximum number of physical cell identity ranges
maxPNOffset INTEGER ::= 511 -- Maximum number of CDMA2000 PN offsets
-- ASN1END
```
maxPMCH-PerMBSFN  INTEGER ::=  15
maxRAT-Capabilities INTEGER ::=  8   -- Maximum number of interworking RATs (incl EUTRA)
maxReportConfigId   INTEGER ::=  32
maxSessionPerPMCH   INTEGER ::=  29
maxSessionPerPMCH-1 INTEGER ::=  28
maxSIB              INTEGER ::=  32   -- Maximum number of SIBs
maxSIB-1            INTEGER ::=  31
maxSIB-Messages     INTEGER ::=  32   -- Maximum number of SI messages
maxUTRA-FDD-Carrier INTEGER ::=  16   -- Maximum number of UTRA FDD carrier frequencies
maxUTRA-TDD-Carrier INTEGER ::=  16   -- Maximum number of UTRA TDD carrier frequencies

NOTE: The value of maxDRB align with SA2.

-- End of EUTRA-RRC-Definitions

7 Variables and constants

7.1 UE variables

NOTE: To facilitate the specification of the UE behavioural requirements, UE variables are represented using
ASN.1. Unless explicitly specified otherwise, it is however up to UE implementation how to store the
variables. The optionality of the IEs in ASN.1 is used only to indicate that the values may not always be
available.

-- EUTRA-UE-Variables

This ASN.1 segment is the start of the E-UTRA UE variable definitions.

-- EUTRA-UE-Variables DEFINITIONS AUTOMATIC TAGS ::==
BEGIN

IMPORTS
  CarrierFreqGERAN,
  CellIdentity,
  SpeedStateScaleFactors,
  C-RNTI,
  MeasId,
  MeasIdToAddModList,
  MeasObjectToAddModList,
  MobilityStateParameters,
  NeighCellConfig,
  PhysCellId,
  PhysCellIdCDMA2000,
  PhysCellIdUTRA-FDD,
  PhysCellIdUTRA-TDD,
  QuantityConfig,
  ReportConfigToAddModList,
  RSRP-Range,
  maxCellMeas,
  maxMeasId
FROM EUTRA-RRC-Definitions;

-- ASNISTOP
-- VarMeasConfig

The UE variable VarMeasConfig includes the accumulated configuration of the measurements to be performed by the UE, covering intra-frequency, inter-frequency and inter-RAT mobility related measurements.

VarMeasConfig UE variable

-- ASN1START

VarMeasConfig ::= SEQUENCE {
  -- Measurement identities
  measIdList       MeasIdToAddModList     OPTIONAL,
  -- Measurement objects
 _measObjectList   MeasObjectToAddModList   OPTIONAL,
  -- Reporting configurations
  reportConfigList  ReportConfigToAddModList   OPTIONAL,
  -- Other parameters
  quantityConfig    QuantityConfig      OPTIONAL,
  s-Measure        RSRP-Range       OPTIONAL,
  speedStatePars   SPEEDSTATEPars     OPTIONAL
    release        NULL,
    setup          MobilityStateParameters, SpeedStateScaleFactors

}  OPTIONAL

-- ASN1STOP

-- VarMeasReportList

The UE variable VarMeasReportList includes information about the measurements for which the triggering conditions have been met.

VarMeasReportList UE variable

-- ASN1START

VarMeasReportList ::= SEQUENCE (SIZE (1..maxMeasId)) OF VarMeasReport

VarMeasReport ::= SEQUENCE {
  -- List of measurement that have been triggered
  measId        MeasId,
  cellsTriggeredList     CellsTriggeredList    OPTIONAL,
  numberOfReportsSent     INTEGER
}

CellsTriggeredList ::= SEQUENCE (SIZE (1..maxCellMeas)) OF CHOICE {
  physCellIdEUTRA       PhysCellId,
  physCellIdUTRA       CHOICE {
    fdd          PhysCellIdUTRA-FDD,
    tdd          PhysCellIdUTRA-TDD
  },
  physCellIdGERAN       SEQUENCE {
    carrierFreq        CarrierFreqGERAN,
    physCellId        PhysCellIdGERAN
  },
  physCellIdCDMA2000    PhysCellIdCDMA2000
}

-- ASN1STOP

-- VarShortMAC-Input

The UE variable VarShortMAC-Input specifies the input used to generate the shortMAC-I.

VarShortMAC-Input UE variable

-- ASN1START
### VarShortMAC-Input field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cellIdentity</td>
<td>Set to CellIdentity of the current cell.</td>
</tr>
<tr>
<td>physCellId</td>
<td>Set to the physical cell identity of the cell the UE was connected to prior to the failure.</td>
</tr>
<tr>
<td>c-RNTI</td>
<td>Set to C-RNTI that the UE had in the cell it was connected to prior to the failure.</td>
</tr>
</tbody>
</table>

## Multiplicity and type constraint definitions

This section includes multiplicity and type constraints applicable (only) for UE variables.

### End of EUTRA-UE-Variables

### 7.2 Counters

<table>
<thead>
<tr>
<th>Counter</th>
<th>Reset</th>
<th>Incremented</th>
<th>When reaching max value</th>
</tr>
</thead>
</table>
### 7.3 Timers (Informative)

<table>
<thead>
<tr>
<th>Timer</th>
<th>Start</th>
<th>Stop</th>
<th>At expiry</th>
</tr>
</thead>
<tbody>
<tr>
<td>T300</td>
<td>Transmission of RRCConnectionRequest</td>
<td>Reception of RRCConnectionSetup or RRCConnectionReject message, cell re-selection and upon abortion of connection establishment by upper layers</td>
<td>Perform the actions as specified in 5.3.3.6</td>
</tr>
<tr>
<td>T301</td>
<td>Transmission of RRCConnectionReestablishmentRequest</td>
<td>Reception of RRCConnectionReestablishmentReject message as well as when the selected cell becomes unsuitable</td>
<td>Go to RRC_IDLE</td>
</tr>
<tr>
<td>T302</td>
<td>Reception of RRCConnectionReject while performing RRC connection establishment</td>
<td>Upon entering RRC_CONNECTED and upon cell re-selection</td>
<td>Inform upper layers about barring alleviation as specified in 5.3.3.7</td>
</tr>
<tr>
<td>T303</td>
<td>Access barred while performing RRC connection establishment for mobile originating calls</td>
<td>Upon entering RRC_CONNECTED and upon cell re-selection</td>
<td>Inform upper layers about barring alleviation as specified in 5.3.3.7</td>
</tr>
<tr>
<td>T304</td>
<td>Reception of RRCConnectionReconfiguration message including the MobilityControlInfo or reception of MobilityFromEUTRACommand message including CellChangeOrder</td>
<td>Criterion for successful completion of handover to EUTRA or cell change order is met (the criterion is specified in the target RAT in case of inter-RAT)</td>
<td>In case of cell change order from E-UTRA or intra E-UTRA handover, initiate the RRC connection re-establishment procedure; In case of handover to E-UTRA, perform the actions defined in the specifications applicable for the source RAT.</td>
</tr>
<tr>
<td>T305</td>
<td>Access barred while performing RRC connection establishment for mobile originating signalling</td>
<td>Upon entering RRC_CONNECTED and upon cell re-selection</td>
<td>Inform upper layers about barring alleviation as specified in 5.3.3.7</td>
</tr>
<tr>
<td>T310</td>
<td>Upon detecting physical layer problems i.e. upon receiving N310 consecutive out-of-sync indications from lower layers</td>
<td>Upon receiving N311 consecutive in-sync indications from lower layers, upon triggering the handover procedure and upon initiating the connection re-establishment procedure</td>
<td>If security is not activated: go to RRC_IDLE else: initiate the connection re-establishment procedure</td>
</tr>
<tr>
<td>T311</td>
<td>Upon initiating the RRC connection re-establishment procedure</td>
<td>Selection of a suitable E-UTRA cell or a cell using another RAT.</td>
<td>Enter RRC_IDLE</td>
</tr>
<tr>
<td>T320</td>
<td>Upon receiving t320 or upon cell (re)selection to E-UTRA from another RAT with validity time configured for dedicated priorities (in which case the remaining validity time is applied).</td>
<td>Upon entering RRC_CONNECTED, when PLMN selection is performed on request by NAS, or upon cell (re)selection to another RAT (in which case the timer is carried on to the other RAT).</td>
<td>Discard the cell reselection priority information provided by dedicated signalling.</td>
</tr>
<tr>
<td>T321</td>
<td>Upon receiving measConfig including a reportConfig with the purpose set to reportCGI</td>
<td>Upon acquiring the information needed to set all fields of cellGlobalId for the requested cell, upon receiving measConfig that includes removal of the reportConfig with the purpose set to reportCGI</td>
<td>Initiate the measurement reporting procedure, stop performing the related measurements and remove the corresponding measId</td>
</tr>
</tbody>
</table>
7.4 Constants

<table>
<thead>
<tr>
<th>Constant</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>N310</td>
<td>Maximum number of consecutive &quot;out-of-sync&quot; indications received from lower layers</td>
</tr>
<tr>
<td>N311</td>
<td>Maximum number of consecutive &quot;in-sync&quot; indications received from lower layers</td>
</tr>
</tbody>
</table>

8 Protocol data unit abstract syntax

8.1 General

The RRC PDU contents in clause 6 and clause 10 are described using abstract syntax notation one (ASN.1) as specified in ITU-T Rec. X.680 [13] and X.681 [14]. Transfer syntax for RRC PDUs is derived from their ASN.1 definitions by use of Packed Encoding Rules, unaligned as specified in ITU-T Rec. X.691 [15].

The following encoding rules apply in addition to what has been specified in X.691:

- When a bit string value is placed in a bit-field as specified in 15.6 to 15.11 in X.691, the leading bit of the bit string value shall be placed in the leading bit of the bit-field, and the trailing bit of the bit string value shall be placed in the trailing bit of the bit-field.

NOTE: The terms 'leading bit' and 'trailing bit' are defined in ITU-T Rec. X.680. When using the 'bstring' notation, the leading bit of the bit string value is on the left, and the trailing bit of the bit string value is on the right.

- When decoding types constrained with the ASN.1 Contents Constraint ("CONTAINING"), automatic decoding of the contained type should not be performed because errors in the decoding of the contained type should not cause the decoding of the entire RRC message PDU to fail. It is recommended that the decoder first decodes the outer PDU type that contains the OCTET STRING or BIT STRING with the Contents Constraint, and then decodes the contained type that is nested within the OCTET STRING or BIT STRING as a separate step.

- When decoding a) RRC message PDUs, b) BIT STRING constrained with a Contents Constraint, or c) OCTET STRING constrained with a Contents Constraint, PER decoders are required to never report an error if there are extraneous zero or non-zero bits at the end of the encoded RRC message PDU, BIT STRING or OCTET STRING.

8.2 Structure of encoded RRC messages

An RRC PDU, which is the bit string that is exchanged between peer entities/ across the radio interface contains the basic production as defined in X.691.

RRC PDUs shall be mapped to and from PDCP SDUs (in case of DCCH) or RLC SDUs (in case of PCCH, BCCH, CCCH or MCCH) upon transmission and reception as follows:

- when delivering an RRC PDU as an PDCP SDU to the PDCP layer for transmission, the first bit of the RRC PDU shall be represented as the first bit in the PDCP SDU and onwards; and

- when delivering an RRC PDU as an RLC SDU to the RLC layer for transmission, the first bit of the RRC PDU shall be represented as the first bit in the RLC SDU and onwards; and

- upon reception of an PDCP SDU from the PDCP layer, the first bit of the PDCP SDU shall represent the first bit of the RRC PDU and onwards; and

- upon reception of an RLC SDU from the RLC layer, the first bit of the RLC SDU shall represent the first bit of the RRC PDU and onwards.
8.3 Basic production

The 'basic production' is obtained by applying UNALIGNED PER to the abstract syntax value (the ASN.1 description) as specified in X.691. It always contains a multiple of 8 bits.

8.4 Extension

The following rules apply with respect to the use of protocol extensions:

- A transmitter compliant with this version of the specification shall, unless explicitly indicated otherwise on a PDU type basis, set the extension part empty. Transmitters compliant with a later version may send non-empty extensions;
- A transmitter compliant with this version of the specification shall set spare bits to zero;

8.5 Padding

If the encoded RRC message does not fill a transport block, the RRC layer shall add padding bits. This applies to PCCH and BCCH.

Padding bits shall be set to 0 and the number of padding bits is a multiple of 8.

9 Specified and default radio configurations

Specified and default configurations are configurations of which the details are specified in the standard. Specified configurations are fixed while default configurations can be modified using dedicated signalling.
9.1 Specified configurations

9.1.1 Logical channel configurations

9.1.1.1 BCCH configuration

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDCP configuration</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RLC configuration</td>
<td>TM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAC configuration</td>
<td>TM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: RRC will perform padding, if required due to the granularity of the TF signalling, as defined in 8.5.

9.1.1.2 CCCH configuration

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDCP configuration</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RLC configuration</td>
<td>TM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAC configuration</td>
<td>Normal MAC headers are used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logical channel configuration</td>
<td>priority</td>
<td>1</td>
<td>Highest priority</td>
</tr>
<tr>
<td></td>
<td>prioritisedBitRate</td>
<td>infinity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bucketSizeDuration</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>logicalChannelGroup</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>logicalChannelSR-Mask-r9</td>
<td>release</td>
<td>v920</td>
</tr>
</tbody>
</table>

9.1.1.3 PCCH configuration

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDCP configuration</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RLC configuration</td>
<td>TM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAC configuration</td>
<td>TM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: RRC will perform padding, if required due to the granularity of the TF signalling, as defined in 8.5.

9.1.1.4 MCCH and MTCH configuration

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDCP configuration</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RLC configuration</td>
<td>UM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sn-FieldLength</td>
<td>size5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>t-Reordering</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9.1.2 SRB configurations

9.1.2.1 SRB1

Parameters
9.1.2.2 SRB2

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLC configuration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>logicalChannelIdentity</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9.2 Default radio configurations

NOTE: Value "N/A" indicates that the UE does not apply a specific value (i.e. upon switching to a default configuration, E-UTRAN can not assume the UE keeps the previously configured value). This implies that E-UTRAN needs to configure a value before invoking the related functionality.

9.2.1 SRB configurations

9.2.1.1 SRB1

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLC configuration</td>
<td>am</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ul-RLC-Config</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;t-PollRetransmit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;pollPDU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;pollByte</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;maxRetxThreshold</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dl-RLC-Config</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;t-Reordering</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;t-StatusProhibit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>priority</td>
<td>1</td>
<td>Highest priority</td>
<td></td>
</tr>
<tr>
<td>prioritisedBitRate</td>
<td>infinity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bucketSizeDuration</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>logicalChannelGroup</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>logicalChannelSR-Mask-r9</td>
<td>release</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9.2.1.2 SRB2

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLC configuration</td>
<td>am</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ul-RLC-Config</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;t-PollRetransmit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;pollPDU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;pollByte</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;maxRetxThreshold</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dl-RLC-Config</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;t-Reordering</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;t-StatusProhibit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>priority</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>prioritisedBitRate</td>
<td>infinity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bucketSizeDuration</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 9.2.2 Default MAC main configuration

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>logicalChannelGroup</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>logicalChannelSR-Mask-r9</td>
<td>release</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 9.2.3 Default semi-persistent scheduling configuration

<table>
<thead>
<tr>
<th>SPS-Config</th>
<th>release</th>
<th>release</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;sps-ConfigDL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;sps-ConfigUL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 9.2.4 Default physical channel configuration

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDSCH-ConfigDedicated</td>
<td>p-a</td>
<td>dB0</td>
<td></td>
</tr>
<tr>
<td>&gt;tdd-AckNackFeedbackMode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;ackNackRepetition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PUCCH-ConfigDedicated</td>
<td>bundling release</td>
<td>Only valid for TDD mode</td>
<td></td>
</tr>
<tr>
<td>&gt;betaOffset-ACK-Index</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;betaOffset-RI-Index</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;betaOffset-CQI-Index</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UplinkPowerControlDedicated</td>
<td>p0-UE-PUSCH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;p1-MCS-Enabled</td>
<td>0</td>
<td>en0 (disabled)</td>
<td>TRUE</td>
</tr>
<tr>
<td>&gt;p0-UE-PUSCH</td>
<td>0</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>&gt;pSRS-Offset</td>
<td></td>
<td>fC4</td>
<td></td>
</tr>
<tr>
<td>&gt;filterCoefficient</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tpc-pdcch-ConfigPUCCH</td>
<td>release</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tpc-pdcch-ConfigPUSCH</td>
<td>release</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CQI-ReportConfig</td>
<td></td>
<td>CQI-ReportPeriodic</td>
<td></td>
</tr>
<tr>
<td>&gt;CQI-ReportPeriodic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CQI-ReportConfig-v920</td>
<td></td>
<td>release N/A v920</td>
<td></td>
</tr>
<tr>
<td>&gt;cqi-Mask-r9</td>
<td>release</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;pmi-RI-Report-r9</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SoundingRS-UL-ConfigDedicated</td>
<td>release</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AntennaInfoDedicated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;transmissionMode</td>
<td>tm1, tm2</td>
<td>If the number of PBCH antenna ports is one, tm1 is used as default; otherwise tm2 is used as default</td>
<td></td>
</tr>
<tr>
<td>&gt;codebookSubsetRestriction</td>
<td>N/A</td>
<td>release N/A v920</td>
<td></td>
</tr>
<tr>
<td>&gt;ue-TransmitAntennaSelection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>antennaInfoDedicated-v920</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
9.2.5 Default values timers and constants

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>t310</td>
<td>ms1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n310</td>
<td>n1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>t311</td>
<td>ms1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n311</td>
<td>n1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10 Radio information related interactions between network nodes

10.1 General

This section specifies RRC messages that are transferred between network nodes. These RRC messages may be transferred to or from the UE via another Radio Access Technology. Consequently, these messages have similar characteristics as the RRC messages that are transferred across the E-UTRA radio interface, i.e. the same transfer syntax and protocol extension mechanisms apply.

10.2 Inter-node RRC messages

10.2.1 General

This section specifies RRC messages that are sent either across the X2- or the S1-interface, either to or from the eNB, i.e. a single 'logical channel' is used for all RRC messages transferred across network nodes. The information could originate from or be destined for another RAT.

---

**EUTRA-InterNodeDefinitions**

This ASN.1 segment is the start of the E-UTRA inter-node PDU definitions.

```asn1
-- ASN1START
EUTRA-InterNodeDefinitions DEFINITIONS AUTOMATIC TAGS ::= BEGIN
IMPORTS
  AntennaInfoCommon,
  CellIdentity,
  C-RNTI,
  DL-DCCCH-Message,
  ARFCN-ValueEUTRA,
  MasterInformationBlock,
  MeasConfig,
  OtherConfig-r9,
  PhysCellId,
  RadioResourceConfigDedicated,
  SecurityAlgorithmConfig,
  ShortMAC-I,
  SystemInformationBlockType1,
  SystemInformationBlockType1-v890-IES,
  SystemInformationBlockType2,
  UECapabilityInformation,
```
10.2.2  Message definitions

—  **HandoverCommand**

This message is used to transfer the handover command generated by the target eNB, which is transparently transferred by the source RAN to the UE.

  Direction: target eNB to source eNB/ source RAN

**HandoverCommand message**

```asn1
HandoverCommand ::=   SEQUENCE {
  criticalExtensions     CHOICE {
    c1         CHOICE{
      handoverCommand-r8     HandoverCommand-r8-IEs,
      spare7 NULL,
      spare6 NULL, spare5 NULL, spare4 NULL,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}
  }
}

HandoverCommand-r8-IEs ::=   SEQUENCE {
  handoverCommandMessage    OCTET STRING (CONTAINING DL-DCCH-Message),
  nonCriticalExtension    SEQUENCE {}       OPTIONAL
}
```

**HandoverCommand field descriptions**

`handoverCommandMessage`
Contains the entire DL-DCCH-Message including the `RRConnectionReconfiguration` message used to perform handover to E-UTRAN, generated (entirely) by the target eNB.

—  **HandoverPreparationInformation**

This message is used to transfer the E-UTRA RRC information used by the target eNB during handover preparation, including UE capability information.

  Direction: source eNB/ source RAN to target eNB

**HandoverPreparationInformation message**

```asn1
HandoverPreparationInformation ::= SEQUENCE {
  criticalExtensions     CHOICE {
    c1         CHOICE{
      handoverPreparationInformation-r8 HandoverPreparationInformation-r8-IEs,
      spare7 NULL,
      spare6 NULL, spare5 NULL, spare4 NULL,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}
  }
}

HandoverPreparationInformation-r8-IEs ::= SEQUENCE {
```
### HandoverPreparationInformation field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ue-RadioAccessCapabilityInfo</strong></td>
<td>E-UTRA radio access capabilities are always included and in case of inter-RAT handover to E-UTRA, UTRA radio access capabilities may be included. (If UTRA radio access capabilities are received from the source RAN, they are ignored by target eNB.) In case of inter-RAT handover to E-UTRA and the source is GERAN, GERAN capabilities are always included.</td>
</tr>
<tr>
<td><strong>as-Config</strong></td>
<td>The radio resource configuration. Applicable in case of intra-E-UTRA handover. If the target receives an incomplete MeasConfig and RadioResourceConfigDedicated in the as-Config, the target eNB may decide to apply the full configuration option based on the ue-ConfigRelease.</td>
</tr>
<tr>
<td><strong>rrm-Config</strong></td>
<td>Local E-UTRAN context used depending on the target node’s implementation, which is mainly used for the RRM purpose.</td>
</tr>
<tr>
<td><strong>as-Context</strong></td>
<td>Local E-UTRAN context required by the target eNB.</td>
</tr>
<tr>
<td><strong>ue-ConfigRelease</strong></td>
<td>Indicates the RRC protocol release applicable for the current UE configuration. This could be used by target eNB to decide if the full configuration approach should be used. If this field is not present, the target assumes that the current UE configuration is based on the release 8 version of RRC protocol. NOTE 1.</td>
</tr>
</tbody>
</table>

**NOTE 1**: The source typically sets the ue-ConfigRelease to the release corresponding with the current dedicated radio configuration. The source may however also consider the common radio resource configuration e.g. in case interoperability problems would appear if the UE temporary continues extensions of this part of the configuration in a target cell not supporting them.

---

### Conditional presence

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HO</strong></td>
<td>The field is mandatory present in case of handover within E-UTRA; otherwise the field is not present.</td>
</tr>
<tr>
<td><strong>HO2</strong></td>
<td>The field is optional present in case of handover within E-UTRA; otherwise the field is not present.</td>
</tr>
</tbody>
</table>

---

**UERadioAccessCapabilityInformation**

This message is used to transfer UE radio access capability information, covering both upload to and download from the EPC.

Direction: eNB to/ from EPC

---

**UERadioAccessCapabilityInformation message**

```asciidoc
UERadioAccessCapabilityInformation ::= SEQUENCE {  
criticalExtensions CHOICE {  
c1 CHOICE {  
ueradioAccessCapabilityInformation-r8 UERadioAccessCapabilityInformation-r8-IEs,  
spare7 NULL,  
}  
}  
nonCriticalExtension HandoverPreparationInformation-v920-IEs OPTIONAL  
UE-CapabilityRAT-ContainerList,  
AS-Config OPTIONAL, -- Cond HO  
RRM-Config OPTIONAL,  
AS-Context OPTIONAL, -- Cond HO  
nonCriticalExtension HandoverPreparationInformation-v920-IEs OPTIONAL  
```
3GPP TS 36.331 version 9.6.0 Release 9

10.3 Inter-node RRC information element definitions

- **AS-Config**

The AS-Config IE contains information about RRC configuration information in the source cell which can be utilized by target cell to determine the need to change the RRC configuration during the handover preparation phase. The information can also be used after the handover is successfully performed or during the RRC connection re-establishment.

**AS-Config information element**

```asn1
-- ASN1START

AS-Config ::= SEQUENCE {
  sourceMeasConfig       MeasConfig,
  sourceRadioResourceConfig   RadioResourceConfigDedicated,
  sourceSecurityAlgorithmConfig  SecurityAlgorithmConfig,
  sourceUE-Identity     C-RNTI,
  sourceMasterInformationBlock  MasterInformationBlock,
  sourceSystemInformationBlockType1 SystemInformationBlockType1(WITH COMPONENTS {..., nonCriticalExtension ABSENT}),
  sourceSystemInformationBlockType2 SystemInformationBlockType2,
  antennaInfoCommon     AntennaInfoCommon,
  sourceD1-CarrierFreq    ARFCN-ValueEUTRA,
  ...
  [...] sourceSystemInformationBlockType1Ext OCTET STRING (CONTAINING SystemInformationBlockType1-v890-IEs) OPTIONAL,
  sourceOtherConfig-r9  OtherConfig-r9
}

-- ASN1STOP
```

**NOTE:** The AS-Config re-uses information elements primarily created to cover the radio interface signalling requirements. Consequently, the information elements may include some parameters that are not relevant for the target eNB e.g. the SFN as included in the MasterInformationBlock.
### AS-Config field descriptions

**sourceMeasConfig**
Measurement configuration in the source cell. The measurement configuration for all measurements existing in the source cell when handover is triggered shall be included. See 10.5.

**sourceRadioResourceConfig**
Radio configuration in the source cell. The radio resource configuration for all radio bearers existing in the source cell when handover is triggered shall be included. See 10.5.

**sourceSecurityAlgorithmConfig**
This field provides the AS integrity protection (SRBs) and AS ciphering (SRBs and DRBs) algorithm configuration used in the source cell.

**sourceMasterInformationBlock**
MasterInformationBlock transmitted in the source cell.

**sourceSystemInformationBlockType1**
SystemInformationBlockType1 transmitted in the source cell.

**sourceSystemInformationBlockType2**
SystemInformationBlockType2 transmitted in the source cell.

**antennaInfoCommon**
This field provides information about the number of antenna ports in the source cell.

**sourceDL-CarrierFreq**
Provides the parameter Downlink EARFCN in the source cell, see TS 36.101 [42].

**sourceOtherConfig**
Provides other configuration in the source cell.

#### AS-Context

The IE **AS-Context** is used to transfer local E-UTRAN context required by the target eNB.

### AS-Context information element

```asn1
-- ASN1START
AS-Context ::=       SEQUENCE { 
  reestablishmentInfo      ReestablishmentInfo   OPTIONAL -- Cond HO }
-- ASN1STOP
```

### AS-Context field descriptions

**reestablishmentInfo**
Including information needed for the RRC connection re-establishment.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HO</strong></td>
<td>The field is mandatory present in case of handover within E-UTRA; otherwise the field is not present.</td>
</tr>
</tbody>
</table>

#### ReestablishmentInfo

The **ReestablishmentInfo** IE contains information needed for the RRC connection re-establishment.

### ReestablishmentInfo information element

```asn1
-- ASN1START
ReestablishmentInfo ::=    SEQUENCE { 
  sourcePhysCellId     PhysCellId, 
  targetCellShortMAC-I    ShortMAC-I, 
} -- ASN1STOP
```
```asn1
additionalReestabInfoList ::= SEQUENCE { SIZE (1..maxReestabInfo) } OF AdditionalReestabInfo
AdditionalReestabInfo ::= SEQUENCE {
  cellIdentity CellIdentity,
  key-eNodeB-Star Key-eNodeB-Star,
  shortMAC-I ShortMAC-I
}
Key-eNodeB-Star ::= BIT STRING (SIZE (256))
```

---

**ReestablishmentInfo field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sourcePhyCellId</td>
<td>The physical cell identity of the source cell, used to determine the UE context in the target eNB at re-establishment.</td>
</tr>
<tr>
<td>targetCellShortMAC-I</td>
<td>The ShortMAC-I for the handover target cell, in order for potential re-establishment to succeed.</td>
</tr>
<tr>
<td>additionalReestabInfoList</td>
<td>Contains a list of shortMAC-I and KeNB* for cells under control of the target eNB, required for potential re-establishment by the UE in these cells to succeed.</td>
</tr>
<tr>
<td>Key-eNodeB-Star</td>
<td>Parameter KeNB*: See TS 33.401 [32, 7.2.8.4]. This parameter is only used for X2 handover, and for S1 handover, it shall be ignored by target eNB.</td>
</tr>
</tbody>
</table>

---

**RRM-Config field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ue-InactiveTime</td>
<td>Duration while UE has not received or transmitted any user data. Thus the timer is still running in case e.g., UE measures the neighbour cells for the HO purpose. Value s1 corresponds to 1 second, s2 corresponds to 2 seconds and so on. Value min1 corresponds to 1 minute, value min1s20 corresponds to 1 minute and 20 seconds, value min1s40 corresponds to 1 minute and 40 seconds and so on. Value hr1 corresponds to 1 hour, hr1min30 corresponds to 1 hour and 30 minutes and so on.</td>
</tr>
</tbody>
</table>
10.4 Inter-node RRC multiplicity and type constraint values

– Multiplicity and type constraints definitions

```asn1
maxReestabInfo  INTEGER ::= 32 -- Maximum number of KeNB* and shortMAC-I forwarded
                       -- at handover for re-establishment preparation
```

– End of EUTRA-InterNodeDefinitions

10.5 Mandatory information in AS-Config

The AS-Config transferred between source eNB and target-eNB shall include all IEs necessary to describe the AS context. The conditional presence in section 6 is only applicable for eNB to UE communication.

The "need" or "cond" statements are not applied in case of sending the IEs from source eNB to target eNB. Some information elements shall be included regardless of the "need" or "cond" e.g. discardTimer. The AS-Config re-uses information elements primarily created to cover the radio interface signalling requirements. The information elements may include some parameters that are not relevant for the target eNB e.g. the SFN as included in the MasterInformationBlock.

Within the sourceRadioResourceConfig the source eNB shall include fields that are optional for eNB to UE communication, if the functionality is configured unless explicitly specified otherwise in the following:

- in accordance with a condition that is explicitly stated to be applicable; or
- a default value is defined for the concerned field; and the configured value is the same as the default value that is defined; or
- the need of the field is OP and the current UE configuration corresponds with the behaviour defined for absence of the field;
<table>
<thead>
<tr>
<th>Name</th>
<th>Presence in clause 6</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; srb-ToAddModList</td>
<td>OPTIONAL, -Cond HO-toEUTRA</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; rlc-Config</td>
<td>OPTIONAL, -Cond Setup</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; logicalChannelConfig</td>
<td>OPTIONAL, -Cond Setup</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt; ul-SpecificParameters</td>
<td>OPTIONAL, -Cond UL</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;&gt;&gt; logicalChannelGroup</td>
<td>OPTIONAL, -Need OR</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt; logicalChannelSR-Mask-r9</td>
<td>OPTIONAL, -Cond SRmask</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;drb-ToAddModList</td>
<td>OPTIONAL, -Cond HO-toEUTRA</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; eps-BearerIdentity</td>
<td>OPTIONAL, -Cond DRB-Setup</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; pdcp-Config</td>
<td>OPTIONAL, -Cond PDCP</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt; discardTimer</td>
<td>OPTIONAL, -Cond Setup</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt; rlc-AM</td>
<td>OPTIONAL, -Cond Rlc-AM</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;&gt;&gt; rlc-UM</td>
<td>OPTIONAL, -Cond Rlc-UM</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;&gt; rlc-Config</td>
<td>OPTIONAL, -Cond Setup</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; logicalChannelIdentity</td>
<td>OPTIONAL, -Cond DRB-Setup</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; logicalChannelConfig</td>
<td>OPTIONAL, -Cond Setup</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt; ul-SpecificParameters</td>
<td>OPTIONAL, -Cond UL</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;&gt;&gt; logicalChannelGroup</td>
<td>OPTIONAL, -Need OR</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt; logicalChannelSR-Mask-r9</td>
<td>OPTIONAL, -Cond SRmask</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt; mac-MainConfig</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; ul-SCH-Config</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt; maxHARQ-Tx</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; periodicBSR-Timer</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; drx-Config</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; shortDRX</td>
<td>OPTIONAL, -Need OR</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; phr-Config</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; sr-ProhibitTimer</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt; sps-Config</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; sps-ConfigDL</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; sps-ConfigUL</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt; p0-Persistent</td>
<td>OPTIONAL, -Need OP</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt; twIntervalsConfig</td>
<td>OPTIONAL, -Cond TDD</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt; physicalConfigDedicated</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; pucch-ConfigDedicated</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; pusch-ConfigDedicated</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt; tdd-AckNackFeedbackMode</td>
<td>OPTIONAL, -Cond TDD</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;&gt; uplinkPowerControlDedicated</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; tpc-PDCCH-ConfigPUCCH</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; tpc-PDCCH-ConfigPUSCH</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; cqi-ReportConfig</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt; cqi-ReportingModeAperiodic</td>
<td>OPTIONAL, -Need OR</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt; cqi-ReportPeriodic</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; soundingRS-UL-ConfigDedicated</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; antennaInfo</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt; codebookSubsetRestriction</td>
<td>OPTIONAL, -Cond TM</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;&gt; schedulingRequestConfig</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;physicalConfigDedicated-v920</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; cqi-ReportConfig-v920</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt; cqi-Mask-r9</td>
<td>OPTIONAL, -Cond cqi-Setup</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;&gt; pmi-Ri-Report-r9</td>
<td>OPTIONAL, -Cond PMI-r</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;&gt; antennaInfo-v920</td>
<td>OPTIONAL, -Cond TM8</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;&gt; codebookSubsetRestriction-v920</td>
<td>OPTIONAL, -Cond TM8</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt; rlf-TimersAndConstants-r9</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
</tbody>
</table>

For the measurement configuration, a corresponding operation as 5.5.6.1 is executed by target eNB.

Within the `sourceMeasConfig` the source eNB shall include fields that are optional for eNB to UE communication, if the functionality is configured unless explicitly specified otherwise in the following:

- in accordance with a condition that is explicitly stated to be applicable; or
- a default value is defined for the concerned field; and the configured value is the same as the default value that is defined; or

**ETSI**
- the need of the field is OP and the current UE configuration corresponds with the behaviour defined for absence of the field;

<table>
<thead>
<tr>
<th>Name</th>
<th>Presence in clause 6</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>MeasConfig</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; measObjectToAddModList</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; measObject</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt; measObjectEUTRA</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt;&gt; cellsToAddModList</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt;&gt; blackCellsToAddModList</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt;&gt; cellForWhichToReportCGI</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt;&gt; MeasObjectUTRA</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt;&gt; cellsToAddModList</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt;&gt; cellForWhichToReportCGI</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt;&gt; csg-allowedReportingCells-v930</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt;&gt; MeasObjectGERAN</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt;&gt; MeasObjectCDMA2000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt;&gt; searchWindowSize</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt;&gt; cellsToAddModList</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt;&gt; cellForWhichToReportCGI</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt; reportConfigToAddModList</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt; measIdToAddModList</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt; quantityConfig</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; quantityConfigEUTRA</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; quantityConfigUTRA</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; quantityConfigGERAN</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; quantityConfigCDMA2000</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt; s-Measure</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt; preRegistrationInfoHRPD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; preRegistrationZoneId</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; secondaryPreRegistrationZoneIdList</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
<tr>
<td>&gt;&gt; speedStatePars</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
</tbody>
</table>

Within the sourceOtherConfig the source eNB shall include fields that are optional for eNB to UE communication, if the functionality is configured unless explicitly specified otherwise in the following:

- in accordance with a condition that is explicitly stated to be applicable; or
- a default value is defined for the concerned field; and the configured value is the same as the default value that is defined; or
- the need of the field is OP and the current UE configuration corresponds with the behaviour defined for absence of the field;

<table>
<thead>
<tr>
<th>Name</th>
<th>Presence in clause 6</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>OtherConfig</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; reportProximityConfig-r9</td>
<td>OPTIONAL, -Need ON</td>
<td>-</td>
</tr>
</tbody>
</table>

11 UE capability related constraints and performance requirements

11.1 UE capability related constraints

The following table lists constraints regarding the UE capabilities that E-UTRAN is assumed to take into account.
### 11.2 Processing delay requirements for RRC procedures

The UE performance requirements for RRC procedures are specified in the following table, by means of a value N:

N = the number of 1ms subframes from the end of reception of the E-UTRAN -> UE message on the UE physical layer up to when the UE shall be ready for the reception of uplink grant for the UE -> E-UTRAN response message with no access delay other than the TTI-alignment (e.g. excluding delays caused by scheduling, the random access procedure or physical layer synchronisation).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>#DRBs</td>
<td>The number of DRBs that a UE of categories 1-5 shall support</td>
<td>8</td>
</tr>
<tr>
<td>#RLC-AM</td>
<td>The number of RLC AM entities that a UE of categories 1-5 shall support</td>
<td>10</td>
</tr>
<tr>
<td>#minCellperMeasObjectEUTRA</td>
<td>The minimum number of neighbour cells (excluding blacklist cells) that a UE shall be able to store within a MeasObjectEUTRA</td>
<td>32</td>
</tr>
<tr>
<td>#minBlackCellRangeperMeasObjectEUTRA</td>
<td>The minimum number of blacklist cell PCI ranges that a UE shall be able to store within a MeasObjectEUTRA</td>
<td>32</td>
</tr>
<tr>
<td>#minCellperMeasObjectUTRA</td>
<td>The minimum number of neighbour cells that a UE shall be able to store within a MeasObjectUTRA</td>
<td>32</td>
</tr>
<tr>
<td>#minCellperMeasObjectGERAN</td>
<td>The minimum number of neighbour cells that a UE shall be able to store within a MeasObjectGERAN</td>
<td>32</td>
</tr>
<tr>
<td>#minCellperMeasObjectCDMA2000</td>
<td>The minimum number of neighbour cells that a UE shall be able to store within a MeasObjectCDMA2000</td>
<td>32</td>
</tr>
<tr>
<td>#minCellTotal</td>
<td>The minimum number of neighbour cells (excluding blacklist cells) that a UE shall be able to store in total in all measurement objects configured</td>
<td>256</td>
</tr>
</tbody>
</table>

![Figure 11.2-1: Illustration of RRC procedure delay](image)
<table>
<thead>
<tr>
<th>Procedure title</th>
<th>E-UTRAN -&gt; UE</th>
<th>UE -&gt; E-UTRAN</th>
<th>N</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RRC Connection Control Procedures</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RRC connection establishment</td>
<td>RRCCConnectionSetup</td>
<td>RRCCConnectionSetupComplete</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>RRC connection release</td>
<td>RRCCConnectionSetupRelease</td>
<td></td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>RRC connection re-configuration (radio resource configuration)</td>
<td>RRCCConnectionReconfiguration</td>
<td>RRCCConnectionReconfigurationComplete</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>RRC connection re-configuration (measurement configuration)</td>
<td>RRCCConnectionReconfiguration</td>
<td>RRCCConnectionReconfigurationComplete</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>RRC connection re-configuration (intra-LTE mobility)</td>
<td>RRCCConnectionReconfiguration</td>
<td>RRCCConnectionReconfigurationComplete</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>RRC connection re-establishment</td>
<td>RRCCConnectionReestablishment</td>
<td>RRCCConnectionReestabishmentComplete</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Initial security activation</td>
<td>SecurityModeCommand</td>
<td>SecurityModeCommandComplete/SecurityModeCommandFailure</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Initial security activation + RRC connection re-configuration (RB establishment)</td>
<td>SecurityModeCommand, RRCCConnectionReconfiguration</td>
<td>RRCCConnectionReconfigurationComplete</td>
<td>20</td>
<td>The two DL messages are transmitted in the same TTI</td>
</tr>
<tr>
<td>Paging</td>
<td>Paging</td>
<td></td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td><strong>Inter RAT mobility</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handover to E-UTRA</td>
<td>RRCCConnectionReconfiguration (sent by other RAT)</td>
<td>RRCCConnectionReconfigurationComplete</td>
<td>NA</td>
<td>The performance of this procedure is specified in [50] in case of handover from GSM and [29], [30] in case of handover from UTRA.</td>
</tr>
<tr>
<td>Handover from E-UTRA</td>
<td>MobilityFromEUTRACommand</td>
<td></td>
<td>NA</td>
<td>The performance of this procedure is specified in [16]</td>
</tr>
<tr>
<td>Handover from E-UTRA to CDMA2000</td>
<td>HandoverFromEUTRAAPreparationRequest (CDMA2000)</td>
<td></td>
<td>NA</td>
<td>Used to trigger the handover preparation procedure with a CDMA2000 RAT. The performance of this procedure is specified in [16]</td>
</tr>
</tbody>
</table>

**Measurement procedures**

| Measurement Reporting | MeasurementReport | NA |

**Other procedures**

| UE capability transfer | UECapabilityEnquiry | UECapabilityInformation | 10 |

### 11.3 Conditionally mandatory Release 9 features

The following table lists new functionalities introduced from Release 9 of which support by UEs of releases including and beyond Release 9 are conditionally mandated.
<table>
<thead>
<tr>
<th>Feature</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMS emergency call</td>
<td>Mandatory for Release 9 LTE UEs which are IMS voice capable in LTE.</td>
</tr>
<tr>
<td>SSAC</td>
<td>Mandatory for Release 9 LTE UEs which are IMS voice capable in LTE.</td>
</tr>
<tr>
<td>SR mask</td>
<td>Refers to supporting the configuration indicated by logicalChannelSR-Mask. Mandatory for Release 9 LTE UEs which have set bit number 3 of featureGroupIndicators to “1”.</td>
</tr>
</tbody>
</table>
Annex A (informative):
Guidelines, mainly on use of ASN.1

Editor's note No agreements have been reached concerning the extension of RRC PDUs so far. Any statements in this section about the protocol extension mechanism should be considered as FFS.

A.1 Introduction

The following clauses contain guidelines for the specification of RRC protocol data units (PDUs) with ASN.1.

A.2 Procedural specification

A.2.1 General principles

The procedural specification provides an overall high level description regarding the UE behaviour in a particular scenario.

It should be noted that most of the UE behaviour associated with the reception of a particular field is covered by the applicable parts of the PDU specification. The procedural specification may also include specific details of the UE behaviour upon reception of a field, but typically this should be done only for cases that are not easy to capture in the PDU section e.g. general actions, more complicated actions depending on the value of multiple fields.

Likewise, the procedural specification need not specify the UE requirements regarding the setting of fields within the messages that are send to E-UTRAN i.e. this may also be covered by the PDU specification.

A.2.2 More detailed aspects

The following more detailed conventions should be used:

- Bullets:
  - Capitals should be used in the same manner as in other parts of the procedural text i.e. in most cases no capital applies since the bullets are part of the sentence starting with 'The UE shall:'
  - All bullets, including the last one in a sub-clause, should end with a semi-colon i.e. an ';'
- Conditions
  - Whenever multiple conditions apply, a semi-colon should be used at the end of each conditions with the exception of the last one, i.e. as in 'if cond1; or cond2:'

A.3 PDU specification

A.3.1 General principles

A.3.1.1 ASN.1 sections

The RRC PDU contents are formally and completely described using abstract syntax notation (ASN.1), see X.680 [13], X.681 (02/2002) [14].

The complete ASN.1 code is divided into a number of ASN.1 sections in the specifications. In order to facilitate the extraction of the complete ASN.1 code from the specification, each ASN.1 section begins with a text paragraph consisting entirely of an ASN.1 start tag, which consists of a double hyphen followed by a single space and the text string "ASN1START" (in all upper case letters). Each ASN.1 section ends with a text paragraph consisting entirely of
an **ASN.1 start tag**, which consists of a double hyphen followed by a single space and the text "ASN1START" (in all upper case letters):

```
-- ASN1START
-- ASN1STOP
```

The text paragraphs containing the ASN.1 start and stop tags should not contain any ASN.1 code significant for the complete description of the RRC PDU contents. The complete ASN.1 code may be extracted by copying all the text paragraphs between an ASN.1 start tag and the following ASN.1 stop tag in the order they appear, throughout the specification.

**NOTE:** A typical procedure for extraction of the complete ASN.1 code consists of a first step where the entire RRC PDU contents description (ultimately the entire specification) is saved into a plain text (ASCII) file format, followed by a second step where the actual extraction takes place, based on the occurrence of the ASN.1 start and stop tags.

### A.3.1.2 ASN.1 identifier naming conventions

The naming of identifiers (i.e., the ASN.1 field and type identifiers) should be based on the following guidelines:

- Message (PDU) identifiers should be ordinary mixed case without hyphenation. These identifiers, e.g., the `RRCConnectionModificationCommand`, should be used for reference in the procedure text. Abbreviated forms of these identifiers should not be used.

- Type identifiers other than PDU identifiers should be ordinary mixed case, with hyphenation used to set off acronyms only where an adjacent letter is a capital, e.g., `EstablishmentCause`, `SelectedPLMN` (not `Selected-PLMN`, since the "d" in "Selected" is lowercase), `InitialUE-Identity` and `MeasSFN-SFN-TimeDifference`.

- Field identifiers shall start with a lowercase letter and use mixed case thereafter, e.g., `establishmentCause`. If a field identifier begins with an acronym (which would normally be in upper case), the entire acronym is lowercase (`plmn-Identity`, not `pLMN-Identity`), in order to facilitate a consistent search pattern with corresponding type identifiers.

- Identifiers that are likely to be keywords of some language, especially widely used languages, such as C++ or Java, should be avoided to the extent possible.

- Identifiers, other than PDU identifiers, longer than 25 characters should be avoided where possible. It is recommended to use abbreviations, which should be done in a consistent manner i.e. use 'Meas' instead of 'Measurement' for all occurrences. Examples of typical abbreviations are given in table A.3.1.2.1-1 below.

- **For future extension:** When an extension is introduced a suffix is added to the identifier of the concerned ASN.1 field and/ or type. A suffix of the form "-rX" is used, with X indicating the release, for ASN.1 fields or types introduced in a later release (i.e. a release later than the original/ first release of the protocol) as well as for ASN.1 fields or types for which a revision is introduced in a later release replacing a previous version, e.g., `Foo-r9` for the Rel-9 version of the ASN.1 type `Foo`. A suffix of the form "-vXYZ" is used for ASN.1 fields or types that only are an extension of a corresponding earlier field or type (see sub-clause A.4), e.g., `AnElement-v10b0` for the extension of the ASN.1 type `AnElement` introduced in version 10.11.0 of the specification. A number 0...9, 10, 11, etc. is used to represent the first part of the version number, indicating the release of the protocol. Lower case letters a, b, c, etc. are used to represent the second (and third) part of the version number if they are greater than 9. In the procedural specification, in field descriptions as well as in headings suffices are not used, unless there is a clear need to distinguish the extension from the original field.

- More generally, in case there is a need to distinguish different variants of an ASN.1 field or IE, a suffix should be added at the end of the identifiers e.g. `MeasObjectUTRAN`, `ConfigCommon`. When there is no particular need to distinguish the fields (e.g. because the field is included in different IEs), a common field identifier name may be used. This may be attractive e.g. in case the procedural specification is the same for the different variants.
Table A.3.1.2-1: Examples of typical abbreviations used in ASN.1 identifiers

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Abbreviated word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conf</td>
<td>Confirmation</td>
</tr>
<tr>
<td>Config</td>
<td>Configuration</td>
</tr>
<tr>
<td>DL</td>
<td>Downlink</td>
</tr>
<tr>
<td>Freq</td>
<td>Frequency</td>
</tr>
<tr>
<td>Id</td>
<td>Identity</td>
</tr>
<tr>
<td>Ind</td>
<td>Indication</td>
</tr>
<tr>
<td>Info</td>
<td>Information</td>
</tr>
<tr>
<td>Meas</td>
<td>Measurement</td>
</tr>
<tr>
<td>Neigh</td>
<td>Neighbour(ing)</td>
</tr>
<tr>
<td>Param(s)</td>
<td>Parameter(s)</td>
</tr>
<tr>
<td>Persist</td>
<td>Persistent</td>
</tr>
<tr>
<td>Phys</td>
<td>Physical</td>
</tr>
<tr>
<td>Reestab</td>
<td>Reestablishment</td>
</tr>
<tr>
<td>Req</td>
<td>Request</td>
</tr>
<tr>
<td>Sched</td>
<td>Scheduling</td>
</tr>
<tr>
<td>Thresh</td>
<td>Threshold</td>
</tr>
<tr>
<td>Transm</td>
<td>Transmission</td>
</tr>
<tr>
<td>UL</td>
<td>Uplink</td>
</tr>
</tbody>
</table>

NOTE: The table A.3.1.2-1 is not exhaustive. Additional abbreviations may be used in ASN.1 identifiers when needed.

A.3.1.3 Text references using ASN.1 identifiers

A text reference into the RRC PDU contents description from other parts of the specification is made using the ASN.1 field or type identifier of the referenced element. The ASN.1 field and type identifiers used in text references should be in the italic font style. The "do not check spelling and grammar" attribute in Word should be set. Quotation marks (i.e., "") should not be used around the ASN.1 field or type identifier.

A reference to an RRC PDU type should be made using the corresponding ASN.1 type identifier followed by the word "message", e.g., a reference to the RRCConnectionRelease message.

A reference to a specific part of an RRC PDU, or to a specific part of any other ASN.1 type, should be made using the corresponding ASN.1 field identifier followed by the word "field", e.g., a reference to the prioritisedBitRate field in the example below.

```
-- /example/ ASN1START
LogicalChannelConfig ::= SEQUENCE {
    ul-SpecificParameters SEQUENCE {
        priority Priority,
        prioritisedBitRate PrioritisedBitRate,
        bucketSizeDuration BucketSizeDuration,
        logicalChannelGroup INTEGER (0..3)
    } OPTIONAL
}
-- ASN1STOP
```

NOTE: All the ASN.1 start tags in the ASN.1 sections, used as examples in this annex to the specification, are deliberately distorted, in order not to include them when the ASN.1 description of the RRC PDU contents is extracted from the specification.

A reference to a specific type of information element should be made using the corresponding ASN.1 type identifier preceded by the acronym "IE", e.g., a reference to the IE LogicalChannelConfig in the example above.

References to a specific type of information element should only be used when those are generic, i.e., without regard to the particular context wherein the specific type of information element is used. If the reference is related to a particular context, e.g., an RRC PDU type (message) wherein the information element is used, the corresponding field identifier in that context should be used in the text reference.
A reference to a specific value of an ASN.1 field should be made using the corresponding ASN.1 value while using quotation marks (i.e., "") around the ASN.1 value, e.g., 'if the status field is set to value "true"'.

### A.3.2 High-level message structure

Within each logical channel type, the associated RRC PDU (message) types are alternatives within a CHOICE, as shown in the example below.

--- /example/ ASN1START

```asn1
DL-DCCH-Message ::= SEQUENCE {
  message     DL-DCCH-MessageType
}

DL-DCCH-MessageType ::= CHOICE {
  c1      CHOICE {
    dlInformationTransfer     DLInformationTransfer,
    handoverFromEUTRAPreparationRequest  HandoverFromEUTRAPreparationRequest,
    mobilityFromEUTRACommand     MobilityFromEUTRACommand,
    rrcConnectionReconfiguration   RRCConnectionReconfiguration,
    rrcConnectionRelease     RRCConnectionRelease,
    securityModeCommand      SecurityModeCommand,
    ueCapabilityEnquiry      UECapabilityEnquiry,
    spare1 NULL
  },
  messageClassExtension SEQUENCE {}
}
```

--- ASN1STOP

A nested two-level CHOICE structure is used, where the alternative PDU types are alternatives within the inner level c1 CHOICE.

Spare alternatives (i.e., spare1 in this case) may be included within the c1 CHOICE to facilitate future extension. The number of such spare alternatives should not extend the total number of alternatives beyond an integer-power-of-two number of alternatives (i.e., eight in this case).

Further extension of the number of alternative PDU types is facilitated using the messageClassExtension alternative in the outer level CHOICE.

### A.3.3 Message definition

Each PDU (message) type is specified in an ASN.1 section similar to the one shown in the example below.

--- /example/ ASN1START

```asn1
RRCConnectionReconfiguration ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1         CHOICE{
      rrcConnectionReconfiguration-r8  RRCConnectionReconfiguration-r8-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}
  }
}
```

--- ASN1STOP

Hooks for **critical** and **non-critical** extension should normally be included in the PDU type specification. How these hooks are used is further described in sub-clause A.4.

Critical extensions are characterised by a redefinition of the PDU contents and need to be governed by a mechanism for protocol version agreement between the encoder and the decoder of the PDU, such that the encoder is prevented from sending a critically extended version of the PDU type, which is not comprehended by the decoder.
Critical extension of a PDU type is facilitated by a two-level CHOICE structure, where the alternative PDU contents are alternatives within the inner level c1 CHOICE. Spare alternatives (i.e., spare3 down to spare1 in this case) may be included within the c1 CHOICE. The number of spare alternatives to be included in the original PDU specification should be decided case by case, based on the expected rate of critical extension in the future releases of the protocol.

Further critical extension, when the spare alternatives from the original specifications are used up, is facilitated using the criticalExtensionsFuture in the outer level CHOICE.

In PDU types where critical extension is not expected in the future releases of the protocol, the inner level c1 CHOICE and the spare alternatives may be excluded, as shown in the example below.

--- /example/ ASN1START

RRCConnectionReconfigurationComplete ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    rrcConnectionReconfigurationComplete-r8
    criticalExtensionsFuture   SEQUENCE {}}
}

RRCConnectionReconfigurationComplete-r8-IEs ::= SEQUENCE {
  -- Enter the IEs here. --              -- Cond condTag
  ...}

-- ASN1STOP

Non-critical extensions are characterised by the addition of new information to the original specification of the PDU type. If not comprehended, a non-critical extension may be skipped by the decoder, whilst the decoder is still able to complete the decoding of the comprehended parts of the PDU contents.

Non-critical extensions at locations other than the end of the message or other than at the end of a field contained in a BIT or OCTET STRING are facilitated by use of the ASN.1 extension marker "...". The original specification of a PDU type should normally include the extension marker at the end of the sequence of information elements contained.

Non-critical extensions at the end of the message or at the end of a field that is contained in a BIT or OCTET STRING are facilitated by use of an empty sequence that is marked OPTIONAL e.g. as shown in the following example:

--- /example/ ASN1START

RRCMessage-r8-IEs ::=      SEQUENCE {
  field1         InformationElement1,
  field2         InformationElement2,
  nonCriticalExtension     SEQUENCE {}      OPTIONAL -- Need OP
}

-- ASN1STOP

The ASN.1 section specifying the contents of a PDU type may be followed by a field description table where a further description of, e.g., the semantic properties of the fields may be included. The general format of this table is shown in the example below. The field description table is absent in case there are no fields for which further description needs to be provided e.g. because the PDU does not include any fields, or because an IE is defined for each field while there is nothing specific regarding the use of this IE that needs to be specified.

<table>
<thead>
<tr>
<th>%PDU-TypeIdentifier% field descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>%field identifier% Field description.</td>
</tr>
<tr>
<td>%field identifier% Field description.</td>
</tr>
</tbody>
</table>

The field description table has one column. The header row shall contain the ASN.1 type identifier of the PDU type.

The following rows are used to provide field descriptions. Each row shall include a first paragraph with a field identifier (in bold and italic font style) referring to the part of the PDU to which it applies. The following paragraphs at the same
row may include (in regular font style), e.g., semantic description, references to other specifications and/or specification of value units, which are relevant for the particular part of the PDU.

The parts of the PDU contents that do not require a field description shall be omitted from the field description table.

### A.3.4 Information elements

Each IE (information element) type is specified in an ASN.1 section similar to the one shown in the example below.

```
-- /example/ ASN1START
PRACH-ConfigSIB ::= SEQUENCE {
  rootSequenceIndex       INTEGER (0..1023),
  prach-ConfigInfo        PRACH-ConfigInfo
}
PRACH-Config ::= SEQUENCE {
  rootSequenceIndex       INTEGER (0..1023),
  prach-ConfigInfo        PRACH-ConfigInfo  OPTIONAL
}
PRACH-ConfigInfo ::= SEQUENCE {
  prach-ConfigIndex       ENUMERATED {ffs},
  highSpeedFlag           ENUMERATED {ffs},
  zeroCorrelationZoneConfig ENUMERATED {ffs}
}
-- ASN1STOP
```

IEs should be introduced whenever there are multiple fields for which the same set of values apply. IEs may also be defined for other reasons e.g. to break down a ASN.1 definition in to smaller pieces.

A group of closely related IE type definitions, like the IEs `PRACH-ConfigSIB` and `PRACH-Config` in this example, are preferably placed together in a common ASN.1 section. The IE type identifiers should in this case have a common base, defined as the generic type identifier. It may be complemented by a suffix to distinguish the different variants. The "PRACH-Config" is the generic type identifier in this example, and the "SIB" suffix is added to distinguish the variant. The sub-clause heading and generic references to a group of closely related IEs defined in this way should use the generic type identifier.

The same principle should apply if a new version, or an extension version, of an existing IE is created for critical or non-critical extension of the protocol (see sub-clause A.4). The new version, or the extension version, of the IE is included in the same ASN.1 section defining the original. A suffix is added to the type identifier, using the naming conventions defined in sub-clause A.3.1.2, indicating the release or version of the where the new version, or extension version, was introduced.

Local IE type definitions, like the IE `PRACH-ConfigInfo` in the example above, may be included in the ASN.1 section and be referenced in the other IE types defined in the same ASN.1 section. The use of locally defined IE types should be encouraged, as a tool to break up large and complex IE type definitions. It can improve the readability of the code. There may also be a benefit for the software implementation of the protocol end-points, as these IE types are typically provided by the ASN.1 compiler as independent data elements, to be used in the software implementation.

An IE type defined in a local context, like the IE `PRACH-ConfigInfo`, should not be referenced directly from other ASN.1 sections in the RRC specification. An IE type which is referenced in more than one ASN.1 section should be defined in a separate sub-clause, with a separate heading and a separate ASN.1 section (possibly as one in a set of closely related IE types, like the IEs `PRACH-ConfigSIB` and `PRACH-Config` in the example above). Such IE types are also referred to as 'global IEs'.

**NOTE:** Referring to an IE type, that is defined as a local IE type in the context of another ASN.1 section, does not generate an ASN.1 compilation error. Nevertheless, using a locally defined IE type in that way makes the IE type definition difficult to find, as it would not be visible at an outline level of the specification. It should be avoided.

The ASN.1 section specifying the contents of one or more IE types, like in the example above, may be followed by a field description table, where a further description of, e.g., the semantic properties of the fields of the information elements may be included. This table may be absent, similar as indicated in sub-clause A.3.3 for the specification of the
PDU type. The general format of the field description table is the same as shown in sub-clause A.3.3 for the specification of the PDU type.

A.3.5 Fields with optional presence

A field with optional presence may be declared with the keyword DEFAULT. It identifies a default value to be assumed, if the sender does not include a value for that field in the encoding:

```
-- /example/ ASN1START
PreambleInfo ::=     SEQUENCE {
    numberOfRA-Preambles     INTEGER (1..64)      DEFAULT 1,
    ...
}
-- ASN1STOP
```

Alternatively, a field with optional presence may be declared with the keyword OPTIONAL. It identifies a field for which a value can be omitted. The omission carries semantics, which is different from any normal value of the field:

```
-- /example/ ASN1START
PRACH-Config ::=    SEQUENCE {
    rootSequenceIndex     INTEGER (0..1023),
    prach-ConfigInfo     PRACH-ConfigInfo     OPTIONAL -- Need ON
}
-- ASN1STOP
```

The semantics of an optionally present field, in the case it is omitted, should be indicated at the end of the paragraph including the keyword OPTIONAL, using a short comment text with a need statement. The need statement includes the keyword "Need", followed by one of the predefined semantics tags (OP, ON or OR) defined in sub-clause 6.1. If the semantics tag OP is used, the semantics of the absent field are further specified either in the field description table following the ASN.1 section, or in procedure text.

A.3.6 Fields with conditional presence

A field with conditional presence is declared with the keyword OPTIONAL. In addition, a short comment text shall be included at the end of the paragraph including the keyword OPTIONAL. The comment text includes the keyword "Cond", followed by a condition tag associated with the field ("UL" in this example):

```
-- /example/ ASN1START
LogicalChannelConfig ::=   SEQUENCE {
    ul-SpecificParameters    SEQUENCE {
        priority       INTEGER (0),
        ...
    }  OPTIONAL                 -- Cond UL
}
-- ASN1STOP
```

When conditionally present fields are included in an ASN.1 section, the field description table after the ASN.1 section shall be followed by a conditional presence table. The conditional presence table specifies the conditions for including the fields with conditional presence in the particular ASN.1 section.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL</td>
<td>Specification of the conditions for including the field associated with the condition tag = &quot;UL&quot;. Semantics in case of optional presence under certain conditions may also be specified.</td>
</tr>
</tbody>
</table>

The conditional presence table has two columns. The first column (heading: "Conditional presence") contains the condition tag (in italic font style), which links the fields with a condition tag in the ASN.1 section to an entry in the table. The second column (heading: "Explanation") contains a text specification of the conditions and requirements for
the presence of the field. The second column may also include semantics, in case of an optional presence of the field, under certain conditions i.e. using the same predefined tags as defined for optional fields in A.3.5.

Conditional presence should primarily be used when presence of a field depends on the presence and/or value of other fields within the same message. If the presence of a field depends on whether another feature/function has been configured, while this function can be configured independently e.g. by another message and/or at another point in time, the relation is best reflected by means of a statement in the field description table.

If the ASN.1 section does not include any fields with conditional presence, the conditional presence table shall not be included.

Whenever a field is only applicable in specific cases e.g. TDD, use of conditional presence should be considered.

### A.3.7 Guidelines on use of lists with elements of SEQUENCE type

Where an information element has the form of a list (the SEQUENCE OF construct in ASN.1) with the type of the list elements being a SEQUENCE data type, an information element shall be defined for the list elements even if it would not otherwise be needed.

For example, a list of PLMN identities with reservation flags is defined as in the following example:

```asn1
PLMN-IdentityInfoList ::= SEQUENCE {SIZE (1..6)} OF PLMN-IdentityInfo

PLMN-IdentityInfo ::= SEQUENCE {
    plmn-Identity PLMN-Identity,
    cellReservedForOperatorUse ENUMERATED {reserved, notReserved}
}
```

rather than as in the following (bad) example, which may cause generated code to contain types with unpredictable names:

```asn1
PLMN-IdentityList ::= SEQUENCE {
    plmn-Identity PLMN-Identity,
    cellReservedForOperatorUse ENUMERATED {reserved, notReserved}
}
```

### A.4 Extension of the PDU specifications

#### A.4.1 General principles to ensure compatibility

It is essential that extension of the protocol does not affect interoperability i.e. it is essential that implementations based on different versions of the RRC protocol are able to interoperate. In particular, this requirement applies for the following kind of protocol extensions:

- Introduction of new PDU types (i.e. these should not cause unexpected behaviour or damage).
- Introduction of additional fields in an extensible PDUs (i.e. it should be possible to ignore uncomprehended extensions without affecting the handling of the other parts of the message).
- Introduction of additional values of an extensible field of PDUs. If used, the behaviour upon reception of an uncomprehended value should be defined.

It should be noted that the PDU extension mechanism may depend on the logical channel used to transfer the message e.g. for some PDUs an implementation may be aware of the protocol version of the peer in which case selective ignoring of extensions may not be required.
The non-critical extension mechanism is the primary mechanism for introducing protocol extensions i.e. the critical extension mechanism is used merely when there is a need to introduce a 'clean' message version. Such a need appears when the last message version includes a large number of non-critical extensions, which results in issues like readability, overhead associated with the extension markers. The critical extension mechanism may also be considered when it is complicated to accommodate the extensions by means of non-critical extension mechanisms.

A.4.2 Critical extension of messages

The mechanisms to critically extend a message are defined in A.3.3. There are both "outer branch" and "inner branch" mechanisms available. The "outer branch" consists of a CHOICE having the name criticalExtensions, with two values, c1 and criticalExtensionsFuture. The criticalExtensionsFuture branch consists of an empty SEQUENCE, while the c1 branch contains the "inner branch" mechanism.

The "inner branch" structure is a CHOICE with values of the form "MessageName-rX-IEs" (e.g., "RRCConnectionReconfiguration-r8-IEs") or "spareX", with the spare values having type NULL. The "-rX-IEs" structures contain the complete structure of the message IEs for the appropriate release; i.e., the critical extension branch for the Rel-10 version of a message includes all Rel-8 and Rel-9 fields (that are not obviated in the later version), rather than containing only the additional Rel-10 fields.

The following guidelines may be used when deciding which mechanism to introduce for a particular message, i.e. only an 'outer branch', or an 'outer branch' in combination with an 'inner branch' including a certain number of spares:

- For certain messages, e.g. initial uplink messages, messages transmitted on a broadcast channel, critical extension may not be applicable.
- An outer branch may be sufficient for messages not including any fields.
- The number of spares within inner branch should reflect the likelihood that the message will be critically extended in future releases (since each release with a critical extension for the message consumes one of the spare values). The estimation of the critical extension likelyhood may be based on the number, size and changeability of the fields included in the message.
- In messages where an inner branch extension mechanism is available, all spare values of the inner branch should be used before any critical extensions are added using the outer branch.

The following example illustrates the use of the critical extension mechanism by showing the ASN.1 of the original and of a later release:

```
-- /example/ ASN1START

RRCMessage ::= SEQUENCE {
  rrc-TransactionIdentifier    RRC-TransactionIdentifier,
  criticalExtensions    CHOICE {
    c1    CHOICE{
      rrcMessage-r8    RRCMessage-r8-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture    SEQUENCE {}
  }
}

-- /example/ ASN1STOP

-- /example/ ASN1START

RRCMessage ::= SEQUENCE {
  rrc-TransactionIdentifier    RRC-TransactionIdentifier,
  criticalExtensions    CHOICE {
    c1    CHOICE{
      rrcMessage-r8    RRCMessage-r8-IEs,
      rrcMessage-r10    RRCMessage-r10-IEs,
      rrcMessage-r11    RRCMessage-r11-IEs,
      rrcMessage-r14    RRCMessage-r14-IEs
    },
    later    CHOICE {
      c2    CHOICE{
        rrcMessage-r16    RRCMessage-r16-IEs,
        spare7 NULL, spare6 NULL, spare5 NULL, spare4 NULL,
      }
    }
  }
}
```


A.4.3 Non-critical extension of messages

A.4.3.1 General principles

The mechanisms to extend a message in a non-critical manner are defined in A.3.3. W.r.t. the use of extension markers, the following additional guidelines apply:

- When further non-critical extensions are added to a message that has been critically extended, the inclusion of these non-critical extensions in earlier critical branches of the message should be avoided when possible.

- The extension marker ("…") is the primary non-critical extension mechanism that is used unless a length determinant is not required. Examples of cases where a length determinant is not required:
  - at the end of a message,
  - at the end of a structure contained in a BIT STRING or OCTET STRING

- When an extension marker is available, non-critical extensions are preferably placed at the location (e.g. the IE) where the concerned parameter belongs from a logical/functional perspective (referred to as the 'default extension location')

  - It is desirable to aggregate extensions of the same release or version of the specification into a group, which should be placed at the lowest possible level.

  - In specific cases it may be preferable to place extensions elsewhere (referred to as the 'actual extension location') e.g. when it is possible to aggregate several extensions in a group. In such a case, the group should be placed at the lowest suitable level in the message. <TBD: ref to separate example>

  - In case placement at the default extension location affects earlier critical branches of the message, locating the extension at a following higher level in the message should be considered.

  - In case an extension is not placed at the default extension location, an IE should be defined. The IE’s ASN.1 definition should be placed in the same ASN.1 section as the default extension location. In case there are intermediate levels in-between the actual and the default extension location, an IE may be defined for each level. Intermediate levels are primarily introduced for readability and overview. Hence intermediate levels need not always be introduced e.g. they may not be needed when the default and the actual extension location are within the same ASN.1 section. <TBD: ref to separate example>

A.4.3.2 Further guidelines

Further to the general principles defined in the previous section, the following additional guidelines apply regarding the use of extension markers:

- Extension markers within SEQUENCE
  - Extension markers are primarily, but not exclusively, introduced at the higher nesting levels
  - Extension markers are introduced for a SEQUENCE comprising several fields as well as for information elements whose extension would result in complex structures without it (e.g. re-introducing another list)
  - Extension markers are introduced to make it possible to maintain important information structures e.g. parameters relevant for one particular RAT
  - Extension markers are also used for size critical messages (i.e. messages on BCCH, PCCH and CCCH), although introduced somewhat more carefully
- The extension fields introduced (or frozen) in a specific version of the specification are grouped together using double brackets.

- Extension markers within ENUMERATED
  - Spare values are used until the number of values reaches the next power of 2, while the extension marker caters for extension beyond that limit
  - A suffix of the form "vXYZ" is used for the identifier of each new value, e.g. "value-vXYZ".

- Extension markers within CHOICE:
  - Extension markers are introduced when extension is foreseen and when comprehension is not required by the receiver i.e. behaviour is defined for the case where the receiver cannot comprehend the extended value (e.g. ignoring an optional CHOICE field). It should be noted that defining the behaviour of a receiver upon receiving a not comprehended choice value is not required if the sender is aware whether or not the receiver supports the extended value.
  - A suffix of the form "vXYZ" is used for the identifier of each new choice value, e.g. "choice-vXYZ".

Non-critical extensions at the end of a message/ of a field contained in an OCTET or BIT STRING:

- When a nonCriticalExtension is actually used, a "Need" statement is not provided for the field, which always is a group including at least one extension and a field facilitating further possible extensions.

Further, more general, guidelines:

- In case a need statement is not provided for a group, a "Need" statement is provided for all individual extension fields within the group i.e. including for fields that are not marked as OPTIONAL. The latter is to clarify the action upon absence of the whole group.

### A.4.3.3 Typical example of evolution of IE with local extensions

The following example illustrates the use of the extension marker for a number of elementary cases (sequence, enumerated, choice). The example also illustrates how the IE may be revised in case the critical extension mechanism is used.

**NOTE** In case there is a need to support further extensions of release n while the ASN.1 of release (n+1) has been frozen, without requiring the release n receiver to support decoding of release (n+1) extensions, more advanced mechanisms are needed e.g. including multiple extension markers.

```asn1
-- /example/ ASN1START

InformationElement1 ::= SEQUENCE {
  field1        ENUMERATED {
    value1, value2, value3, value4-v880,
    ..., value5-v960 },

  field2        CHOICE {
    field2a        BOOLEAN,
    field2b        InformationElement2b,
    ...
    field2c-v960      InformationElement2c-r9
  },

  ...
  [[ field3-r9
    InformationElement3-r9 OPTIONAL -- Need OR
  ]],
  [[ field3-v9a0
    InformationElement3-v9a0 OPTIONAL, -- Need OR
  ]]
}

InformationElement1-r10 ::= SEQUENCE {
  field1        ENUMERATED {
    value1, value2, value3, value4-v880,
    value5-v960, value6-v1170, spare2, spare1, ...
  },

  field2        CHOICE {
    field2a        BOOLEAN,
    field2b        InformationElement2b,
    field2c-v960      InformationElement2c-r9,
    ...
  }
}  ```
Some remarks regarding the extensions of InformationElement\textsubscript{1} as shown in the above example:

- The InformationElement\textsubscript{1} is initially extended with a number of non-critical extensions. In release 10 however, a critical extension is introduced for the message using this IE. Consequently, a new version of the IE InformationElement\textsubscript{1} (i.e. InformationElement\textsubscript{1-r10}) is defined in which the earlier non-critical extensions are incorporated by means of a revision of the original field.

- The value\textsubscript{4-v880} is replacing a spare value defined in the original protocol version for field\textsubscript{1}. Likewise value\textsubscript{6-v1170} replaces spare\textsubscript{3} that was originally defined in the r10 version of field\textsubscript{1}

- Within the critically extended release 10 version of InformationElement\textsubscript{1}, the names of the original fields/IEs are not changed, unless there is a real need to distinguish them from other fields/IEs. E.g. the field\textsubscript{3-r9} and InformationElement\textsubscript{4} were defined in the original protocol version (release 8) and hence not tagged. Moreover, the field\textsubscript{3-r9} is introduced in release 9 and not re-tagged; although, the InformationElement\textsubscript{3} is also critically extended and therefore tagged InformationElement\textsubscript{3-r10} in the release 10 version of InformationElement\textsubscript{1}.

A.4.3.4 Typical examples of non-critical extension at the end of a message

The following example illustrates the use of non-critical extensions at the end of the message or at the end of a field that is contained in a BIT or OCTET STRING i.e. when an empty sequence is used.

Some remarks regarding the extensions shown in the above example:

- The InformationElement\textsubscript{4} is introduced in the original version of the protocol (release 8) and hence no suffix is used.

A.4.3.5 Examples of non-critical extensions not placed at the default extension location

The following example illustrates the use of non-critical extensions in case an extension is not placed at the default extension location.
---

**ParentIE-WithEM**

The IE *ParentIE-WithEM* is an example of a high level IE including the extension marker (EM). The root encoding of this IE includes two lower level IEs *ChildIE1-WithoutEM* and *ChildIE2-WithoutEM* which not include the extension marker. Consequently, non-critical extensions of the Child-IEs have to be included at the level of the Parent-IE.

The example illustrates how the two extension IEs *ChildIE1-WithoutEM-vN* and *ChildIE2-WithoutEM-vN* (both in release N) are used to connect non-critical extensions with a default extension location in the lower level IEs to the actual extension location in this IE.

**ParentIE-WithEM information element**

```asn1
ParentIE-WithEM ::=   SEQUENCE {
   -- Root encoding, including:
   childIE1-WithoutEM   ChildIE1-WithoutEM    OPTIONAL,  -- Need ON
   childIE2-WithoutEM   ChildIE2-WithoutEM    OPTIONAL,  -- Need ON
   ....
   [[ childIE1-WithoutEM-vN   ChildIE1-WithoutEM-vN   OPTIONAL,  -- Need ON
     childIE2-WithoutEM-vN   ChildIE2-WithoutEM-vN   OPTIONAL  -- Need ON
     ]]
}
```

Some remarks regarding the extensions shown in the above example:

- The the fields *childIEEx-WithoutEM-vN* may not really need to be optional (depends on what is defined at the next lower level).
- In general, especially when there are several nesting levels, fields should be marked as optional only when there is a clear reason.

---

**ChildIE1-WithoutEM**

The IE *ChildIE1-WithoutEM* is an example of a lower level IE, used to control certain radio configurations including a configurable feature which can be setup or released using the local IE *ChIE1-ConfigurableFeature*. The example illustrates how the new field *chIE1-NewField* is added in release N to the configuration of the configurable feature. The example is based on the following assumptions:

- when initially configuring as well as when modifying the new field, the original fields of the configurable feature have to be provided also i.e. as if the extended ones were present within the setup branch of this feature.
- when the configurable feature is released, the new field should be released also.
- when omitting the original fields of the configurable feature the UE continues using the existing values (which is used to optimise the signalling for features that typically continue unchanged upon handover).
- when omitting the new field of the configurable feature the UE releases the existing values and discontinues the associated functionality (which may be used to support release of unsupported functionality upon handover to an eNB supporting an earlier protocol version).

The above assumptions, which affect the use of conditions and need codes, may not always apply. Hence, the example should not be re-used blindly.

**ChildIE1-WithoutEM information elements**

```asn1
ChildIE1-WithoutEM ::=    SEQUENCE {
   -- Root encoding, including:
   chIE1-ConfigurableFeature   ChIE1-ConfigurableFeature  OPTIONAL   -- Need ON
}
```
The field is optional present, need OR, in case of ChildIE1-ConfigurableFeature is included and set to "setup"; otherwise the field is not present and the UE shall delete any existing value for this field.

The following rules provide guidance on which messages should include a Transaction identifier:

1. DL messages on CCCH that move UE to RRC-Idle should not include the RRC transaction identifier.
2. All network initiated DL messages by default should include the RRC transaction identifier.
3. All UL messages that are direct response to a DL message with an RRC Transaction identifier should include the RRC Transaction identifier.
4. All UL messages that require a direct DL response message should include an RRC transaction identifier.
5: All UL messages that are not in response to a DL message nor require a corresponding response from the network should not include the RRC Transaction identifier.

A.6 Protection of RRC messages (informative)

The following list provides information which messages can be sent (unprotected) prior to security activation and which messages can be sent unprotected after security activation.

P…Messages that can be sent (unprotected) prior to security activation
A - I…Messages that can be sent without integrity protection after security activation
A - C…Messages that can be sent unciphered after security activation
NA… Message can never be sent after security activation
<table>
<thead>
<tr>
<th>Message</th>
<th>P</th>
<th>A-I</th>
<th>A-C</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSFBParametersRequestCDMA2000</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CSFBParametersResponseCDMA2000</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CounterCheck</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CounterCheckResponse</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>DLInformationTransfer</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>HandoverFromEUTRAPreparationRequestCDMA2000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>MasterInformationBlock</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>MBSFNAreaConfiguration</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>MeasurementReport</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>Justification for case “P”: RAN2 agreed that measurement configuration may be sent prior to security activation</td>
</tr>
<tr>
<td>MobilityFromEUTRACommand</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Paging</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>ProximityIndication</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>RRCConnectionReconfiguration</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>The message shall not be sent unprotected before security activation if it is used to perform handover or to establish SRB2 and DRBs</td>
</tr>
<tr>
<td>RRCConnectionReconfigurationComplete</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>Unprotected, if sent as response to RRCConnectionReconfiguration which was sent before security activation</td>
</tr>
<tr>
<td>RRCConnectionReestablishment</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>This message is not protected by PDCP operation.</td>
</tr>
<tr>
<td>RRCConnectionReestablishmentComplete</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>RRCConnectionReestablishmentReject</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>One reason to send this may be that the security context has been lost, therefore sent as unprotected.</td>
</tr>
<tr>
<td>RRCConnectionReestablishmentRequest</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>This message is not protected by PDCP operation. However a short MAC-I is included.</td>
</tr>
<tr>
<td>RRCConnectionReject</td>
<td>+</td>
<td>NA</td>
<td>NA</td>
<td>Justification for P: If the RRC connection only for signalling not requiring DRBs or ciphered messages, or the signalling connection has to be released prematurely, this message is sent as unprotected.</td>
</tr>
<tr>
<td>RRCConnectionRelease</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>RRCConnectionRequest</td>
<td>+</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>RRCConnectionSetup</td>
<td>+</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>RRCConnectionSetupComplete</td>
<td>+</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>SecurityModeCommand</td>
<td>+</td>
<td>NA</td>
<td>NA</td>
<td>Integrity protection applied, but no ciphering (integrity verification done after the message received by RRC)</td>
</tr>
<tr>
<td>SecurityModeComplete</td>
<td>-</td>
<td>NA</td>
<td>NA</td>
<td>Integrity protection applied, but no ciphering. Ciphering is applied after completing the procedure.</td>
</tr>
<tr>
<td>SecurityModeFailure</td>
<td>+</td>
<td>NA</td>
<td>NA</td>
<td>Neither integrity protection nor ciphering applied.</td>
</tr>
<tr>
<td>SystemInformation</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>SystemInformationBlockType1</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>UECapabilityEnquiry</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>UECapabilityInformation</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>UEInformationRequest</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>UEInformationResponse</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>ULHandoverPreparationTransferCDMA2000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>This message should follow HandoverFromEUTRAPreparationRequest</td>
</tr>
<tr>
<td>ULInformationTransfer</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>
A.7 Miscellaneous

The following miscellaneous conventions should be used:

- References: Whenever another specification is referenced, the specification number and optionally the relevant subclause, table or figure, should be indicated in addition to the pointer to the References section e.g. as follows: 'see TS 36.212 [22, 5.3.3.1.6]'.
Annex B (normative): Release 8 AS feature handling

B.1 Feature group indicators

This annex contains the definitions of the bits in field featureGroupIndicators.

In this release of the protocol, the UE shall include the field featureGroupIndicators in the IE UE-EUTRA-Capability. All the functionalities defined within the field featureGroupIndicators defined in Table B.1-1 are mandatory for the UE, if the related capability (frequency band, RAT or SR-VCC) is also supported. For a specific indicator, if all functionalities for a feature group listed in Table B.1-1 have been implemented and tested, the UE shall set the indicator as one (1), else (i.e. if any one of the functionalities in a feature group listed in Table B.1-1, which have not been implemented or tested), the UE shall set the indicator as zero (0).

The UE shall set all indicators that correspond to RATs not supported by the UE as zero (0).

The UE shall set all indicators, which do not have a definition in Table B.1-1, as zero (0).

If the optional field featureGroupIndicators is not included by a UE of a future release, the network may assume that all features pertaining to the RATs supported by the UE, listed in Table B.1-1 and deployed in the network, have been implemented and tested by the UE.

In Table B.1-1, a ‘VoLTE capable UE’ corresponds to a UE that is capable of the “Voice domain preference for E-UTRAN” defined in TS 24.301 [35] being set to “IMS PS voice only”, “IMS PS voice preferred, CS voice as secondary” or “CS voice preferred, IMS PS voice as secondary.”

<table>
<thead>
<tr>
<th>Index of indicator (bit number)</th>
<th>Definition (description of the supported functionality, if indicator set to one)</th>
<th>Notes</th>
<th>If indicated “Yes” the feature shall be implemented and successfully tested for this version of the specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>- Intra-subframe frequency hopping for PUSCH scheduled by UL grant</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- DCI format 3a (TPC commands for PUCCH and PUSCH with single bit power adjustments)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- PDSCH transmission mode 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Aperiodic CQI/PMI/RI reporting on PUSCH: Mode 2-0 – UE selected subband CQI without PMI</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Aperiodic CQI/PMI/RI reporting on PUSCH: Mode 2-2 – UE selected subband CQI with multiple PMI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>- Simultaneous CQI and ACK/NACK on PUCCH, i.e. PUCCH format 2a and 2b</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Absolute TPC command for PUSCH</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Resource allocation type 1 for PDSCH</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Periodic CQI/PMI/RI reporting on PUCCH: Mode 2-0 – UE selected subband CQI without PMI</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Periodic CQI/PMI/RI reporting on PUCCH: Mode 2-1 – UE selected subband CQI with single PMI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>- 5bit RLC UM SN</td>
<td>- can only be set to 1 if the UE has set bit number 7 to 1.</td>
<td>Yes, if UE supports VoLTE</td>
</tr>
<tr>
<td></td>
<td>- 7bit PDCP SN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>- Short DRX cycle</td>
<td>- can only be set to 1 if the UE has set bit number 5 to 1.</td>
<td></td>
</tr>
</tbody>
</table>

[Table B.1-1: Definitions of feature group indicators]
<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>- Long DRX cycle &lt;br&gt; - DRX command MAC control element</td>
<td>Yes</td>
</tr>
<tr>
<td>6</td>
<td>- Prioritised bit rate</td>
<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>- RLC UM</td>
<td>- can only be set to 0 if the UE does not support VoLTE &lt;br&gt; Yes, if UE supports VoLTE</td>
</tr>
<tr>
<td>8</td>
<td>- EUTRA RRC_CONNECTED to UTRA CELL_DCH PS handover</td>
<td>- can only be set to 1 if the UE has set bit number 22 to 1 &lt;br&gt; Yes, if UE supports UTRA</td>
</tr>
<tr>
<td>9</td>
<td>- EUTRA RRC_CONNECTED to GERAN GSM_Dedicated handover</td>
<td>- related to SR-VCC &lt;br&gt; - can only be set to 1 if the UE has set bit number 23 to 1</td>
</tr>
<tr>
<td>10</td>
<td>- EUTRA RRC_CONNECTED to GERAN (Packet_ ) Idle by Cell Change Order &lt;br&gt; - EUTRA RRC_CONNECTED to GERAN (Packet_ ) Idle by Cell Change Order with NACC (Network Assisted Cell Change)</td>
<td>- related to SR-VCC &lt;br&gt; - can only be set to 1 if the UE has set bit number 24 to 1</td>
</tr>
<tr>
<td>11</td>
<td>- EUTRA RRC_CONNECTED to CDMA2000 1xRTT CS Active handover</td>
<td>- related to SR-VCC &lt;br&gt; - can only be set to 1 if the UE has set bit number 26 to 1</td>
</tr>
<tr>
<td>12</td>
<td>- EUTRA RRC_CONNECTED to CDMA2000 HRPD Active handover</td>
<td>- can only be set to 1 if the UE has set bit number 25 to 1 &lt;br&gt; Yes, unless UE only supports band 13</td>
</tr>
<tr>
<td>13</td>
<td>- Inter-frequency handover</td>
<td>- can only be set to 1 if the UE has set bit number 25 to 1</td>
</tr>
<tr>
<td>14</td>
<td>- Measurement reporting event: Event A4 – Neighbour &gt; threshold &lt;br&gt; - Measurement reporting event: Event A5 – Serving &lt; threshold1 &amp; Neighbour &gt; threshold2</td>
<td>- can only be set to 1 if the UE has set at least one of the bit number 22, 23, 24 or 26 to 1.</td>
</tr>
<tr>
<td>15</td>
<td>- Measurement reporting event: Event B1 – Neighbour &gt; threshold</td>
<td>- can only be set to 1 if the UE has set bit number 25 to 1</td>
</tr>
<tr>
<td>16</td>
<td>- non-ANR related intra-frequency periodical measurement reporting; &lt;br&gt; - non-ANR related inter-frequency periodical measurement reporting, if the UE has set bit number 25 to 1; and &lt;br&gt; - non-ANR related inter-RAT periodical measurement reporting for UTRAN, GERAN, 1xRTT or HRPD, if the UE has set bit number 22, 23, 24 or 26 to 1, respectively. &lt;br&gt; NOTE: “non-ANR related periodical measurement reporting” corresponds only to ‘periodical’ trigger type with purpose set to ‘reportStrongestCells’. Event triggered periodical reporting (i.e., ‘event’ trigger type with reportAmount &gt; 1) is a mandatory functionality of event triggered reporting and therefore not the subject of this bit.</td>
<td>Yes</td>
</tr>
<tr>
<td>17</td>
<td>- Periodical measurement reporting for SON / ANR &lt;br&gt; - ANR related intra-frequency measurement reporting events</td>
<td>- can only be set to 1 if the UE has set bit number 5 to 1.</td>
</tr>
<tr>
<td>18</td>
<td>- ANR related inter-frequency measurement reporting events</td>
<td>- can only be set to 1 if the UE has set bit number 5 to 1.</td>
</tr>
<tr>
<td>19</td>
<td>- ANR related inter-RAT measurement reporting events</td>
<td>- can only be set to 1 if the UE has set bit number 5 to 1.</td>
</tr>
<tr>
<td>20</td>
<td>If bit number 7 is set to ‘0’: &lt;br&gt; - SRB1 and SRB2 for DCCH + 8x AM DRB</td>
<td>- Regardless of what bit number 7 and bit number 20 is set to, UE shall support at least SRB1 and SRB2 for DCCH + 4x AM DRB</td>
</tr>
<tr>
<td>Feature Group</td>
<td>Description</td>
<td>Support Conditions</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>21</td>
<td>DRB combination</td>
<td>NOTE: UE which indicate support for a DRB combination also support all subsets of the DRB combination. Therefore, release of DRB(s) never results in an unsupported DRB combination.</td>
</tr>
<tr>
<td>22</td>
<td>UTRAN measurements, reporting and measurement reporting event B2 in E-UTRA connected mode</td>
<td>Yes, if UE supports UTRA</td>
</tr>
<tr>
<td>23</td>
<td>GERAN measurements, reporting and measurement reporting event B2 in E-UTRA connected mode</td>
<td>Yes, if UE supports GERAN</td>
</tr>
<tr>
<td>24</td>
<td>1xRTT measurements, reporting and measurement reporting event B2 in E-UTRA connected mode</td>
<td>Yes, if UE supports enhanced 1xRTT CSFB</td>
</tr>
<tr>
<td>25</td>
<td>Inter-frequency measurements and reporting in E-UTRA connected mode</td>
<td>Yes, unless UE only supports band 13</td>
</tr>
<tr>
<td>26</td>
<td>HRPD measurements, reporting and measurement reporting event B2 in E-UTRA connected mode</td>
<td>Yes, if UE supports HRPD</td>
</tr>
</tbody>
</table>
| 27            | EUTRA RRC_CONNECTED to UTRA CELL_DCH CS handover | - related to SR-VCC  
- can only be set to 1 if the UE has set bit number 8 to 1 |
| 28            | TTI bundling | |
| 29            | Semi-Persistent Scheduling | Undefined |
| 30            | | Undefined |
| 31            | | Undefined |
| 32            | | Undefined |

**Clarification for mobility from EUTRAN and inter-frequency handover within EUTRAN**

There are several feature groups related to mobility from E-UTRAN and inter-frequency handover within EUTRAN. The description of these features is based on the assumption that we have 5 main "functions" related to mobility from E-UTRAN:

A. Support of measurements and cell reselection procedure in idle mode  
B. Support of RRC release with redirection procedure in connected mode  
C. Support of Network Assisted Cell Change in connected mode  
D. Support of measurements and reporting in connected mode  
E. Support of handover procedure in connected mode

All functions can be applied for mobility to Inter-frequency to EUTRAN, GERAN, UTRAN, CDMA2000 HRPD and CDMA2000 1xRTT except for function C which is only applicable for mobility to GERAN. Table B.1-2 below summarises the mobility functions that are supported based on the UE capability signaling (band support) and the setting of the feature group support indicators.
In case measurements and reporting function is not supported by UE, the network may still issue the mobility procedures redirection (B) and CCO (C) in a blind fashion.

### B.2 CSG support

In this release of the protocol, it is mandatory for the UE to support a minimum set of CSG functionality consisting of:

- Identifying whether a cell is CSG or not;
- Ignoring CSG cells in cell selection/reselection.

Additional CSG functionality in AS, i.e. the requirement to detect and camp on CSG cells when the “CSG whitelist” is available or when manual CSG selection is triggered by the user, are related to the corresponding NAS features. This additional AS functionality consists of:

- Manual CSG selection;
- Autonomous CSG search;
- Implicit priority handling for cell reselection with CSG cells.

It is possible that this additional CSG functionality in AS is not supported or tested in early UE implementations.

Note that since the above AS features relate to idle mode operations, the capability support is not signalled to the network. For these reasons, no “feature group indicator” is assigned to this feature to indicate early support in Rel-8.
Annex C (informative):
Change history
3GPP TS 36.331 version 9.6.0 Release 9

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ETSI TS 136 331 V9.6.0 (2011-03)

Change history
Date
12/2007
03/2008
03/2008
05/2008
09/2008
12/2008
03/2009

TSG #
RP-38
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TSG Doc.
RP-070920
RP-080163
RP-080164
RP-080361
RP-080693
RP-081021
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Rev Subject/Comment
Approved at TSG-RAN #38 and placed under Change Control
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CR to 36.331 with Miscellaneous corrections
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CR to 36.331 to convert RRC to agreed ASN.1 format
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CR to 36.331 on Miscellaneous clarifications/ corrections
CR on Miscellaneous corrections and clarifications
Miscellaneous corrections and clarifications
Correction to the Counter Check procedure
CR to 36.331-UE Actions on Receiving SIB11
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Spare usage on BCCH
Issues in handling optional IE upon absence in GERAN NCL
CR to 36.331 on Removal of useless RLC re-establishment at RB
release
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Clarification to RRC level padding at PCCH and BCCH
Removal of Inter-RAT message
Padding of the SRB-ID for security input
Validity of ETWS SIB
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Configuration of the Two-Intervals-SPS
Corrections on Scaling Factor Values of Qhyst
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Optionality of srsMaxUppts
CR for discussion on field name for common and dedicated IE
Corrections to Connected mode mobility
Clarification regarding the measurement reporting procedure
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Corrections on s-Measure
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R1 of CR0023 (R2-091029) on combination of SPS and TTI
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L3 filtering for path loss measurements
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S-measure handling for reportCGI
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Measurement configuration clean up
Alignment of measurement quantities for UTRA
CR to 36.331 on L1 parameters ranges alignment
Default configuration for transmissionMode
CR to 36.331 on RRC Parameters for MAC, RLC and PDCP
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CR to 36.331 - Clarification on Configured PRACH Freq Offset
Clarification on TTI bundling configuration
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Update of R2-091039 on Inter-RAT UE Capability
Feature Group Support Indicators
Corrections to RLF detection
Indication of Dedicated Priority
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Correction of TTT value range
Correction on CDMA measurement result IE
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Clarification of Measurement Reporting
Spare values in DL and UL Bandwidth in MIB and SIB2
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Validity time for ETWS message Id and Sequence No
CR for Timers and constants values used during handover to EUTRA
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CR for CSG related items in 36.331
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Delivery of Message Identifier and Serial Number to upper layers
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Clarification on the maximum size of cell lists

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RP-51  RP-110272  0578  -  Correction to cs-fallbackIndicator field description  9.5.0  9.6.0  
RP-51  RP-110265  0586  -  Clarification of band indicator in handover from E-UTRAN to GERAN  9.5.0  9.6.0  
RP-51  RP-110272  0608  -  Minor ASN.1 corrections for the UEInformationResponse message  9.5.0  9.6.0  
RP-51  RP-110272  0639  -  Small corrections to E-UTRAS and CMAS system information  9.5.0  9.6.0  
RP-51  RP-110455  0647  2  Updates to FGI settings  9.5.0  9.6.0
## History

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