**3GPP TSG-CT WG1 Meeting #128-eC1-211159**

**Electronic meeting, 25 February – 5 March 2021**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  | **24.301** | **CR** | **3482** | **rev** | **-** | **Current version:** | **17.1.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network |  |

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| ***Title:***  | Rapporteur clean-up |
|  |  |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell, Ericsson |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | TEI17 |  | ***Date:*** | 2021-02-25 |
|  |  |  |  |  |
| ***Category:*** | **D** |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)...Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | There are editorial errors in the TS. |
|  |  |
| ***Summary of change:*** | Editorial fixes are made. |
|  |  |
| ***Consequences if not approved:*** | Editorial errors remain. |
|  |  |
| ***Clauses affected:*** | 3.2, 4.3.1, 4.4.2.3, 4.4.2.5, 4.4.4.1, 4.5, 4.7, 4.8, 4.9, 5.1.3.2.2.6, 5.2.3.2.2, 5.3.1.1, 5.3.1.2.1, 5.3.5, 5.3.7b, 5.3.17, 5.4.1.6, 5.4.3.2, 5.4.3.3, 5.5.1.2.2, 5.5.1.2.4, 5.5.1.2.5B, 5.5.1.2.6, 5.5.1.3.4.2, 5.5.1.3.4.3, 5.5.1.3.5, 5.5.2.1, 5.5.2.2.1, 5.5.2.3.5, 5.5.3.1, 5.5.3.2.2, 5.5.3.2.4, 5.5.3.2.6, 5.5.3.2.7, 5.5.3.3.2, 5.5.3.3.4.2, 5.6.1.2.2, 5.6.1.6, 5.6.2.2.1.2, 5.6.1.6, 5.6.2.2.1.2, 5.6.2.3.3, 5.6.3.4, 5.6.4.4, 6.2.2, 6.3.3, 6.4.1.6, 6.5.3.4.1, 6.5.4.2, 6.6.1.2.2, 6.6.3.3, 6.6.4.4, 8.2.26.22, 9.6, 9.9.3.12A, 9.9.3.22, 9.9.3.34, 9.9.3.42, 9.9.3.43, 9.9.3.51, 9.9.3.56, 9.9.3.57, 9.9.3.61, 9.9.3.62, 9.9.4.3, 9.9.4.22, 9.9.4.27, 9.9.4.29, 9.9.4.30, 10.2, A.1, D.1 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP 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 3GPP TR 21.905 [1].

5G-GUTI 5G-Globally Unique Temporary Identifier

5GMM 5GS Mobility Management

5GS 5G System

ACDC Application specific Congestion control for Data Communication

AKA Authentication and Key Agreement

AMBR Aggregate Maximum Bit Rate

APN Access Point Name

APN-AMBR APN Aggregate Maximum Bit Rate

ARP Allocation Retention Priority

BCM Bearer Control Mode

CIoT Cellular IoT

CP-CIoT Control Plane CIoT

CP-EDT Control Plane EDT

CSG Closed Subscriber Group

E-UTRA Evolved Universal Terrestrial Radio Access

E-UTRAN Evolved Universal Terrestrial Radio Access Network

EAB Extended Access Barring

ECM EPS Connection Management

eDRX Extended idle-mode DRX cycle

EDT Early Data Transmission

EENLV Extended Emergency Number List Validity

eKSI Key Set Identifier for E-UTRAN

EMM EPS Mobility Management

eNode B Evolved Node B

EPC Evolved Packet Core Network

EPS Evolved Packet System

ESM EPS Session Management

GBR Guaranteed Bit Rate

GUMMEI Globally Unique MME Identifier

GUTI Globally Unique Temporary Identifier

HeNB Home eNode B

HRPD High Rate Packet Data

IoT Internet of Things

IP-CAN IP-Connectivity Access Network

ISR Idle mode Signalling Reduction

kbps Kilobits per second

KSI Key Set Identifier

L-GW Local PDN Gateway

LHN-ID Local Home Network Identifier

LIPA Local IP Access

M-TMSI M-Temporary Mobile Subscriber Identity

Mbps Megabits per second

MBR Maximum Bit Rate

MME Mobility Management Entity

MMEC MME Code

MT-EDT Mobile Terminated-Early Data Transmission

NB-IoT Narrowband IoT

NR New Radio

NSSAI Network Slice Selection Assistance Information

PD Protocol Discriminator

PDN GW Packet Data Network Gateway

ProSe Proximity-based Services

PSM Power Saving Mode

PTI Procedure Transaction Identity

QCI QoS Class Identifier

QoS Quality of Service

RACS Radio Capability Signalling Optimisation

RLOS Restricted Local Operator Services

ROHC RObust Header Compression

RRC Radio Resource Control

S-NSSAI Single NSSAI

S-TMSI S-Temporary Mobile Subscriber Identity

S101-AP S101 Application Protocol

S1AP S1 Application Protocol

SAE System Architecture Evolution

SCEF Service Capability Exposure Function

SGC Service Gap Control

SIPTO Selected IP Traffic Offload

TA Tracking Area

TAC Tracking Area Code

TAI Tracking Area Identity

TFT Traffic Flow Template

TI Transaction Identifier

TIN Temporary Identity used in Next update

URN Uniform Resource Name

V2X Vehicle-to-Everything

WUS Wake-Up Signal

\*\*\*\*\* Next change \*\*\*\*\*

### 4.3.1 General

A UE attached for EPS services shall operate in one of the following operation modes:

- PS mode 1 of operation: the UE registers only to EPS services, and UE's usage setting is "voice centric";

- PS mode 2 of operation: the UE registers only to EPS services, and UE's usage setting is "data centric";

- CS/PS mode 1 of operation: the UE registers to both EPS and non-EPS services, and UE's usage setting is "voice centric"; and

- CS/PS mode 2 of operation: the UE registers to both EPS and non-EPS services, and UE's usage setting is "data centric".

A UE configured to use CS fallback, shall operate in CS/PS mode 1 or CS/PS mode 2. Such UE may also be configured to use IMS, in which case the voice domain preference for E-UTRAN as defined in 3GPP TS 24.167 [13B] shall be used for the selection of the domain for originating voice communication services.

NOTE 1: The domain selected for originating voice communication services can be ignored by attempting a CS emergency call.

Upon request from upper layers to establish a CS emergency call:

- if the UE needs to initiate a CS fallback emergency call but it is unable to perform CS fallback, the UE shall attempt to select GERAN or UTRAN radio access technology, and a UE with "IMS voice not available" should disable the E-UTRA capability (see subclause 4.5) to allow a potential callback, and then progress the CS emergency call establishment;

- if the UE needs to initiate a 1xCS fallback emergency call but it is unable to perform 1xCS fallback, the UE shall attempt to select cdma2000® 1x radio access technology to establish the call.

NOTE 2: Unable to perform CS fallback or 1xCS fallback means that either the UE was not allowed to attempt CS fallback or 1xCS fallback, or CS fallback or 1xCS fallback attempt failed.

A UE configured to use SMS over SGs shall operate in CS/PS mode 1 or CS/PS mode 2.

The behaviour of the UE in CS/PS mode 1 of operation, upon failure to access the CS domain or upon reception of a "CS fallback not preferred" or "SMS only" indication, will depend on the availability of voice over IMS. In the present document, "IMS voice not available" refers to one of the following conditions:

a) the UE is not configured to use IMS;

b) the UE is not configured to use IMS voice, i.e. when the voice domain preference for E-UTRAN, as defined in 3GPP TS 24.167 [13B], indicates that voice communication services are allowed to be invoked only over the CS domain;

c) the UE is configured to use IMS voice, but the network indicates in the ATTACH ACCEPT message or the TRACKING AREA UPDATE ACCEPT message that IMS voice over PS sessions are not supported; or

d) the UE is configured to use IMS voice, the network indicates in the ATTACH ACCEPT message or the TRACKING AREA UPDATE ACCEPT message that IMS voice over PS sessions are supported, but the upper layers:

- provide no indication that the UE is available for voice call in the IMS within a manufacturer determined period of time; or

- indicate that the UE is not available for voice calls in the IMS.

NOTE 3: If conditions a, b and c evaluate to false, the upper layers need time to attempt IMS registration. In the event an indication from the upper layers that the UE is available for voice calls in the IMS takes longer than the manufacturer determined period of time (e.g. due to delay when attempting IMS registration or due to delay obtaining an EPS bearer context for SIP signalling), the NAS layer assumes the UE is not available for voice calls in the IMS.

Other conditions may exist but these are implementation specific.

In the present document, "IMS voice available" refers to the conditions a, b, c and d, and other implementation specific conditions for "IMS voice not available" evaluate to false.

\*\*\*\*\* Next change \*\*\*\*\*

#### 4.4.2.3 Establishment of secure exchange of NAS messages

Secure exchange of NAS messages via a NAS signalling connection is usually established by the MME during the attach procedure by initiating a security mode control procedure. After successful completion of the security mode control procedure, all NAS messages exchanged between the UE and the MME are sent integrity protected using the current EPS security algorithms, and except for the messages specified in subclause 4.4.5, all NAS messages exchanged between the UE and the MME are sent ciphered using the current EPS security algorithms.

During inter-system handover from A/Gb mode to S1 mode or Iu mode to S1 mode, secure exchange of NAS messages is established between the MME and the UE by:

- the transmission of NAS security related parameters encapsulated in the AS signalling from the MME to the UE triggering the inter-system handover (see 3GPP TS 33.401 [19]). The UE uses these parameters to generate the mapped EPS security context; and,

- after the handover, the transmission of a TRACKING AREA UPDATE REQUEST message from the UE to the MME. The UE shall send this message integrity protected using the mapped EPS security context, but unciphered. From this time onward, all NAS messages exchanged between the UE and the MME are sent integrity protected using the mapped EPS security context, and except for the messages specified in subclause 4.4.5, all NAS messages exchanged between the UE and the MME are sent ciphered using the mapped EPS security context.

During inter-system change from N1 mode to S1 mode in EMM-CONNECTED mode, secure exchange of NAS messages is established between the MME and the UE by:

- the transmission of NAS security related parameters encapsulated in the AS signalling from the AMF to the UE triggering the inter-system handover (see 3GPP TS 33.501 [56]). The UE uses these parameters to generate the mapped EPS security context (see subclause 8.6.1 of 3GPP TS 33.501 [56]); and

- after the handover, the transmission of a TRACKING AREA UPDATE REQUEST message from the UE to the MME. The UE shall send this message integrity protected using the mapped EPS security context, but unciphered. From this time onward, all NAS messages exchanged between the UE and the MME are sent integrity protected using the mapped EPS security context, and except for the messages specified in subclause 4.4.5, all NAS messages exchanged between the UE and the MME are sent ciphered using the mapped EPS security context.

During inter-system change from N1 mode to S1 mode in EMM-IDLE mode, if the UE is operating in the single-registration mode and:

1) if the tracking area updating procedure is initiated as specified in 3GPP TS 24.501 [54], the UE shall transmit a TRACKING AREA UPDATE REQUEST message integrity protected with the current 5G NAS security context and the UE shall derive a mapped EPS security context (see subclause 8.6.1 of 3GPP TS 33.501 [56]). The UE shall set the uplink and downlink NAS COUNT counters to the uplink and downlink NAS COUNT counters of the current 5G NAS security context respectively. The UE shall include the eKSI indicating the 5G NAS security context value in the TRACKING AREA UPDATE REQUEST message.

 After receiving the TRACKING AREA UPDATE REQUEST message including the eKSI, the MME forwards the TRACKING AREA UPDATE REQUEST message to the source AMF, if possible, to obtain the mapped EPS security context from the AMF as specified in 3GPP TS 33.501 [56]. The MME shall store the mapped EPS NAS security context with the uplink and downlink NAS COUNT counters associated with the derived K'ASME key set to the uplink and downlink NAS COUNT counters of the mapped EPS NAS security context respectively. The MME re-establishes the secure exchange of NAS messages by either:

- replying with a TRACKING AREA UPDATE ACCEPT message that is integrity protected and ciphered using the mapped EPS security context. From this time onward, all NAS messages exchanged between the UE and the MME are sent integrity protected and except for the messages specified in subclause 4.4.5, all NAS messages exchanged between the UE and the MME are sent ciphered; or

- initiating a security mode control procedure. This can be used by the MME to take a non-current EPS security context into use or to modify the current EPS security context by selecting new NAS security algorithms; or

2) if the attach procedure is initiated as specified in 3GPP TS 24.501 [54] and:

a) if the UE has received an "interworking without N26 interface not supported" indication from the network and the UE has a valid 5G NAS security context, the UE shall send an ATTACH REQUEST message integrity protected with the current 5G NAS security context and the UE shall derive a mapped EPS security context (see subclause 8.6.1 of 3GPP TS 33.501 [56]). The UE shall set the uplink and downlink NAS COUNT counters to the uplink and downlink NAS COUNT counters of the current 5G NAS security context respectively. The UE shall include the eKSI indicating the 5G NAS security context value in the ATTACH REQUEST message.

 After receiving the ATTACH REQUEST message including the eKSI, the MME forwards the ATTACH REQUEST message to the source AMF, if possible, to obtain the mapped EPS security context from the AMF as specified in 3GPP TS 33.501 [56]. The MME shall store the mapped EPS NAS security context with the uplink and downlink NAS COUNT counters associated with the derived K'ASME key set to the uplink and downlink NAS COUNT counters of the mapped EPS NAS security context respectively. The MME re-establishes the secure exchange of NAS messages by either:

- replying with an ATTACH ACCEPT message that is integrity protected and ciphered using the mapped EPS NAS security context. From this time onward, all NAS messages exchanged between the UE and the MME are sent integrity protected and except for the messages specified in subclause 4.4.5, all NAS messages exchanged between the UE and the MME are sent ciphered; or

- initiating a security mode control procedure. This can be used by the MME to modify the current EPS security context by selecting new NAS security algorithms; or

b) otherwise:

i) if the UE has a valid native EPS security context, the UE shall send an ATTACH REQUEST message integrity protected with the native EPS security context. The UE shall include the eKSI indicating the native EPS security context value in the ATTACH REQUEST message.

 After receiving the ATTACH REQUEST message including the eKSI, the MME shall check whether the eKSI included in the initial NAS message belongs to an EPS security context available in the MME, and shall verify the MAC of the NAS message. If the verification is successful, the MME re-establishes the secure exchange of NAS messages by either:

- replying with an ATTACH ACCEPT message that is integrity protected and ciphered using the current EPS security context. From this time onward, all NAS messages exchanged between the UE and the MME are sent integrity protected and except for the messages specified in subclause 4.4.5, all NAS messages exchanged between the UE and the MME are sent ciphered; or

- initiating a security mode control procedure. This can be used by the MME to modify the current EPS security context by selecting new NAS security algorithms; or

ii) if the UE has no valid native EPS security context, the UE shall send an ATTACH REQUEST message without integrity protection and encryption.

The secure exchange of NAS messages shall be continued after S1 mode to S1 mode handover. It is terminated after inter-system handover from S1 mode to A/Gb mode or Iu mode or when the NAS signalling connection is released.

When a UE in EMM-IDLE mode establishes a new NAS signalling connection and has a valid current EPS security context, secure exchange of NAS messages can be re-established in the following ways:

1) Except for the cases described in items 3 and 4 below, the UE shall transmit the initial NAS message integrity protected with the current EPS security context, but unciphered. The UE shall include the eKSI indicating the current EPS security context value in the initial NAS message. The MME shall check whether the eKSI included in the initial NAS message belongs to an EPS security context available in the MME, and shall verify the MAC of the NAS message. If the verification is successful, the MME may re-establish the secure exchange of NAS messages:

- by replying with a NAS message that is integrity protected and ciphered using the current EPS security context. From this time onward, all NAS messages exchanged between the UE and the MME are sent integrity protected and except for the messages specified in subclause 4.4.5, all NAS messages exchanged between the UE and the MME are sent ciphered; or

- by initiating a security mode control procedure. This can be used by the MME to take a non-current EPS security context into use or to modify the current EPS security context by selecting new NAS security algorithms; or

2) If the initial NAS message was a SERVICE REQUEST message or EXTENDED SERVICE REQUEST message, secure exchange of NAS messages is triggered by the indication from the lower layers that the user plane radio bearers are successfully set up. After successful completion of the procedure, all NAS messages exchanged between the UE and the MME are sent integrity protected and except for the messages specified in subclause 4.4.5, all NAS messages exchanged between the UE and the MME are sent ciphered.

3) If the UE has no current EPS security context and performs a tracking area updating procedure after an inter-system change in idle mode from A/Gb mode to S1 mode or Iu mode to S1 mode, the UE shall send the TRACKING AREA UPDATE REQUEST message without integrity protection and encryption. The UE shall include a nonce and a GPRS ciphering key sequence number for creation of a mapped EPS security context. The MME creates a fresh mapped EPS security context and takes this context into use by initiating a security mode control procedure and this context becomes the current EPS security context in both the UE and the MME. This re-establishes the secure exchange of NAS messages.

4) If the initial NAS message is a CONTROL PLANE SERVICE REQUEST message, the UE shall send the message integrity protected. If an ESM message container information element or a NAS message container information element is included the message shall be sent partially ciphered (see subclause 4.4.5), otherwise the message shall be sent unciphered. Secure exchange of NAS messages is re-established in the UE:

- by the indication from the lower layers that the user plane radio bearers are successfully set up;

- upon receipt of a NAS message (e.g. a SERVICE ACCEPT message or ESM DATA TRANSPORT message) that is integrity protected and ciphered using the current EPS security context; or

- upon receipt of a SECURITY MODE COMMAND message that has successfully passed the integrity check.

\*\*\*\*\* Next change \*\*\*\*\*

#### 4.4.2.5 Derivation of keys at CS to PS SRVCC handover from A/Gb mode to S1 mode or from Iu mode to S1 mode

At change from A/Gb mode to S1 mode or from Iu mode to S1 mode due to CS to PS SRVCC handover (see 3GPP TS 23.216 [8]), the UE shall derive a mapped EPS security context for the PS domain from the UMTS security context for the CS domain.

At change from A/Gb mode to S1 mode due to CS to PS SRVCC handover, ciphering may be started and integrity protection shall be started (see 3GPP TS 36.331 [22]) without any new authentication procedure.

NOTE 1: CS to PS SRVCC handover from A/Gb mode to S1 mode or from Iu mode to S1 mode is not supported if the current CS security context is a GSM security context.

NOTE 2: For emergency calls, CS to PS SRVCC handover from A/Gb mode to S1 mode or from Iu mode to S1 mode is not supported.

In order to derive a mapped EPS security context for a CS to PS SRVCC handover from A/Gb mode or Iu mode to S1 mode, the MSC creates a NONCEMSC and generates the CK'PS and IK'PS using the CS UMTS integrity key, the CS UMTS ciphering key and the created NONCEMSC as specified in annex B.6 in 3GPP TS 33.102 [18]. The MSC associates the CK'PS and IK'PS with a KSI'PS. The KSI'PS is set to the value of the KSICS associated with the CS UMTS integrity key and the CS UMTS ciphering key. The MSC transfers the CK'PS, IK'PS and the KSI'PS to the MME. The MME shall create a mapped EPS security context by setting the K'ASME to the concatenation of the CK'PS and IK'PS received from the MSC (i.e. CK'PS || IK'PS). The MME shall associate the K'ASME with a KSISGSN. The MME shall set KSISGSN to the value of the KSI'PS received from the MSC. The MME shall include the selected NAS algorithms, NONCEMME and generated KSISGSN (associated with the K'ASME) in the NAS security transparent container for the handover to E-UTRAN. The MME shall derive the EPS NAS keys from K'ASME.

When the UE receives the command to perform CS to PS SRVCC handover to S1 mode, the ME shall generate the CK'PS and IK'PS using the CS UMTS integrity key, the CS UMTS ciphering key and the received NONCEMSC value in the transparent container in the CS to PS SRVCC handover command as specified in annex B.6 in 3GPP TS 33.102 [18]. The ME shall ignore the NONCEMME value received in the NAS Security Transparent Container in the CS to PS SRVCC handover command.

NOTE 3: The NONCEMME value received in the NAS Security Transparent Container for the handover to E-UTRAN is not used by the ME or MME in any key derivation in this handover.

The ME shall create the key K'ASME by concatenating the derived CK'PS and IK'PS (i.e. CK'PS || IK'PS.). The ME shall associate the derived key K'ASME with a KSISGSN. The ME shall set the KSISGSN associated to K'ASME to the KSISGSN value received in the NAS Security Transparent Container from the network.

NOTE 4: Although this case is related to the MSC server enhanced for SRVCC, the name KSISGSN is kept to avoid introducing a new name for the same domain.

The ME shall derive the EPS NAS keys (CK' and IK') from the K'ASME as specified in 3GPP TS 33.401 [19]. The ME shall apply these derived EPS NAS security keys (CK' and IK'), reset the uplink and downlink NAS COUNT values for the mapped EPS security context (i.e. to the value 0), and replace an already established mapped EPS security context for the PS domain, if any, in the ME, when the CS to PS SRVCC handover from A/Gb mode or Iu mode has been completed successfully. If the already established current EPS security context is of type native, then it shall become the non-current native EPS security context and overwrite any existing non-current native EPS security context in the ME.

The network shall replace an already established mapped EPS security context for the PS domain, if any, when the CS to PS SRVCC handover from A/Gb mode or Iu mode has been completed successfully. If the already established current EPS security context is of type native, then it shall become the non-current native EPS security context and overwrite any existing non-current native EPS security context in the MME.

If the CS to PS SRVCC handover from A/Gb mode or Iu mode has not been completed successfully, the UE and the network shall delete the new derived mapped EPS security context for the PS domain. Additionally, the network shall delete an already established mapped EPS security context for the PS domain, if any, if the eKSI of the already established EPS security context is equal to the KSISGSN of the new derived EPS security context for the PS domain.

\*\*\*\*\* Next change \*\*\*\*\*

#### 4.4.4.1 General

For the UE, integrity protected signalling is mandatory for the NAS messages once a valid EPS security context exists and has been taken into use. For the network, integrity protected signalling is mandatory for the NAS messages once a secure exchange of NAS messages has been established for the NAS signalling connection. Integrity protection of all NAS signalling messages is the responsibility of the NAS. It is the network which activates integrity protection.

The use of "null integrity protection algorithm" EIA0 (see subclause 9.9.3.23) in the current security context is only allowed for an unauthenticated UE for which establishment of emergency bearer services or access to RLOS is allowed. For setting the security header type in outbound NAS messages, the UE and the MME shall apply the same rules irrespective of whether the "null integrity protection algorithm" or any other integrity protection algorithm is indicated in the security context.

If the "null integrity protection algorithm" EIA0 has been selected as an integrity protection algorithm, the receiver shall regard the NAS messages with the security header indicating integrity protection as integrity protected.

Details of the integrity protection and verification of NAS signalling messages are specified in 3GPP TS 33.401 [19].

When a NAS message needs to be sent both ciphered and integrity protected, the NAS message is first ciphered and then the ciphered NAS message and the NAS sequence number are integrity protected by calculating the MAC. The same applies when an initial NAS message needs to be sent partially ciphered and integrity protected.

NOTE: NAS messages that are ciphered or partially ciphered with the "null ciphering algorithm" EEA0 are regarded as ciphered or partially ciphered, respectively (see subclause 4.4.5).

When a NAS message needs to be sent only integrity protected and unciphered, the unciphered NAS message and the NAS sequence number are integrity protected by calculating the MAC.

When during the EPS attach procedure or service request procedure an ESM message is piggybacked in an EMM message, there is only one sequence number IE and one message authentication code IE, if any, for the combined NAS message.

\*\*\*\*\* Next change \*\*\*\*\*

## 4.5 Disabling and re-enabling of UE's E-UTRA capability

The UE shall only disable the E-UTRA capability when in EMM-IDLE mode.

When the UE supports both N1 mode and S1 mode then the UE's capability to access the 5GCN via E-UTRA shall not be affected, if the UE's E-UTRA capability is disabled or enabled.

When the UE is disabling the E-UTRA capability not due to redirection to 5GCN required, it should proceed as follows:

a) select another RAT (GERAN, UTRAN, or NG-RAN if the UE has not disabled its N1 mode capability for 3GPP access as specified in 3GPP TS 24.501 [54]) of the registered PLMN or a PLMN from the list of equivalent PLMNs;

b) if another RAT of the registered PLMN or a PLMN from the list of equivalent PLMNs cannot be found, or the UE does not have a registered PLMN, then perform PLMN selection as specified in 3GPP TS 23.122 [6]. As an implementation option, instead of performing PLMN selection, the UE may select another RAT of the chosen PLMN. If disabling of E-UTRA capability was not due to UE initiated detach procedure for EPS services only, the UE may re-enable the E-UTRA capability for this PLMN selection; or

c) if no other allowed PLMN and RAT combinations are available, then the UE may re-enable the E-UTRA capability and remain registered for EPS services in E-UTRAN of the registered PLMN. If the UE chooses this option, then it may periodically attempt to select another PLMN and RAT combination that can provide non-EPS services. How this periodic scanning is done, is UE implementation dependent.

When the UE is disabling the E-UTRA capability upon receiving reject cause #31 "Redirection to 5GCN required" as specified in subclauses 5.5.1.2.5, 5.5.1.3.5, 5.5.3.2.5, 5.5.3.3.5 and 5.6.1.5, it should proceed as follows:

i) If the UE is in NB-S1 mode:

1) if lower layers do not provide an indication that the current E-UTRA cell is connected to 5GCN or lower layers do not provide an indication that the current E-UTRA cell supports CIoT 5GS optimizations that are supported by the UE, search for a suitable NB-IoT cell connected to 5GCN according to 3GPP TS 36.304 [21];

2) if lower layers provide an indication that the current E-UTRA cell is connected to 5GCN and the current E-UTRA cell supports CIoT 5GS optimizations that are supported by the UE then perform a core network selection to select 5GCN as specified in 3GPP TS 24.501 [54] subclause 4.8.4A.1; or

3) if lower layers cannot find a suitable NB-IoT cell connected to 5GCN or there is no suitable NB-IoT cell connected to 5GCN which supports CIoT 5GS optimizations that are supported by the UE, the UE may re-enable the E-UTRA capability, and indicate to lower layers to remain camped in E-UTRA connected to EPC of the previously registered PLMN and proceed with the appropriate EMM procedure.

ii) If the UE is in WB-S1 mode:

1) if lower layers do not provide an indication that the current E-UTRA cell is connected to 5GCN or lower layers do not provide an indication that the current E-UTRA cell supports CIoT 5GS optimizations that are supported by the UE, search for a suitable E-UTRA cell connected to 5GCN according to 3GPP TS 36.304 [21];

2) if lower layers provide an indication that the current E-UTRA cell is connected to 5GCN and the current E-UTRA cell supports CIoT 5GS optimizations that are supported by the UE, then perform a core network selection to select 5GCN as specified in 3GPP TS 24.501 [54] subclause 4.8.4A.1; or

3) if lower layers cannot find a suitable E-UTRA cell connected to 5GCN or there is no suitable E-UTRA cell connected to 5GCN which supports CIoT 5GS optimizations that are supported by the UE, the UE may re-enable the E-UTRA capability, and indicate to lower layers to remain camped in E-UTRA connected to EPC of the previously registered PLMN and proceed with the appropriate EMM procedure.

The UE shall re-enable the E-UTRA capability when performing a PLMN selection unless:

- the disabling of E-UTRA capability was due to UE initiated detach procedure for EPS services only; or

- the UE has already re-enabled the E-UTRA capability when performing bullets b) or c) above.

If due to handover, the UE moves to a new PLMN in A/Gb, Iu, or N1 mode which is not in the list of equivalent PLMNs and not a PLMN memorized by the UE for which E-UTRA capability was disabled, and the disabling of E-UTRA capability was not due to UE initiated detach procedure for EPS services only, the UE shall re-enable the E-UTRA capability after the RR/RRC connection is released.

If UE that has disabled its E-UTRA capability due to IMS voice not available and CS fallback not available re-enables it when PLMN selection is performed, then it should memorize the identity of the PLMNs where E-UTRA capability was disabled and use that stored information in subsequent PLMN selections as specified in 3GPP TS 23.122 [6].

The UE may support "E-UTRA Disabling for EMM cause #15" and implement the following behaviour:

- if the "E-UTRA Disabling Allowed for EMM cause #15" parameter as specified in 3GPP TS 24.368 [15A] or 3GPP TS 31.102 [17] is present and set to enabled; and

- if the UE receives an ATTACH REJECT or TRACKING AREA UPDATE REJECT message including both EMM cause #15 "no suitable cells in tracking area" and an Extended EMM cause IE with value "E-UTRAN not allowed";

then the UE shall disable the E-UTRA capability, memorize the identity of the PLMN where the E-UTRA capability was disabled and use that stored information in subsequent PLMN selections as specified in 3GPP TS 23.122 [6].

When the UE supporting the A/Gb and/or Iu mode together with the S1 mode needs to stay in A/Gb or Iu mode, in order to prevent unwanted handover or cell reselection from UTRAN/GERAN to E-UTRAN, the UE shall disable the E-UTRA capability and:

- The UE shall not set the E-UTRA support bits of the MS Radio Access capability IE (see 3GPP TS 24.008 [13], subclause 10.5.5.12a), the E-UTRA support bits of Mobile Station Classmark 3 IE (see 3GPP TS 24.008 [13], subclause 10.5.1.7), the PS inter-RAT HO from GERAN to E-UTRAN S1 mode capability bit and the ISR support bit of the MS network capability IE (see 3GPP TS 24.008 [13], subclause 10.5.5.12) in the ATTACH REQUEST message and the ROUTING AREA UPDATE REQUEST message after it selects GERAN or UTRAN;

- the UE shall use the same value of the EPC capability bit of the MS network capability IE (see 3GPP TS 24.008 [13], subclause 10.5.5.12) in the ATTACH REQUEST message and the ROUTING AREA UPDATE REQUEST message; and

- the UE NAS layer shall indicate the access stratum layer(s) of disabling of the E-UTRA capability.

When the UE supporting N1 mode together with S1 mode needs to stay in N1 mode, in order to prevent unwanted handover or cell reselection from NG-RAN to E-UTRAN, the UE shall disable the E-UTRA capability and:

- the UE shall set the S1 mode bit to "S1 mode not supported" in the 5GMM Capability IE of the REGISTRATION REQUEST message (see 3GPP TS 24.501 [54]);

- the UE shall not include the S1 UE network capability IE in the REGISTRATION REQUEST message (see 3GPP TS 24.501 [54]); and

- the UE NAS layer shall indicate the access stratum layer(s) of disabling of the E-UTRA capability.

If the UE is disabling its E-UTRA capability before selecting to GERAN, UTRAN or NG-RAN radio access technology, the UE shall not perform the detach procedure of subclause 5.5.2.1.

If the UE is required to disable the E-UTRA capability and select GERAN, UTRAN or NG-RAN radio access technology, and the UE is in the EMM-CONNECTED mode:

- if the UE has a persistent EPS bearer context and the ongoing procedure is not a detach procedure, then the UE shall wait until the radio bearer associated with the persistent EPS bearer context has been released;

- otherwise, the UE shall locally release the established NAS signalling connection and enter the EMM-IDLE mode before selecting GERAN, UTRAN or NG-RAN radio access technology.

If the E-UTRA capability was disabled due to the attempt to select GERAN or UTRAN radio access technology progressing the CS emergency call establishment (see subclause 4.3.1), the criteria to enable the E-UTRA capability again is UE implementation specific.

If the E-UTRA capability was disabled due to the UE initiated detach procedure for EPS services only (see subclause 5.5.2.2.2), upon request of the upper layers to re-attach for EPS services the UE shall enable the E-UTRA capability again. If the E-UTRA capability was disabled due to receipt of EMM cause #14 "EPS services not allowed in this PLMN", then the UE shall enable the E-UTRA capability when the UE powers off and powers on again or the USIM is removed. If E-UTRA capability was disabled for any other reason, the UE shall enable the E-UTRA capability in the following cases:

- the UE mode of operation changes from CS/PS mode 1 of operation to CS/PS mode 2 of operation;

- the UE mode of operation changes from PS mode 1 of operation to PS mode 2 of operation; or

- the UE powers off and powers on again or the USIM is removed;

As an implementation option, the UE may start a timer for enabling E-UTRA when the UE's attach attempt counter or tracking area updating attempt counter reaches 5 and the UE disables E-UTRA capability for cases described in subclauses 5.5.1.2.6, 5.5.1.3.4.3, 5.5.1.3.6, 5.5.3.2.6, 5.5.3.3.4.3 and 5.5.3.3.6. The UE should memorize the identity of the PLMNs where E-UTRA capability were disabled. On expiry of this timer:

- if the UE is in Iu mode or A/Gb mode and is in idle mode as specified in 3GPP TS 24.008 [13] on expiry of the timer, the UE should enable the E-UTRA capability;

- if the UE is in Iu mode or A/Gb mode and an RR connection exists, the UE shall delay enabling E-UTRA capability until the RR connection is released;

- if the UE is in Iu mode and a PS signalling connection exists but no RR connection exists, the UE may abort the PS signalling connection before enabling E-UTRA capability;

- if the UE is in N1 mode and is in 5GMM-IDLE mode as specified in 3GPP TS 24.501 [54], on expiry of the timer, the UE should enable the E-UTRA capability; and

- if the UE is in N1 mode and is in 5GMM-CONNECTED mode as specified in 3GPP TS 24.501 [54], on expiry of the timer, the UE shall delay enabling the E-UTRA capability until the N1 NAS signalling connection is released.

If the UE attempts to establish an emergency bearer service in a PLMN where the E-UTRA capability was disabled due to the UE's attach attempt counter or tracking area updating attempt counter have reached 5, the UE may enable the E-UTRA capability for that PLMN memorized by the UE.

For other cases, it is up to the UE implementation when to enable the E-UTRA capability.

NOTE: If the UE is not operating in CS/PS mode 1 operation, the value of the timer for enabling E-UTRA capability is recommended to be not larger than the default value of T3402.

\*\*\*\*\* Next change \*\*\*\*\*

## 4.7 EPS mobility management and EPS session management in NB-S1 mode

A UE in NB-S1 mode (see 3GPP TS 36.331 [22]) shall calculate the value of the applicable NAS timer:

- indicated in table 10.2.1 plus 240s; and

- indicated in table 10.3.1 plus 180s.

The timer value obtained is used as described in the appropriate procedure subclause of this specification. The NAS timer value shall be calculated at start of a NAS procedure and shall not re-calculate the use of the NAS timer value until the NAS procedure is completed, restarted or aborted.

When an MME that supports NB-S1 mode performs NAS signalling with a UE, which is using NB-S1 mode, the MME shall calculate the value of the applicable NAS timer:

- indicated in table 10.2.2 plus 240s; and

- indicated in table 10.3.2 plus 180s.

The timer value obtained is used as described in the appropriate procedure subclause of this specification. The NAS timer value shall be calculated at start of a NAS procedure and shall not re-calculate the use of the NAS timer value until the NAS procedure is completed, restarted or aborted.

NOTE: If the tracking area updating procedure is initiated in EMM-CONNECTED mode, the MME can stop any running implementation specific supervision timer if it is started when sending an ESM DATA TRANSPORT message to the UE.

\*\*\*\*\* Next change \*\*\*\*\*

## 4.8 EPS mobility management and EPS session management in WB-S1 mode for IoT

In WB-S1 mode, a UE operating in category CE can operate in either CE mode A or CE mode B (see 3GPP TS 36.306 [44]). If a UE that supports CE mode B and operates in WB-S1 mode the UE's usage setting is not set to "voice centric" (see 3GPP TS 23.401 [10]), and

a) the use of enhanced coverage is not restricted for the UE; or

b) CE mode B is not restricted for the UE (see 3GPP TS 23.401 [10]);

the UE shall apply the value of the applicable NAS timer indicated in tables 10.2.1 and indicated in table 10.3.1 for WB-S1/CE mode.

A UE that supports CE mode B and operates in WB-S1 mode shall not apply the value of the applicable NAS timer indicated in table 10.2.1 and table 10.3.1 for WB-S1/CE mode before receiving an indication from the network that the use of enhanced coverage is not restricted as described in this subclause.

The NAS timer value obtained is used as described in the appropriate procedure subclause of this specification. The NAS timer value shall be calculated at start of a NAS procedure, and shall not be re-calculated until the NAS procedure is completed, restarted or aborted.

The support of CE mode B by a UE is indicated to the MME by lower layers and shall be stored by the MME. When an MME that supports WB-S1 mode performs NAS signalling with a UE, which supports CE mode B and operates in WB-S1 mode and the MME determines that

a) the use of enhanced coverage is not restricted for the UE; or

b) CE mode B is not restricted for the UE (see 3GPP TS 23.401 [10])

the MME shall calculate the value of the applicable NAS timer indicated in tables 10.2.2 and indicated in table 10.3.2 for WB-S1/CE mode.

The NAS timer value obtained is used as described in the appropriate procedure subclause of this specification. The NAS timer value shall be calculated at start of a NAS procedure and shall not be re-calculated until the NAS procedure is completed, restarted or aborted.

\*\*\*\*\* Next change \*\*\*\*\*

## 4.9 Disabling and re-enabling of UE's NB-IoT capability

If the UE supports disabling and re-enabling of UE's NB-IoT capability and the UE in NB-S1 mode is disabling the NB-IoT capability, it should proceed as follows:

a) select E-UTRAN of the registered PLMN or a PLMN from the list of equivalent PLMNs;

b) if E-UTRAN of the registered PLMN or a PLMN from the list of equivalent PLMNs cannot be found, select another RAT (GERAN, UTRAN, or NG-RAN if the UE has not disabled its N1 mode capability for 3GPP access as specified in 3GPP TS 24.501 [54]) of the registered PLMN or a PLMN from the list of equivalent PLMNs;

c) if another RAT of the registered PLMN or a PLMN from the list of equivalent PLMNs cannot be found, or the UE does not have a registered PLMN, then perform PLMN selection as specified in 3GPP TS 23.122 [6]. As an implementation option, instead of performing PLMN selection, the UE may select another RAT of the chosen PLMN; or

d) if no other allowed PLMN and RAT combinations are available, then the UE may re-enable the NB-IoT capability and remain registered for EPS services in NB-IoT of the registered PLMN. If the UE chooses this option, then it may periodically attempt to select another PLMN and RAT combination that can provide non-EPS services. How this periodic scanning is done, is UE implementation dependent.

If the NB-IoT capability is disabled, the UE shall re-enable the NB-IoT capability when:

- performing a PLMN selection unless the UE has already re-enabled the NB-IoT capability when performing bullets c) or d) above; or

- the UE powers off and powers on again or the USIM is removed.

If the UE in NB-S1 mode receives an ATTACH REJECT or TRACKING AREA UPDATE REJECT message including both EMM cause #15 "no suitable cells in tracking area" and an Extended EMM cause IE with value "NB-IoT not allowed" after the UE requests access to the NB-IoT, in order to prevent unwanted cell reselection from GERAN, UTRAN, E-UTRAN or NG-RAN to NB-IoT, the UE may:

- disable the NB-IoT capability:

- indicate the access stratum layer(s) of disabling of the NB-IoT capability; and

- memorize the identity of the PLMN where the NB-IoT capability was disabled and use that stored information in subsequent PLMN selections as specified in 3GPP TS 23.122 [6].

NOTE: The UE can only disable the NB-IoT capability when in EMM-IDLE mode.

If the UE in NB-S1 mode is required to disable the NB-IoT capability and select E-UTRAN radio access technology, and the UE is in the EMM-CONNECTED mode, the UE shall locally release the established NAS signalling connection and enter the EMM-IDLE mode before selecting E-UTRAN radio access technology.

As an implementation option, the UE may start a timer for enabling the NB-IoT capability. On expiry of this timer, the UE may enable the NB-IoT capability.

\*\*\*\*\* Next change \*\*\*\*\*

###### 5.1.3.2.2.6 EMM-TRACKING-AREA-UPDATING-INITIATED

A UE enters the state EMM-TRACKING-AREA-UPDATING-INITIATED after it has started the tracking area updating or combined tracking area updating procedure and is waiting for a response from the MME (see subclause 5.5.3).

\*\*\*\*\* Next change \*\*\*\*\*

##### 5.2.3.2.2 ATTEMPTING-TO-UPDATE

The UE:

- shall not send any user data;

- shall initiate tracking area updating on the expiry of timers T3411, T3402 or T3346;

- shall initiate tracking area updating when entering a new PLMN, if timer T3346 is running and the new PLMN is not equivalent to the PLMN where the UE started timer T3346, the PLMN identity of the new cell is not in one of the forbidden PLMN lists, and the tracking area is not in one of the lists of forbidden tracking areas;

- shall initiate tracking area updating when the tracking area of the serving cell has changed, if timer T3346 is not running, the PLMN identity of the new cell is not in one of the forbidden PLMN lists and the tracking area is not in one of the lists of forbidden tracking areas;

- may initiate a tracking area updating procedure upon request of the upper layers to establish a PDN connection for emergency bearer services;

- shall initiate tracking area updating procedure upon request of the upper layers to establish a PDN connection without the NAS signalling low priority indication as specified in subclause 5.5.3.2.6, item l), if timer T3346 is running due to a NAS request message (TRACKING AREA UPDATE REQUEST, CONTROL PLANE SERVICE REQUEST or EXTENDED SERVICE REQUEST) which contained the low priority indicator set to "MS is configured for NAS signalling low priority" and timer T3402 and timer T3411 are not running;

- may detach locally and initiate an attach for emergency bearer services even if timer T3346 is running;

- shall use requests for non-EPS services from CM layers to trigger a combined tracking area updating procedure, if timer T3346 is not running (see subclause 5.5.3.3), or to attempt to select GERAN, UTRAN or cdma2000® 1xRTT radio access technology and proceed with the appropriate MM and CC specific procedures;

- may use requests for an MMTEL voice call or MMTEL video call from the upper layers to initiate tracking area updating, if timer T3346 is not running;

- shall initiate tracking area updating in response to paging with S-TMSI or paging with IMSI and domain indicator set to ″CS″;

- shall initiate tracking area updating if the EPS update status is set to EU2 NOT UPDATED, and timers T3411, T3402 and T3346 are not running;

- if configured for eCall only mode as specified in 3GPP TS 31.102 [17], shall perform the eCall inactivity procedure at expiry of timer T3444 or T3445 (see subclause 5.5.4);

- may initiate tracking area updating upon receiving a request from upper layers to transmit user data related to an exceptional event and the UE is allowed to use exception data reporting (see the ExceptionDataReportingAllowed leaf of the NAS configuration MO in 3GPP TS 24.368 [15A]) if timer T3346 is not already running for "MO exception data" and even if timer T3402 or timer T3411 is running; and

- shall not initiate the detach signalling procedure unless the current TAI is part of the TAI list.

\*\*\*\*\* Next change \*\*\*\*\*

#### 5.3.1.1 Establishment of the NAS signalling connection

When the UE is in EMM-IDLE mode without suspend indication and needs to transmit an initial NAS message, the UE shall request the lower layer to establish a RRC connection. In this request to the lower layer the NAS shall provide to the lower layer the RRC establishment cause and the call type as specified in annex D of this specification and, for the case specified in subclause 5.6.1.2.2, shall also provide the initial NAS message, otherwise NAS may also provide the initial NAS message.

Initial NAS messages are:

- ATTACH REQUEST;

- DETACH REQUEST;

- TRACKING AREA UPDATE REQUEST;

- SERVICE REQUEST;

- EXTENDED SERVICE REQUEST; and

- CONTROL PLANE SERVICE REQUEST.

When the UE is in EMM-IDLE mode with suspend indication, the UE shall proceed the behaviour as specified in subclauses 5.3.1.3.

For the routing of the initial NAS message to the appropriate MME, the UE NAS provides the lower layers with either the S-TMSI, the registered globally unique MME identifier (GUMMEI) that consists of the PLMN ID, the MME group ID, and the MME code (see 3GPP TS 23.003 [2]), or none of them according to the following rules:

- If the UE has received the interworking without N26 interface indicator set to "interworking without N26 interface not supported" from the network, the UE holds a valid 5G-GUTI and:

a) the UE performs an initial EPS attach procedure or tracking area updating procedure following an inter-system change from N1 mode to S1 mode; or

b) the UE which was previously registered in N1 mode before entering state 5GMM-DEREGISTERED, performs an initial EPS attach procedure,

 then the UE NAS shall provide the lower layers with the MME identifier part of the mapped GUTI, which is generated from the 5G-GUTI as specified in 3GPP TS 23.003 [4], an indication that the identifier is a native GUMMEI and an indication that the identifier is mapped from 5GS;

- If the TIN indicates "GUTI" or "RAT-related TMSI", or the TIN is not available, and the UE holds a valid GUTI:

a) When the UE in EMM-IDLE mode initiates a tracking area updating or combined tracking area updating procedure for load balancing purposes, the UE NAS shall provide the lower layers with neither S-TMSI nor registered MME identifier;

b) When the tracking area of the current cell is in the list of tracking areas that the UE previously registered in the MME during the NAS signalling connection establishment, the UE NAS shall provide the lower layers with the S-TMSI, but shall not provide the registered MME identifier to the lower layers; or

c) When the tracking area of the current cell is not in the list of tracking areas that the UE previously registered in the MME during the NAS signalling connection establishment, the UE NAS shall provide the lower layers with the MME identifier part of the valid GUTI with an indication that the identifier is a native GUMMEI.

- If the TIN indicates "P-TMSI", or the TIN is not available, and the UE holds a valid P-TMSI and RAI, the UE NAS shall provide the lower layers with the MME identifier part of the mapped GUTI, which is generated from the P-TMSI and RAI with an indication that the identifier is a mapped GUMMEI; or

- Otherwise, the UE NAS does not provide the lower layers with the S-TMSI, the registered GUMMEI and the mapped GUMMEI.

The UE NAS also provides the lower layers with the identity of the selected PLMN (see 3GPP TS 36.331 [22]). In a shared network, the UE shall choose one of the PLMN identities as specified in 3GPP TS 23.122 [6].

When an ATTACH REQUEST message, or a TRACKING AREA UPDATE REQUEST message when the TAI of the current cell is not included in the TAI list, is sent to establish a signalling connection, the UE NAS also provides the lower layers with the DCN-ID according to the following rules:

a) if a DCN-ID for the PLMN code of the selected PLMN is available in the UE, the UE NAS shall provide this DCN-ID to the lower layers; or

b) if no DCN-ID for the PLMN code of the selected PLMN is available but a Default\_DCN\_ID value is available in the UE, as specified in 3GPP TS 24.368 [15A] or in USIM file NASCONFIG as specified in 3GPP TS 31.102 [17], the UE NAS shall provide this DCN-ID to the lower layers.

If a relay node is attaching for relay node operation (see 3GPP TS 23.401 [10]), the NAS in the relay node shall indicate to the lower layers that the establishment of the NAS signalling connection is for a relay node.

In S1 mode, when the RRC connection has been established successfully, the UE shall enter EMM-CONNECTED mode and consider the NAS signalling connection established.

In S101 mode, when the cdma2000® HRPD access network resources are available for tunnelled NAS signalling, the UE shall enter EMM-CONNECTED mode and consider the S101 mode NAS signalling connection established.

\*\*\*\*\* Next change \*\*\*\*\*

##### 5.3.1.2.1 General

The signalling procedure for the release of the NAS signalling connection is initiated by the network.

In S1 mode, when the RRC connection has been released, the UE shall enter EMM-IDLE mode and consider the NAS signalling connection released.

If the UE is configured for eCall only mode as specified in 3GPP TS 31.102 [17] then:

- if the NAS signalling connection that was released had been established for eCall over IMS, the UE shall start timer T3444; and

- if the NAS signalling connection that was released had been established for a call to an HPLMN designated non-emergency MSISDN or URI for test or terminal reconfiguration service, the UE shall start timer T3445.

The UE shall start the SGC timer T3447 with the service gap time value available in the UE when the NAS signalling connection is released if:

- the UE supports SGC feature, and the service gap timer value is available in the UE and does not indicate zero; and

- the NAS signalling connection that was released had been established for mobile originated request for transfer of uplink data.

If the UE receives the "Extended wait time" from the lower layers when no attach, tracking area updating or service request procedure is ongoing, the UE shall ignore the "Extended wait time".

To allow the network to release the NAS signalling connection, the UE:

a) shall start the timer T3440 if the UE receives any of the EMM cause values #11, #12, #13, #14 (not applicable to the service request procedure), #15, #25, #31 or #35;

b) shall start the timer T3440 if:

- the UE receives a TRACKING AREA UPDATE ACCEPT message which does not include a UE radio capability ID deletion indication IE;

- the UE has not set the "active" flag in the TRACKING AREA UPDATE REQUEST message;

- the UE has not set the "signalling active" flag in the TRACKING AREA UPDATE REQUEST message;

- the tracking area updating or combined tracking area updating procedure has been initiated in EMM-IDLE mode; and

- the user plane radio bearers have not been set up;

c) shall start the timer T3440 if the UE receives a DETACH ACCEPT message and the UE has set the detach type to "IMSI detach" in the DETACH REQUEST message and user plane radio bearers have not been set up;

d) shall start the timer T3440 if the UE receives a TRACKING AREA UPDATE REJECT message indicating:

- any of the EMM cause values #9 or #10 and the UE has no CS fallback emergency call, CS fallback call, 1xCS fallback emergency call, or 1xCS fallback call pending; or

- the EMM cause values #40, the TRACKING AREA UPDATE message was not triggered due to receiving a paging for CS fallback or a paging for 1xCS fallback, and the UE has no CS fallback emergency call, CS fallback call, 1xCS fallback emergency call, or 1xCS fallback call pending;

e) shall start the timer T3440 if the UE receives a SERVICE REJECT message indicating any of the EMM cause values #9, #10 or #40 as a response to a SERVICE REQUEST message CONTROL PLANE SERVICE REQUEST message, or an EXTENDED SERVICE REQUEST message with service type set to "packet services via S1";

f) may start the timer T3440 if the UE receives any of the EMM cause values #3, #6, #7 or #8 or if it receives an AUTHENTICATION REJECT message;

g) shall start the timer T3440 if the UE receives a SERVICE REJECT message indicating the EMM cause value #39 and the UE has initiated EXTENDED SERVICE REQUEST in EMM-IDLE and the user plane radio bearers have not been set up; or

h) shall start the timer T3440 if the UE receives a SERVICE REJECT, SERVICE ACCEPT, ATTACH ACCEPT or TRACKING AREA UPDATE ACCEPT message with control plane data back-off timer.

Upon expiry of T3440,

- in cases a, b, c, f and h, the UE shall locally release the established NAS signalling connection; or

- in cases d and e, the UE shall locally release the established NAS signalling connection and the UE shall initiate the attach procedure as described in subclause 5.5.3.2.5, 5.5.3.3.5 or 5.6.1.5.

In cases b, c and g,

- upon an indication from the lower layers that the user plane radio bearers are set up, the UE shall stop timer T3440 and may send uplink signalling via the existing NAS signalling connection or user data via the user plane bearers. If the uplink signalling is for CS fallback for emergency call, or for establishing a PDN connection for emergency bearer services, the UE shall send the uplink signalling via the existing NAS signalling connection; or

- upon receipt of a DETACH REQUEST message, the UE shall stop timer T3440 and respond to the network initiated detach as specified in subclause 5.5.2.3.

In case b,

- upon receiving a request from upper layers to send NAS signalling not associated with establishing either a CS emergency call or a PDN connection for emergency bearer services, the UE shall wait for the local release of the established NAS signalling connection upon expiry of timer T3440 or T3440 being stopped before proceeding;

- upon receiving a request from upper layers to establish either a CS emergency call or a PDN connection for emergency bearer services, the UE shall stop timer T3440 and shall locally release the NAS signalling connection, before proceeding as specified in subclause 5.6.1;

- upon receipt of ESM DATA TRANSPORT message, as an implementation option, the UE may reset and restart timer T3440;

- upon receipt of a DOWNLINK NAS TRANSPORT or DOWNLINK GENERIC NAS TRANSPORT message, the UE which is in EMM-REGISTERED without PDN connections shall stop timer T3440 and may send uplink signalling via the existing NAS signalling connection; or

- upon receipt of an ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST, MODIFY EPS BEARER CONTEXT REQUEST, DEACTIVATE EPS BEARER CONTEXT REQUEST, DOWNLINK NAS TRANSPORT or DOWNLINK GENERIC NAS TRANSPORT message, if the UE is using control plane CIoT EPS optimization, the UE shall stop timer T3440 and may send uplink signalling via the existing NAS signalling connection.

In case c,

- upon receiving a request from upper layers to send NAS signalling not associated with establishing a PDN connection for emergency bearer services, the UE shall wait for the local release of the established NAS signalling connection upon expiry of timer T3440 or T3440 being stopped before proceeding; or

- upon receiving a request from upper layers to establish a PDN connection for emergency bearer services, the UE shall stop timer T3440 and shall locally release the NAS signalling connection, before proceeding as specified in subclause 5.6.1.

In cases d and e,

- upon an indication from the lower layers that the RRC connection has been released, the UE shall stop timer T3440 and perform a new attach procedure as specified in subclause 5.5.3.2.5, 5.5.3.3.5 or 5.6.1.5; or

- upon receiving a request from upper layers to establish a PDN connection for emergency bearer services, the UE shall stop timer T3440 and shall locally release the NAS signalling connection, before proceeding as specified in subclause 5.5.1.

In cases a and f,

- upon receiving a request from upper layers to establish a PDN connection for emergency bearer services, the UE shall stop timer T3440 and shall locally release the NAS signalling connection, before proceeding as specified in subclause 5.5.1.

In case g,

- upon receiving a request from upper layers to send NAS signalling not associated with establishing either a CS emergency call or a PDN connection for emergency bearer services, the UE shall wait for the local release of the established NAS signalling connection upon expiry of timer T3440 or T3440 being stopped before proceeding; or

- upon receiving a request from upper layers to establish either a CS emergency call or a PDN connection for emergency bearer services, the UE shall stop timer T3440 and shall locally release the NAS signalling connection, before proceeding as specified in subclause 5.6.1.

In case h,

- upon an indication from the lower layers that the user plane radio bearers are set up or upon receiving a request from upper layers to send NAS signalling not associated with ESM DATA TRANSPORT, the UE shall stop timer T3440; or

- the UE shall not send ESM DATA TRANSPORT message until expiry of timer T3440 or times T3440 being stopped.

In EMM-CONNECTED mode, if the UE moves to EMM-SERVICE-REQUEST-INITIATED state upon receipt of a CS SERVICE NOTIFICATION message, the UE shall stop timer T3440.

In S101 mode, when the cdma2000® HRPD radio access connection has been released, the UE shall enter EMM-IDLE mode and consider the S101 mode NAS signalling connection released.

\*\*\*\*\* Next change \*\*\*\*\*

### 5.3.5 Handling of the periodic tracking area update timer and mobile reachable timer (S1 mode only)

The periodic tracking area updating procedure is used to periodically notify the availability of the UE to the network. The procedure is controlled in the UE by timer T3412. The value of timer T3412 is sent by the network to the UE in the ATTACH ACCEPT message and can be sent in the TRACKING AREA UPDATE ACCEPT message. The UE shall apply this value in all tracking areas of the list of tracking areas assigned to the UE until a new value is received.

If timer T3412 received by the UE in an ATTACH ACCEPT or TRACKING AREA UPDATE ACCEPT message contains an indication that the timer is deactivated or the timer value is zero, then timer T3412 is deactivated and the UE shall not perform the periodic tracking area updating procedure.

Timer T3412 is reset and started with its initial value, when the UE changes from EMM-CONNECTED to EMM-IDLE mode. Timer T3412 is stopped when the UE enters EMM-CONNECTED mode or the EMM-DEREGISTERED state.

If the UE is attached for emergency bearer services, and timer T3412 expires, the UE shall not initiate a periodic tracking area updating procedure, but shall locally detach from the network. When the UE is camping on a suitable cell, it may re-attach to regain normal service.

When a UE is not attached for emergency bearer services, and timer T3412 expires, the periodic tracking area updating procedure shall be started and the timer shall be set to its initial value for the next start.

If the UE is not attached for emergency bearer services, and is in a state other than EMM-REGISTERED.NORMAL-SERVICE when timer T3412 expires, the periodic tracking area updating procedure is delayed until the UE returns to EMM-REGISTERED.NORMAL-SERVICE.

NOTE 1: When the UE returns to EMM-REGISTERED.NORMAL-SERVICE and it needs to initiate other EMM procedure than the periodic TAU procedure then, based on UE implementation, the EMM procedure can take precedence.

If ISR is activated, the UE shall keep both timer T3412 and timer T3312. The two separate timers run in the UE for updating MME and SGSN independently. The UE shall start timer T3423, if timer T3412 expires, and timer T3346 is running or the UE is in one of the following states:

- EMM-REGISTERED.NO-CELL-AVAILABLE;

- EMM-REGISTERED.PLMN-SEARCH;

- EMM-REGISTERED.UPDATE-NEEDED; or

- EMM-REGISTERED.LIMITED-SERVICE.

The UE shall initiate the tracking area updating procedure and stop timer T3423 when it enters state EMM-REGISTERED.NORMAL-SERVICE before timer T3423 expires. After expiry of timer T3423 the UE shall set its TIN to "P-TMSI".

If timer T3423 expires the UE shall memorize that it has to initiate a tracking area updating procedure when it returns to state EMM-REGISTERED.NORMAL-SERVICE.

If the UE is attached to both EPS and non-EPS services, and if timer T3412 expires or timer T3423 expires when the UE is in EMM-REGISTERED.NO-CELL-AVAILABLE state, then the UE shall initiate the combined tracking area updating procedure indicating "combined TA/LA updating with IMSI attach" when the UE returns to EMM-REGISTERED.NORMAL-SERVICE state.

When the network includes T3412 extended value IE in the ATTACH ACCEPT message or TRACKING AREA UPDATE ACCEPT message, the network uses timer T3412 extended value IE as the value of timer T3412.

The network supervises the periodic tracking area updating procedure of the UE by means of the mobile reachable timer.

If the UE is not attached for emergency bearer services, the mobile reachable timer shall be longer than T3412. In this case, by default, the mobile reachable timer is 4 minutes greater than timer T3412.

If ISR is not activated, the network behaviour upon expiry of the mobile reachable timer is network dependent, but typically the network stops sending paging messages to the UE on the first expiry, and may take other appropriate actions.

If the UE is attached for emergency bearer services, the MME shall set the mobile reachable timer with a value equal to timer T3412. When the mobile reachable timer expires, the MME shall locally detach the UE.

The mobile reachable timer shall be reset and started with the value as indicated above, when the MME releases the NAS signalling connection for the UE. The mobile reachable timer shall be stopped when a NAS signalling connection is established for the UE.

Upon expiry of the mobile reachable timer the network shall start the implicit detach timer. The value of the implicit detach timer is network dependent. If ISR is activated, the default value of the implicit detach timer is 4 minutes greater than timer T3423. If the implicit detach timer expires before the UE contacts the network, the network shall implicitly detach the UE. If the MME includes timer T3346 in the TRACKING AREA UPDATE REJECT message or the SERVICE REJECT message and timer T3346 is greater than timer T3412, the MME sets the mobile reachable timer and the implicit detach timer such that the sum of the timer values is greater than timer T3346.

If the network includes the T3324 value IE in the ATTACH ACCEPT message or TRACKING AREA UPDATE ACCEPT message, and if the UE is not attached for emergency bearer services and has no PDN connection for emergency bearer services the MME shall set the active timer to a value equal to the value of timer T3324.

NOTE 2: Timer T3324 is specified in 3GPP TS 24.008 [13].

If the UE has established a PDN connection for emergency services after receiving the timer T3324 value IE in the ATTACH ACCEPT message or the last TRACKING AREA UPDATE ACCEPT message, the active timer shall not be started.

The active timer shall be reset and started with the value as indicated above, when the MME releases the NAS signalling connection for the UE. The active timer shall be stopped when an NAS signalling connection is established for the UE.

The network behaviour upon expiry of the active timer is network dependent, but typically the network stops sending paging messages to the UE on the first expiry, and may take other appropriate actions.

NOTE 3: ISR is not activated when the network includes the T3324 value IE in the ATTACH ACCEPT message or TRACKING AREA UPDATE ACCEPT message.

The implicit detach timer shall be stopped when a NAS signalling connection is established for the UE.

\*\*\*\*\* Next change \*\*\*\*\*

### 5.3.7b Specific requirements for UE when receiving non-integrity protected reject messages

This subclause specifies the requirements for a UE that is not configured to use timer T3245 (see 3GPP TS 24.368 [15A] or 3GPP TS 31.102 [17]) and receives an ATTACH REJECT, TRACKING AREA UPDATE REJECT or SERVICE REJECT message without integrity protection with specific EMM causes.

NOTE 1: Additional UE requirements for this case, requirements for other EMM causes, and requirements for the case when the UE receives an integrity protected reject message are specified in subclauses 5.5.1, 5.5.3 and 5.6.1.

The UE may maintain a list of PLMN-specific attempt counters and a list of PLMN-specific PS-attempt counters (see 3GPP TS 24.008 [13]). The maximum number of possible entries in each list is implementation dependent.

Additionally, the UE may maintain one counter for "SIM/USIM considered invalid for non-GPRS services" events and one counter for "SIM/USIM considered invalid for GPRS services" events (see 3GPP TS 24.008 [13]).

If the UE receives an ATTACH REJECT, TRACKING AREA UPDATE REJECT or SERVICE REJECT message without integrity protection with EMM cause value #3, #6, #7, #8, #11, #12, #13, #14, #15, #31 or #35 before the network has established secure exchange of NAS messages for the NAS signalling connection, the UE shall start timer T3247 (see 3GPP TS 24.008 [13]) with a random value uniformly drawn from the range between 30 minutes and 60 minutes, if the timer is not running, and take the following actions:

1) if the EMM cause value received is #3, #6, #7 or #8, and

a) if the UE maintains a counter for "SIM/USIM considered invalid for GPRS services" events and the counter has a value less than a UE implementation-specific maximum value, the UE shall:

i) set the EPS update status to EU3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.3) and shall delete any GUTI, last visited registered TAI, TAI list and eKSI;

- delete the list of equivalent PLMNs;

- increment the counter for "SIM/USIM considered invalid for GPRS services" events;

- if the EMM cause value received is #3, #6 or #8, and if the UE maintains a counter for "SIM/USIM considered invalid for non-GPRS services" and the counter has a value less than a UE implementation-specific maximum value, increment the counter;

- if an attach, tracking area updating or a service request procedure was performed, reset the attach attempt counter, the tracking area updating attempt counter or the service request attempt counter, respectively;

- if A/Gb mode or Iu mode is supported by the UE, handle the GMM parameters GPRS attach attempt counter, routing area updating attempt counter or service request attempt counter, GMM state, GPRS update status, P-TMSI, P-TMSI signature, RAI, GPRS ciphering key sequence number as specified in 3GPP TS 24.008 [13] for the case when the GPRS attach, routing area updating or service request procedure is rejected with the GMM cause of the same value in a NAS message without integrity protection;

- If the UE is operating in single-registration mode, the UE shall in addition handle the 5GMM parameters 5GMM state, 5GS update status, 5G-GUTI, TAI list, ngKSI as specified in 3GPP TS 24.501 [54] for the case when the registration request or service request procedure performed over 3GPP access is rejected with the 5GMM cause with the same value in a NAS message without integrity protection.

- store the current TAI in the list of "forbidden tracking areas for roaming", memorize the current TAI was stored in the list of "forbidden tracking areas for roaming" for non-integrity protected NAS reject message and enter the state EMM-DEREGISTERED.LIMITED-SERVICE; and

- search for a suitable cell in another tracking area or in another location area according to 3GPP TS 36.304 [21]; or

ii) proceed as specified in subclauses 5.5.1, 5.5.3 and 5.6.1;

- increment the counter for "SIM/USIM considered invalid for GPRS services" events; and

- if the EMM cause value received is #3, #6 or #8, and if the UE maintains a counter for "SIM/USIM considered invalid for non-GPRS services" and the counter has a value less than a UE implementation specific maximum value, increment the counter; and

b) else the UE shall proceed as specified in subclauses 5.5.1, 5.5.3 and 5.6.1;

2) if the EMM cause value received is #12, #13 or #15, the UE shall additionally proceed as specified in subclauses 5.5.1, 5.5.3 and 5.6.1;

3) if the EMM cause value received is #11, #14 or #35 and the UE is in its HPLMN or EHPLMN (if the EHPLMN list is present),

- the UE shall set the EPS update status to EU3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.3) and shall delete any GUTI, last visited registered TAI, TAI list and eKSI. The UE shall delete the list of equivalent PLMNs. Additionally, if an attach, tracking area updating or service request procedure was performed, the UE shall reset the attach attempt counter or the tracking area updating attempt counter or the service request attempt counter, respectively.

- if A/Gb mode or Iu mode is supported by the UE, the UE shall in addition handle the GMM parameters GMM state, GPRS update status, P-TMSI, P-TMSI signature, RAI, GPRS ciphering key sequence number and GPRS attach attempt counter or routing area updating attempt counter or service request attempt counter as specified in 3GPP TS 24.008 [13] for the case when the procedure is rejected with the GMM cause with the same value in a NAS message without integrity protection;

- If the UE is operating in single-registration mode, the UE shall in addition handle the 5GMM parameters 5GMM state, 5GS update status, 5G-GUTI, TAI list, ngKSI as specified in 3GPP TS 24.501 [54] for the case when the registration request or service request procedure performed over 3GPP access is rejected with the 5GMM cause with the same value in a NAS message without integrity protection.

- the UE shall store the current TAI in the list of "forbidden tracking areas for roaming", memorize the current TAI was stored in the list of "forbidden tracking areas for roaming" for non-integrity protected NAS reject message and enter the state EMM-DEREGISTERED.LIMITED-SERVICE; and

- the UE shall search for a suitable cell in another tracking area or in another location area in the same PLMN according to 3GPP TS 36.304 [21];

4) if the EMM cause value received is #11 or #35 and the UE is not in its HPLMN or EHPLMN (if the EHPLMN list is present), in addition to the UE requirements specified in subclause 5.5.1, 5.5.3 and 5.6.1,

 if the UE maintains a list of PLMN-specific attempt counters and the PLMN-specific attempt counter for the PLMN sending the reject message has a value less than a UE implementation-specific maximum value, the UE shall increment the PLMN-specific attempt counter for the PLMN;

5) if the EMM cause value received is #14 and the UE is not roaming in its HPLMN or EHPLMN (if the EHPLMN list is present), in addition to the UE requirements specified in subclause5.5.1, 5.5.3 and 5.6.1,

 if the UE maintains a list of PLMN-specific PS-attempt counter and the PLMN-specific PS-attempt counter of the PLMN sending the reject message has a value less than a UE implementation-specific maximum value, the UE shall increment the PS-attempt counter of the PLMN; and

6) if the EMM cause value received is #31 for a UE that has indicated support for CIoT optimizations, the UE may discard the message or alternatively the UE should:

- set the EPS update status to EU3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.3);

- store the current TAI in the list of "forbidden tracking areas for roaming", memorize the current TAI was stored in the list of "forbidden tracking areas for roaming" for non-integrity protected NAS reject message; and

- search for a suitable cell in another tracking area according to 3GPP TS 36.304 [21].

Upon expiry of timer T3247, the UE shall

- remove all tracking areas from the list of "forbidden tracking areas for regional provision of service" and the list of "forbidden tracking areas for roaming", which were stored in these lists for non-integrity protected NAS reject message;

- set the USIM to valid for EPS services, if

- the UE does not maintain a counter for "SIM/USIM considered invalid for GPRS services" events; or

- the UE maintains a counter for "SIM/USIM considered invalid for GPRS services" events and this counter has a value less than a UE implementation-specific maximum value;

- set the USIM to valid for non-EPS services, if

- the UE does not maintain a counter for "SIM/USIM considered invalid for non-GPRS services" events; or

- the UE maintains a counter for "SIM/USIM considered invalid for non-GPRS services" events and this counter has a value less than a UE implementation-specific maximum value;

- if the UE maintains a list of PLMN-specific attempt counters, for each PLMN-specific attempt counter that has a value greater than zero and less than a UE implementation-specific maximum value, remove the respective PLMN from the forbidden PLMN list;

- if the UE maintains a list of PLMN-specific PS-attempt counters, for each PLMN-specific PS-attempt counter that has a value greater than zero and less than a UE implementation-specific maximum value, remove the respective PLMN from the "forbidden PLMNs for GPRS service" list. If the resulting "forbidden PLMNs for GPRS service" list is empty, the UE shall re-enable the E-UTRA capability (see subclause 4.5);

- if the UE is supporting A/Gb mode or Iu mode, handle the list of "forbidden location areas for regional provision of service" and the list of "forbidden location areas for roaming" as specified in 3GPP TS 24.008 [13] for the case when timer T3247 expires;

- if the UE is supporting A/Gb mode or Iu mode and maintains a list of "forbidden location areas for non-GPRS services" and a list of "forbidden location areas for GPRS services", handle these lists as specified in 3GPP TS 24.008 [13] for the case when timer T3247 expires; and

- initiate an EPS attach procedure or tracking area updating procedure, if still needed, dependent on EMM state and EPS update status, or perform PLMN selection according to 3GPP TS 23.122 [6].

If the UE maintains a list of PLMN-specific attempt counters and PLMN-specific PS-attempt counters, when the UE is switched off, the UE shall, for each PLMN-specific attempt counter that has a value greater than zero and less than the UE implementation-specific maximum value, remove the respective PLMN from the forbidden PLMN list. When the USIM is removed, the UE should perform this action.

The PLMN-specific attempt counter and the PLMN-specific PS-attempt counter shall be reset when the UICC containing the USIM is removed or the PLMN is added to a list of "forbidden PLMNs" in the USIM as specified in 3GPP TS 23.122 [6].

NOTE 2: If the respective PLMN was stored in the extension of the "forbidden PLMNs" list, then according to 3GPP TS 23.122 [6] the UE will delete the contents of this extension when the USIM is removed.

\*\*\*\*\* Next change \*\*\*\*\*

### 5.3.17 Service Gap Control

The network may control the frequency UEs can transit from EMM-IDLE mode to EMM-CONNECTED mode via the service gap control (SGC) as specified in 3GPP TS 23.401 [10]. If the network supports service gap control (SGC) feature and the service gap time value is available in the EMM context of the UE, the MME shall consider SGC as active for the UE.

The UE and the network negotiate usage of the service gap control (SGC) feature during the attach and tracking area updating procedures:

- the UE supporting service gap control indicates its support for service gap control in the ATTACH REQUEST and TRACKING AREA UPDATE REQUEST message. If the UE supports service gap control and the SGC is active for the UE, the MME shall include service gap timer T3447 value in the ATTACH ACCEPT message and TRACKING AREA UPDATE ACCEPT message (see subclause 5.5.1.2 and subclause 5.5.3.2). The UE shall store the service gap time value; and

- for UEs that do not support the optional SGC feature when the network rejects mobility management signalling requests due to service gap control is active in the network, the mechanism for general NAS level mobility management congestion control as specified in subclause 5.3.9 applies.

The UE shall start the SGC timer T3447 when the NAS signalling connection is released and if:

- the UE supports SGC feature, and the service gap timer value is available in the UE and does not indicate zero; and

- the NAS signalling connection released was not established for:

- paging;

- attach requests without PDN connection request; or

- tracking area update requests without "active" or "signalling active" flag set.

If the SGC is active in the network, after the UE transitions from EMM-CONNECTED mode to EMM-IDLE mode except when the UE was in EMM-CONNECTED mode due to:

- paging;

- attach requests without PDN connection request; or

- tracking area update requests without "active" or "signalling active" flag set,

the network shall start the SGC timer T3447:

- with the service gap time value available in the EMM context minus 4 minutes, if the UE supports SGC feature and the service gap time value has been sent to the UE with a non-zero value; or

- with the service gap time value available in the EMM context if the UE does not support SGC feature.

When the SGC timer T3447 is running, the network allows:

- requests for emergency bearer services;

- requests for exception data reporting;

- attach requests without PDN connection request;

- tracking area update requests without "active" or "signalling active" flag set;

- requests from UEs that were received via NAS signalling connections established with RRC establishment cause "High priority access AC 11 – 15"; and

- mobile terminated service requests triggered by paging and subsequent MO signalling or MO data, if any, until the UE enters EMM-IDLE mode.

If the MME determines that the UE operating in single-registration mode has performed an inter-system change from S1 mode to N1 mode and the timer T3447 is running in the MME, the MME stops the T3447.

Upon inter-system change from N1 mode to S1 mode, if the UE supports service gap control, T3447 is running in the UE, and the T3447 value is included in the ATTACH ACCEPT message or TRACKING AREA UPDATE ACCEPT message received from the MME (see subclause 5.5.1.2 and subclause 5.5.3.2), the UE shall keep T3447 running. Additionally, the UE shall store and replace the currently stored T3447 value with the received T3447 value. Upon expiry of the running T3447 timer, the UE shall use the new value when starting T3447 again.

The UE or the network with a running service gap timer shall keep the timer running when the UE transits from EMM-IDLE mode to EMM-CONNECTED mode.

NOTE: If the UE transitions from EMM-IDLE mode to EMM-CONNECTED mode due to attach request without PDN connection request or tracking area update request without "active" or "signalling active" flag set, the UE initiates no further MO signalling except for tracking area update request without "active" or "signalling active" flag set until the UE receives network-initiated signalling (e.g. DOWNLINK NAS TRANSPORT message for MT SMS) or MT data over user plane, or after the UE has moved to EMM-IDLE state and the service gap timer is not running.

If the timer T3447 is running when the UE enters state EMM-DEREGISTERED, the UE remains switched on, and the USIM in the UE remains the same, then timer T3447 is kept running until it expires.

If the UE is switched off when the timer T3447 is running, the UE shall behave as follows when the UE is switched on and the USIM in the UE remains the same:

- let t1 be the time remaining for T3447 timeout at switch off and let t be the time elapsed between switch off and switch on. If t1 is greater than t, then the timer shall be restarted with the value t1 – t. If t1 is equal to or less than t, then the timer need not be restarted. If the UE is not capable of determining t, then the UE shall restart the timer with the value t1.

\*\*\*\*\* Next change \*\*\*\*\*

#### 5.4.1.6 Abnormal cases on the network side

The following abnormal cases can be identified:

a) Lower layer failure

 If a lower layer failure is detected before the GUTI REALLOCATION COMPLETE message is received, the old and the new GUTI shall be considered as valid until the old GUTI can be considered as invalid by the network. If a new TAI list was provided in the GUTI REALLOCATION COMMAND message, the old and new TAI list shall also be considered as valid until the old TAI list can be considered as invalid by the network.

 During this period the network:

- may first use the old S-TMSI from the old GUTI for paging within the area defined by the old TAI list for an implementation dependent number of paging attempts for network originated transactions. If a new TAI list was provided with old GUTI in the GUTI REALLOCATION COMMAND message, the new TAI list should also be used for paging. Upon response from the UE, the network may re-initiate the GUTI reallocation. If the response is received from a tracking area within the old and new TAI list, the network shall re-initiate the GUTI reallocation. If no response is received to the paging attempts, the network may use the new S-TMSI from the new GUTI for paging for an implementation dependent number of paging attempts. In this case, if a new TAI list was provided with new GUTI in the GUTI REALLOCATION COMMAND message, the new TAI list shall be used instead of the old TAI list. Upon response from the UE the network shall consider the new GUTI as valid and the old GUTI as invalid. If no response is received to the paging attempts, the network may use the IMSI for paging for an implementation dependent number of paging attempts;

NOTE 1: Paging with IMSI causes the UE to re-attach as described in subclause 5.6.2.2.2.

- shall consider the new GUTI as valid if it is used by the UE and, additionally, the new TAI list as valid if it was provided with this GUTI in the GUTI REALLOCATION COMMAND message;

- may use the identification procedure followed by a new GUTI reallocation if the UE uses the old GUTI; and

- if the network accepted to use eDRX for the UE, may determine the next paging window from both old GUTI and new GUTI, and may first use the S-TMSI from the GUTI which led the first eDRX for paging. If no response is received to the paging attempts for the first eDRX, the network may use the other S-TMSI from the other GUTI which led the second eDRX for paging. For this paging procedure, the network shall start timer T3415 long enough to care the paging attempts for both eDRXs.

NOTE 2: If the second eDRX comes during the first eDRX ongoing, the paging attempts for the second eDRX can be initiated with stopping further paging attempts for the first eDRX.

b) Expiry of timer T3450

 The GUTI reallocation procedure is supervised by the timer T3450. The network shall, on the first expiry of timer T3450, reset and restart timer T3450 and shall retransmit the GUTI REALLOCATION COMMAND. This retransmission is repeated four times, i.e. on the fifth expiry of timer T3450, the network shall abort the reallocation procedure and shall follow the rules described for case a above.

c) GUTI reallocation and attach procedure collision

 If the network receives an ATTACH REQUEST message before the ongoing GUTI reallocation procedure has been completed the network shall proceed with the attach procedure after deletion of the EMM context.

d) GUTI reallocation and UE initiated detach procedure collision

 If the network receives a DETACH REQUEST message before the ongoing GUTI reallocation procedure has been completed, the network shall abort the GUTI reallocation procedure and shall progress the detach procedure.

e) GUTI reallocation and tracking area updating procedure collision

 If the network receives a TRACKING AREA UPDATE REQUEST message before the ongoing GUTI reallocation procedure has been completed, the network shall abort the GUTI reallocation procedure and shall progress the tracking area updating procedure. The network may then perform a new GUTI reallocation.

f) GUTI reallocation and service request procedure collision

 If the network receives an EXTENDED SERVICE REQUEST message for CS fallback or 1xCS fallback before the ongoing GUTI reallocation procedure has been completed, the network shall progress both procedures.

g) Lower layer indication of non-delivered NAS PDU due to handover

 If the GUTI REALLOCATION COMMAND message could not be delivered due to an intra MME handover and the target TA is included in the TAI list, then upon successful completion of the intra MME handover the MME shall retransmit the GUTI REALLOCATION COMMAND message. If a failure of the handover procedure is reported by the lower layer and the S1 signalling connection exists, the MME shall retransmit the GUTI REALLOCATION COMMAND message.

If there is a different new GUTI and optionally a new TAI list included in a subsequent GUTI REALLOCATION COMMAND message, the UE always regards the newest GUTI and the newest TAI list as valid for the recovery time.

\*\*\*\*\* Next change \*\*\*\*\*

#### 5.4.3.2 NAS security mode control initiation by the network

The MME initiates the NAS security mode control procedure by sending a SECURITY MODE COMMAND message to the UE and starting timer T3460 (see example in figure 5.4.3.2.1).

The MME shall reset the downlink NAS COUNT counter and use it to integrity protect the initial SECURITY MODE COMMAND message if the security mode control procedure is initiated:

- to take into use the EPS security context created after a successful execution of the EPS authentication procedure;

- upon receipt of TRACKING AREA UPDATE REQUEST message including a GPRS ciphering key sequence number IE, if the MME wishes to create a mapped EPS security context (i.e. the type of security context flag is set to "mapped security context" in the NAS key set identifier IE included in the SECURITY MODE COMMAND message).

The MME shall send the SECURITY MODE COMMAND message unciphered, but shall integrity protect the message with the NAS integrity key based on KASME or mapped K'ASME indicated by the eKSI included in the message. The MME shall set the security header type of the message to "integrity protected with new EPS security context".

The MME shall create a locally generated KASME and send the SECURITY MODE COMMAND message including a KSI value in the NAS key set identifier IE set to "000" and EIA0 and EEA0 as the selected NAS security algorithms only when the security mode control procedure is initiated:

- during an attach procedure for emergency bearer services if no shared EPS security context is available;

- during an attach procedure for access to RLOS if no valid EPS security context is available;

- during a tracking area updating procedure for a UE that has a PDN connection for emergency bearer services if no shared EPS security context is available;

- during a tracking area updating procedure for a UE that has a PDN connection for access to RLOS if no valid EPS security context is available;

- during a service request procedure for a UE that has a PDN connection for emergency bearer services if no shared EPS security context is available;

- during a service request procedure for a UE that has a PDN connection for access to RLOS if no valid EPS security context is available;

- after a failed authentication procedure for a UE that has a PDN connection for emergency bearer services or that is establishing a PDN connection for emergency bearer services, if continued usage of a shared security context is not possible; or

- after a failed authentication procedure for a UE that has a PDN connection for access to RLOS or that is establishing a PDN connection for access to RLOS, if continued usage of a valid security context is not possible.

The UE shall process a SECURITY MODE COMMAND message including a KSI value in the NAS key set identifier IE set to "000" and EIA0 and EEA0 as the selected NAS security algorithms and, if accepted, create a locally generated KASME when the security mode control procedure is initiated:

- during an attach procedure for emergency bearer services;

- during an attach procedure for access to RLOS;

- during a tracking area updating procedure when the UE has a PDN connection for emergency bearer services;

- during a tracking area updating procedure when the UE has a PDN connection for access to RLOS;

- during a service request procedure when the UE has a PDN connection for emergency bearer services;

- during a service request procedure when the UE has a PDN connection for access to RLOS;

- after an authentication procedure when the UE has a PDN connection for emergency bearer services or is establishing a PDN connection for emergency bearer services; or

- after an authentication procedure when the UE has a PDN connection for access to RLOS or is establishing a PDN connection for access to RLOS.

NOTE 1: The process for creation of the locally generated KASME by the MME and the UE is implementation dependent.

Upon receipt of a TRACKING AREA UPDATE REQUEST message including a GPRS ciphering key sequence number IE, if the MME does not have the valid current EPS security context indicated by the UE, the MME shall either:

- indicate the use of the new mapped EPS security context to the UE by setting the type of security context flag in the NAS key set identifier IE to "mapped security context" and the KSI value related to the security context of the source system; or

- set the KSI value "000" in the NAS key set identifier IE if the MME sets EIA0 and EEA0 as the selected NAS security algorithms for a UE that has a PDN connection for emergency bearer services.

While having a current mapped EPS security context with the UE, if the MME wants to take the native EPS security context into use, the MME shall include the eKSI that indicates the native EPS security context in the SECURITY MODE COMMAND message.

The MME shall include the replayed security capabilities of the UE (including the security capabilities with regard to NAS, RRC and UP (user plane) ciphering as well as NAS and RRC integrity, and other possible target network security capabilities, i.e. UTRAN/GERAN if the UE included them in the message to network), the replayed nonceUE when creating a mapped EPS security context and if the UE included it in the message to the network, the selected NAS ciphering and integrity algorithms and the Key Set Identifier (eKSI). If the MME supports handling of UE additional security capabilities and the UE included a UE additional security capability IE in the message to the network, the MME shall include the replayed additional security capabilities of the UE.

The MME shall include both the nonceMME and the nonceUE when creating a mapped EPS security context during inter-system change from A/Gb mode to S1 mode or Iu mode to S1 mode in EMM-IDLE mode.

The MME may initiate a SECURITY MODE COMMAND in order to change the NAS security algorithms for a current EPS security context already in use. The MME re-derives the NAS keys from KASME with the new NAS algorithm identities as input and provides the new NAS algorithm identities within the SECURITY MODE COMMAND message. The MME shall set the security header type of the message to "integrity protected with new EPS security context".

If, during an ongoing attach or tracking area updating procedure, the MME is initiating a SECURITY MODE COMMAND (i.e. after receiving the ATTACH REQUEST or TRACKING AREA UPDATE REQUEST message, but before sending a response to that message) and the ATTACH REQUEST or TRACKING AREA UPDATE REQUEST message is received without integrity protection or does not successfully pass the integrity check at the MME, the MME shall calculate the HASHMME of the entire plain ATTACH REQUEST or TRACKING AREA UPDATE REQUEST message as described in 3GPP TS 33.401 [19] and shall include the HASHMME in the SECURITY MODE COMMAND message.

Additionally, the MME may request the UE to include its IMEISV in the SECURITY MODE COMPLETE message.

NOTE 2: The AS and NAS security capabilities will be the same, i.e. if the UE supports one algorithm for NAS, the same algorithm is also supported for AS.

If:

- the NAS security mode control procedure is initiated during an ongoing attach procedure in WB-S1 mode;

- the network supports RACS;

- the UE has set the RACS bit to "RACS supported" in the UE network capability IE of the ATTACH REQUEST message; and

- the UE has set the URCIDA bit to "UE radio capability ID available" in the UE radio capability ID availability IE of the ATTACH REQUEST message,

then the MME shall request the UE to include its UE radio capability ID in the SECURITY MODE COMPLETE message.

If:

- the NAS security mode control procedure is initiated during an ongoing tracking area updating procedure in WB-S1 mode;

- the network supports RACS;

- the UE has set the RACS bit to "RACS supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message; and

- the UE has set the URCIDA bit to "UE radio capability ID available" in the UE radio capability ID availability IE of the TRACKING AREA UPDATE REQUEST message,

then the MME may request the UE to include its UE radio capability ID in the SECURITY MODE COMPLETE message.

If:

- the NAS security mode control procedure is initiated during an ongoing tracking area updating procedure in WB-S1 mode;

- the network supports RACS;

- the UE has set the RACS bit to "RACS supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message;

- the UE has set the URCIDA bit to "UE radio capability ID available" in the UE radio capability ID availability IE of the TRACKING AREA UPDATE REQUEST message; and

- no UE radio capability ID is available in the UE context in the MME,

then the MME shall request the UE to include its UE radio capability ID in the SECURITY MODE COMPLETE message.



Figure 5.4.3.2.1: Security mode control procedure

\*\*\*\*\* Next change \*\*\*\*\*

#### 5.4.3.3 NAS security mode command accepted by the UE

Upon receipt of the SECURITY MODE COMMAND message, the UE shall check whether the security mode command can be accepted or not. This is done by performing the integrity check of the message and by checking that the received replayed UE security capabilities, the received replayed UE additional security capabilities, if included in the SECURITY MODE COMMAND message, and the received nonceUE have not been altered compared to the latest values that the UE sent to the network. However, the UE is not required to perform the checking of the received nonceUE if the UE does not want to re-generate the K'ASME (i.e. the SECURITY MODE COMMAND message is to derive and take into use a mapped EPS security context and the eKSI matches the current EPS security context, if it is a mapped EPS security context). When the UE has a PDN connection for emergency bearer services established or the UE is establishing a PDN connection for emergency bearer services or the UE is requesting attach for access to RLOS, the UE is not required to locally re-generate the KASME (i.e. the SECURITY MODE COMMAND message is used to derive and take into use a native EPS security context where the KSI value "000" is included in the NAS key set identifier IE and the EIA0 and EEA0 are included as the selected NAS security algorithms).

The UE shall accept a SECURITY MODE COMMAND message indicating the "null integrity protection algorithm" EIA0 as the selected NAS integrity algorithm only if the message is received for a UE that has a PDN connection for emergency bearer services established, or a UE that is attached for access to RLOS, or a UE that is establishing a PDN connection for emergency bearer services or a UE that is requesting attach for access to RLOS.

If the type of security context flag included in the SECURITY MODE COMMAND message is set to "native security context" and if the KSI matches a valid non-current native EPS security context held in the UE while the UE has a mapped EPS security context as the current EPS security context, the UE shall take the non-current native EPS security context into use which then becomes the current native EPS security context and delete the mapped EPS security context.

If the SECURITY MODE COMMAND message can be accepted, the UE shall take the EPS security context indicated in the message into use. The UE shall in addition reset the uplink NAS COUNT counter if:

- the SECURITY MODE COMMAND message is received in order to take an EPS security context into use created after a successful execution of the EPS authentication procedure;

- the SECURITY MODE COMMAND message received includes the type of security context flag set to "mapped security context" in the NAS key set identifier IE the eKSI does not match the current EPS security context, if it is a mapped EPS security context.

If the SECURITY MODE COMMAND message can be accepted and a new EPS security context is taken into use and SECURITY MODE COMMAND message does not indicate the "null integrity protection algorithm" EIA0 as the selected NAS integrity algorithm, the UE shall:

- if the SECURITY MODE COMMAND message has been successfully integrity checked using an estimated downlink NAS COUNT equal 0, then the UE shall set the downlink NAS COUNT of this new EPS security context to 0;

- otherwise the UE shall set the downlink NAS COUNT of this new EPS security context to the downlink NAS COUNT that has been used for the successful integrity checking of the SECURITY MODE COMMAND message.

If the SECURITY MODE COMMAND message can be accepted, the UE shall send a SECURITY MODE COMPLETE message integrity protected with the selected NAS integrity algorithm and the EPS NAS integrity key based on the KASME or mapped K'ASME if the type of security context flag is set to "mapped security context" indicated by the eKSI. When the SECURITY MODE COMMAND message includes the type of security context flag set to "mapped security context" in the NAS key set identifier IE, the nonceMME and the nonceUE, then the UE shall either:

- generate K'ASME from both the nonceMME and the nonceUE as indicated in 3GPP TS 33.401 [19]; or

- check whether the SECURITY MODE COMMAND message indicates the eKSI of the current EPS security context, if it is a mapped EPS security context, in order not to re-generate the K'ASME.

Furthermore, if the SECURITY MODE COMMAND message can be accepted, the UE shall cipher the SECURITY MODE COMPLETE message with the selected NAS ciphering algorithm and the EPS NAS ciphering key based on the KASME or mapped K'ASME indicated by the eKSI. The UE shall set the security header type of the message to "integrity protected and ciphered with new EPS security context".

From this time onward the UE shall cipher and integrity protect all NAS signalling messages with the selected NAS ciphering and NAS integrity algorithms.

If the MME indicated in the SECURITY MODE COMMAND message that the IMEISV is requested, the UE shall include its IMEISV in the SECURITY MODE COMPLETE message.

In WB-S1 mode, if the MME indicated in the SECURITY MODE COMMAND message that the UE radio capability ID is requested, the UE shall:

- if the UE has an applicable network-assigned UE radio capability ID for the current UE radio configuration in the selected PLMN, include the applicable network-assigned UE radio capability ID in the UE radio capability ID IE of the SECURITY MODE COMPLETE message; and

- if the UE:

a) does not have an applicable network-assigned UE radio capability ID for the current UE radio configuration in the selected PLMN; and

b) has an applicable manufacturer-assigned UE radio capability ID for the current UE radio configuration,

 include the applicable manufacturer-assigned UE radio capability ID in the UE radio capability ID IE of the SECURITY MODE COMPLETE message.

If, during an ongoing attach or tracking area updating procedure, the SECURITY MODE COMMAND message includes a HASHMME, the UE shall compare HASHMME with a hash value locally calculated as described in 3GPP TS 33.401 [19] from the entire plain ATTACH REQUEST or TRACKING AREA UPDATE REQUEST message that the UE had sent to initiate the procedure. If HASHMME and the locally calculated hash value are different, the UE shall include the complete ATTACH REQUEST or TRACKING AREA UPDATE REQUEST message which the UE had previously sent in the Replayed NAS message container IE of the SECURITY MODE COMPLETE message.

\*\*\*\*\* Next change \*\*\*\*\*

##### 5.5.1.2.2 Attach procedure initiation

In state EMM-DEREGISTERED, the UE initiates the attach procedure by sending an ATTACH REQUEST message to the MME, starting timer T3410 and entering state EMM-REGISTERED-INITIATED (see example in figure 5.5.1.2.2.1). If timer T3402 is currently running, the UE shall stop timer T3402. If timer T3411 is currently running, the UE shall stop timer T3411.

The UE shall include the IMSI in the EPS mobile identity IE in the ATTACH REQUEST message if the selected PLMN is neither the registered PLMN nor in the list of equivalent PLMNs and:

a) the UE is configured for "AttachWithIMSI" as specified in 3GPP TS 24.368 [15A] or 3GPP TS 31.102 [17]; or

b) the UE is in NB-S1 mode.

For all other cases, the UE shall handle the EPS mobile identity IE in the ATTACH REQUEST message as follows:

a) if the UE operating in the single-registration mode is performing an inter-system change from N1 mode to S1 mode or the UE was previously registered in N1 mode before entering state 5GMM-DEREGISTERED and:

1) the UE has received the interworking without N26 interface indicator set to "interworking without N26 interface supported" from the network and:

i) if the UE holds a valid GUTI, the UE shall include the valid GUTI into the EPS mobile identity IE, include Old GUTI type IE with GUTI type set to "native GUTI" and include the UE status IE with a 5GMM registration status set to:

- "UE is in 5GMM-REGISTERED state" if the UE is in 5GMM-REGISTERED state; or

- "UE is in 5GMM-DEREGISTERED state" if the UE is in 5GMM-DEREGISTERED state; or

ii) if the UE does not hold a valid GUTI, the UE shall include the IMSI in the EPS mobile identity IE; or

2) the UE has received the interworking without N26 interface indicator set to "interworking without N26 interface not supported" from the network and:

i) if the UE holds a valid 5G-GUTI, the UE shall include a GUTI, mapped from 5G-GUTI into the EPS mobile identity IE, include Old GUTI type IE with GUTI type set to "native GUTI" and include the UE status IE with a 5GMM registration status set to "UE is in 5GMM-DEREGISTERED state";

ii) if the UE holds a valid GUTI and does not hold a valid 5G-GUTI, the UE shall indicate the GUTI in the EPS mobile identity IE and include Old GUTI type IE with GUTI type set to "native GUTI"; or

iii) if the UE holds neither a valid GUTI nor a valid 5G-GUTI, the UE shall include the IMSI in the EPS mobile identity IE; or

NOTE 1: The value of the EMM registration status included by the UE in the UE status IE is not used by the MME.

b) otherwise:

1) if the UE supports neither A/Gb mode nor Iu mode, the UE shall include in the ATTACH REQUEST message a valid GUTI together with the last visited registered TAI, if available. In addition, the UE shall include Old GUTI type IE with GUTI type set to "native GUTI". If there is no valid GUTI available, the UE shall include the IMSI in the ATTACH REQUEST message; or

2) If the UE supports A/Gb mode or Iu mode or both and:

i) if the TIN indicates "P-TMSI" and the UE holds a valid P-TMSI and RAI, the UE shall map the P-TMSI and RAI into the EPS mobile identity IE, and include Old GUTI type IE with GUTI type set to "mapped GUTI". If a P-TMSI signature is associated with the P-TMSI, the UE shall include it in the Old P-TMSI signature IE. Additionally, if the UE holds a valid GUTI, the UE shall indicate the GUTI in the Additional GUTI IE;

NOTE 2: The mapping of the P-TMSI and the RAI to the GUTI is specified in 3GPP TS 23.003 [2].

ii) if the TIN indicates "GUTI" or "RAT-related TMSI" and the UE holds a valid GUTI, the UE shall indicate the GUTI in the EPS mobile identity IE, and include Old GUTI type IE with GUTI type set to "native GUTI";

iii) if the TIN is deleted and:

- the UE holds a valid GUTI, the UE shall indicate the GUTI in the EPS mobile identity IE, and include Old GUTI type IE with GUTI type set to "native GUTI";

- the UE does not hold a valid GUTI but holds a valid P-TMSI and RAI, the UE shall map the P-TMSI and RAI into the EPS mobile identity IE, and include Old GUTI type IE with GUTI type set to "mapped GUTI". If a P-TMSI signature is associated with the P-TMSI, the UE shall include it in the Old P-TMSI signature IE; or

- the UE does not hold a valid GUTI, P-TMSI or RAI, the UE shall include the IMSI in the EPS mobile identity IE; or

iv) otherwise the UE shall include the IMSI in the EPS mobile identity IE.

If the UE is operating in the dual-registration mode and it is in 5GMM state 5GMM-REGISTERED, the UE shall include the UE status IE with the 5GMM registration status set to "UE is in 5GMM-REGISTERED state".

NOTE 3: The value of the EMM registration status included by the UE in the UE status IE is not used by the MME.

If the UE is attaching for emergency bearer services and does not hold a valid GUTI, P-TMSI or IMSI as described above, the IMEI shall be included in the EPS mobile identity IE.

If the UE in limited service state is attaching for access to RLOS and does not hold a valid GUTI, P-TMSI or IMSI as described above, the IMEI shall be included in the EPS mobile identity IE.

If the UE supports A/Gb mode or Iu mode or if the UE needs to indicate its UE specific DRX parameter to the network, the UE shall include the UE specific DRX parameter in the DRX parameter IE in the ATTACH REQUEST message. If the UE in NB-S1 mode needs to indicate the UE specific DRX parameter in NB-S1 mode to the network, it shall include the UE specific DRX parameter in NB-S1 mode in the DRX parameter in NB-S1 mode IE in the ATTACH REQUEST message.

If the UE supports eDRX and requests the use of eDRX, the UE shall include the extended DRX parameters IE in the ATTACH REQUEST message.

If the UE supports WUS assistance, then the UE shall set the WUSA bit to "WUS assistance supported" in the UE network capability IE, and if the UE is not attaching for emergency bearer services, the UE may include its UE paging probability information in the Requested WUS assistance information IE of the ATTACH REQUEST message.

If the UE supports SRVCC to GERAN/UTRAN, the UE shall set the SRVCC to GERAN/UTRAN capability bit to "SRVCC from UTRAN HSPA or E-UTRAN to GERAN/UTRAN supported".

If the UE supports vSRVCC from S1 mode to Iu mode, then the UE shall set the H.245 after handover capability bit to "H.245 after SRVCC handover capability supported" and additionally set the SRVCC to GERAN/UTRAN capability bit to "SRVCC from UTRAN HSPA or E-UTRAN to GERAN/UTRAN supported" in the ATTACH REQUEST message.

If the UE supports PSM and requests the use of PSM, then the UE shall include the T3324 value IE with a requested timer value in the ATTACH REQUEST message. When the UE includes the T3324 value IE and the UE indicates support for extended periodic timer value in the MS network feature support IE, it may also include the T3412 extended value IE to request a particular T3412 value to be allocated.

If the UE supports ProSe direct discovery, then the UE shall set the ProSe bit to "ProSe supported" and set the ProSe direct discovery bit to "ProSe direct discovery supported" in the UE network capability IE of the ATTACH REQUEST message.

If the UE supports ProSe direct communication, then the UE shall set the ProSe bit to "ProSe supported" and set the ProSe direct communication bit to "ProSe direct communication supported" in the UE network capability IE of the ATTACH REQUEST message.

If the UE supports acting as a ProSe UE-to-network relay, then the UE shall set the ProSe bit to "ProSe supported" and set the ProSe UE-to-network relay bit to "acting as a ProSe UE-to-network relay supported" in the UE network capability IE of the ATTACH REQUEST message.

If the UE supports NB-S1 mode, Non-IP or Ethernet PDN type, N1 mode, or if the UE supports DNS over (D)TLS (see 3GPP TS 33.501 [24]), then the UE shall support the extended protocol configuration options IE.

NOTE 4: Support of DNS over (D)TLS is based on the informative requirements as specified in 3GPP TS 33.501 [24].

If the UE supports the extended protocol configuration options IE, then the UE shall set the ePCO bit to "extended protocol configuration options supported" in the UE network capability IE of the ATTACH REQUEST message.

If the UE supports the restriction on use of enhanced coverage, then the UE shall set the RestrictEC bit to "Restriction on use of enhanced coverage supported" in the UE network capability IE of the ATTACH REQUEST message.

If the UE supports the control plane data back-off timer T3448, the UE shall set the CP backoff bit to "back-off timer for transport of user data via the control plane supported" in the UE network capability IE of the ATTACH REQUEST message.

If the UE is in NB-S1 mode, then the UE shall set the Control plane CIoT EPS optimization bit to "Control plane CIoT EPS optimization supported" in the UE network capability IE of the ATTACH REQUEST message. If the UE is capable of NB-N1 mode, then the UE shall set the Control plane CIoT 5GS optimization bit to "Control plane CIoT 5GS optimization supported" in the N1 UE network capability IE of the ATTACH REQUEST message.

If the UE is in NB-S1 mode, supports NB-S1 mode only, and requests to attach for EPS services and "SMS only", the UE shall indicate the SMS only requested bit to "SMS only" in the additional update type IE and shall set the EPS attach type IE to "EPS attach" in the ATTACH REQUEST message.

If the UE supports CIoT EPS optimizations, it shall indicate in the UE network capability IE of the ATTACH REQUEST message whether it supports EMM-REGISTERED without PDN connection.

If the UE supports S1-U data transfer and multiple user plane radio bearers (see 3GPP TS 36.306 [44], 3GPP TS 36.331 [22]) in NB-S1 mode, then the UE shall set the Multiple DRB support bit to "Multiple DRB supported" in the UE network capability IE of the ATTACH REQUEST message.

If the UE supports control plane MT-EDT, then the UE shall set the CP-MT-EDT bit to "Control plane Mobile Terminated-Early Data Transmission supported" in the UE network capability IE of the ATTACH REQUEST message.

If the UE supports user plane MT-EDT, then the UE shall set the UP-MT-EDT bit to "User plane Mobile Terminated-Early Data Transmission supported" in the UE network capability IE of the ATTACH REQUEST message.

If the UE supports V2X communication over E-UTRA-PC5, then the UE shall set the V2X PC5 bit to "V2X communication over E-UTRA-PC5 supported" in the UE network capability IE of the ATTACH REQUEST message.

If the UE supports V2X communication over NR-PC5, then the UE shall set the V2X NR-PC5 bit to "V2X communication over NR-PC5 supported" in the UE network capability IE of the ATTACH REQUEST message.

If the UE supports service gap control, then the UE shall set the SGC bit to "service gap control supported" in the UE network capability IE of the ATTACH REQUEST message.

If the UE supports dual connectivity with New Radio (NR), then the UE shall set the DCNR bit to "dual connectivity with NR supported" in the UE network capability IE of the ATTACH REQUEST message and shall include the UE additional security capability IE in the ATTACH REQUEST message.

If the UE supports N1 mode, the UE shall set the N1mode bit to "N1 mode supported" in the UE network capability IE of the ATTACH REQUEST message and shall include the UE additional security capability IE in the ATTACH REQUEST message.

If the UE supports signalling for a maximum number of 15 EPS bearer contexts, then the UE shall set the 15 bearers bit to "Signalling for a maximum number of 15 EPS bearer contexts supported" in the UE network capability IE of the ATTACH REQUEST message.

If the UE supports ciphered broadcast assistance data and needs to obtain new ciphering keys, the UE shall include the Additional information requested IE with the CipherKey bit set to "ciphering keys for ciphered broadcast assistance data requested" in the ATTACH REQUEST message.

If EMM-REGISTERED without PDN connection is not supported by the UE or the MME, or if the UE wants to request PDN connection with the attach procedure, the UE shall send the ATTACH REQUEST message together with a PDN CONNECTIVITY REQUEST message contained in the ESM message container IE.

If EMM-REGISTERED without PDN connection is supported by the UE and the MME, and the UE does not want to request PDN connection with the attach procedure, the UE shall send the ATTACH REQUEST message together with an ESM DUMMY MESSAGE contained in the ESM message container information element.

In WB-S1 mode, if the UE supports RACS, the UE shall:

a) set the RACS bit to "RACS supported" in the UE network capability IE of the ATTACH REQUEST message; and

b) if the UE has an applicable UE radio capability ID for the current UE radio configuration in the selected PLMN, set the URCIDA bit to "UE radio capability ID available" in the UE radio capability ID availability IE of the ATTACH REQUEST message.

If the attach procedure is initiated following an inter-system change from N1 mode to S1 mode in EMM-IDLE mode or the UE which was previously registered in N1 mode before entering state 5GMM-DEREGISTERED initiates the attach procedure:

a) if the UE has received an "interworking without N26 interface not supported" indication from the network and a valid 5G NAS security context exists in the UE, the UE shall integrity protect the ATTACH REQUEST message combined with the message included in the ESM message container IE using the 5G NAS security context;

b) otherwise:

1) if a valid EPS security context exists, the UE shall integrity protect the ATTACH REQUEST message combined with the message included in the ESM message container IE using the EPS security context; or

2) if the UE does not have a valid EPS security context, the ATTACH REQUEST message combined with the message included in the ESM message container IE is not integrity protected.



Figure 5.5.1.2.2.1: Attach procedure and combined attach procedure

\*\*\*\*\* Next change \*\*\*\*\*

##### 5.5.1.2.4 Attach accepted by the network

During an attach for emergency bearer services, if not restricted by local regulations, the MME shall not check for mobility and access restrictions, regional restrictions, subscription restrictions, or perform CSG access control when processing the ATTACH REQUEST message. The network shall not apply subscribed APN based congestion control during an attach procedure for emergency bearer services.

During an attach for access to RLOS, the MME shall not check for access restrictions, regional restrictions and subscription restrictions when processing the ATTACH REQUEST message.

If the attach request is accepted by the network, the MME shall send an ATTACH ACCEPT message to the UE and start timer T3450.

If the attach request included the PDN CONNECTIVITY REQUEST message in the ESM message container information element to request PDN connectivity, the MME when accepting the attach request shall:

- send the ATTACH ACCEPT message together with an ESM DUMMY MESSAGE contained in the ESM message container information element and discard the ESM message container information element included in the attach request if:

- the UE indicated support of EMM-REGISTERED without PDN connection in the UE network capability IE of the ATTACH REQUEST message;

- the MME supports EMM-REGISTERED without PDN connection and PDN connection is restricted according to the user's subscription data;

- the attach type is not set to "EPS emergency attach" or "EPS RLOS attach"; and

- the request type of the UE requested PDN connection is not set to "handover of emergency bearer services", "emergency" or "RLOS";

- otherwise, send the ATTACH ACCEPT message together with an ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message contained in the ESM message container information element to activate the default bearer (see subclause 6.4.1). In WB-S1 mode, the network may also initiate the activation of dedicated bearers towards the UE by invoking the dedicated EPS bearer context activation procedure (see subclause 6.4.2). In NB-S1 mode the network shall not initiate the activation of dedicated bearers.

If EMM-REGISTERED without PDN connection is supported by the UE and the MME, and the UE included an ESM DUMMY MESSAGE in the ESM message container information element of the ATTACH REQUEST message, the MME shall send the ATTACH ACCEPT message together with an ESM DUMMY MESSAGE contained in the ESM message container information element.

If the attach request is accepted by the network, the MME shall delete the stored UE radio capability information or the UE radio capability ID, if any.

In NB-S1 mode, if the attach request is accepted by the network, the MME shall set the EMC BS bit to zero in the EPS network feature support IE included in the ATTACH ACCEPT message to indicate that support of emergency bearer services in NB-S1 mode is not available.

If the UE has included the UE network capability IE or the MS network capability IE or both in the ATTACH REQUEST message, the MME shall store all octets received from the UE, up to the maximum length defined for the respective information element.

NOTE 1: This information is forwarded to the new MME during inter-MME handover or to the new SGSN during inter-system handover to A/Gb mode or Iu mode.

NOTE 2: For further details concerning the handling of the MS network capability and UE network capability in the MME see also 3GPP TS 23.401 [10].

If the UE specific DRX parameter was included in the DRX Parameter IE in the ATTACH REQUEST message, the MME shall replace any stored UE specific DRX parameter with the received parameter and use it for the downlink transfer of signalling and user data in WB-S1 mode.

In NB-S1 mode, if the DRX parameter in NB-S1 mode IE was included in the ATTACH REQUEST message, the MME shall provide to the UE the Negotiated DRX parameter in NB-S1 mode IE in the ATTACH ACCEPT message. The MME shall replace any stored UE specific DRX parameter in NB-S1 mode with the negotiated DRX parameter and use it for the downlink transfer of signalling and user data in NB-S1 mode.

NOTE 3: In NB-S1 mode, if a DRX parameter was included in the Negotiated DRX parameter in NB-S1 mode IE in the ATTACH ACCEPT message, then the UE stores and uses the received DRX parameter in NB-S1 mode (see 3GPP TS 36.304 [21]). If the UE did not receive a DRX parameter in the Negotiated DRX parameter in NB-S1 mode IE, or if the Negotiated DRX parameter in NB-S1 mode IE was not included in the ATTACH ACCEPT message, then the UE uses the cell specific DRX value in NB-S1 mode (see 3GPP TS 36.304 [21]).

In NB-S1 mode, if the UE requested "SMS only" in the Additional update type IE, supports NB-S1 mode only and the MME decides to accept the attach request for EPS services and "SMS only", the MME shall indicate "SMS only" in the Additional update result IE and shall set the EPS attach result IE to "EPS only" in the ATTACH ACCEPT message.

The MME shall include the extended DRX parameters IE in the ATTACH ACCEPT message only if the extended DRX parameters IE was included in the ATTACH REQUEST message, and the MME supports and accepts the use of eDRX.

If

- the UE supports WUS assistance; and

- the MME supports and accepts the use of WUS assistance,

then the MME shall determine the negotiated UE paging probability information for the UE, store it in the EMM context of the UE, and if the UE is not attaching for emergency bearer services, the MME shall include it in the Negotiated WUS assistance information IE in the ATTACH ACCEPT message. The MME may take into account the UE paging probability information received in the Requested WUS assistance information IE when determining the negotiated UE paging probability information for the UE.

NOTE 4: Besides the UE paging probability information requested by the UE, the MME can take local configuration or previous statistical information for the UE into account when determining the negotiated UE paging probability information for the UE (see 3GPP TS 23.401 [10]).

The MME shall assign and include the TAI list the UE is registered to in the ATTACH ACCEPT message. The MME shall not assign a TAI list containing both tracking areas in NB-S1 mode and tracking areas in WB-S1 mode. The UE, upon receiving an ATTACH ACCEPT message, shall delete its old TAI list and store the received TAI list.

NOTE 5: When assigning the TAI list, the MME can take into account the eNodeB's capability of support of CIoT EPS optimization.

The MME may include T3412 extended value IE in the ATTACH ACCEPT message only if the UE indicates support of the extended periodic timer T3412 in the MS network feature support IE in the ATTACH REQUEST message.

The MME shall include the T3324 value IE in the ATTACH ACCEPT message only if the T3324 value IE was included in the ATTACH REQUEST message, and the MME supports and accepts the use of PSM.

If the MME supports and accepts the use of PSM, and the UE included the T3412 extended value IE in the ATTACH REQUEST message, then the MME shall take into account the T3412 value requested when providing the T3412 value IE and the T3412 extended value IE in the ATTACH ACCEPT message.

NOTE 6: Besides the value requested by the UE, the MME can take local configuration or subscription data provided by the HSS into account when selecting a value for T3412 (3GPP TS 23.401 [10] subclause 4.3.17.3).

If the UE indicates support for EMM-REGISTERED without PDN connection in the ATTACH REQUEST message and the MME supports EMM-REGISTERED without PDN connection, the MME shall indicate support for EMM-REGISTERED without PDN connection in the EPS network feature support IE of the ATTACH ACCEPT message. The UE and the MME shall use the information whether the peer entity supports EMM-REGISTERED without PDN connection as specified in the present clause 5 and in clause 6.

If the UE requests "control plane CIoT EPS optimization" in the Additional update type IE, indicates support of control plane CIoT EPS optimization in the UE network capability IE and the MME decides to accept the requested CIoT EPS optimization and the attach request, the MME shall indicate "control plane CIoT EPS optimization supported" in the EPS network feature support IE.

If the MME supports NB-S1 mode, Non-IP or Ethernet PDN type, inter-system change with 5GS or the network wants to enforce the use of DNS over (D)TLS (see 3GPP TS 33.501 [24]), then the MME shall support the extended protocol configuration options IE.

NOTE 7: Support of DNS over (D)TLS is based on the informative requirements as specified in 3GPP TS 33.401 [19] and it is implemented based on the operator requirement.

If the MME supports the extended protocol configuration options IE and the UE indicated support of the extended protocol configuration options IE, then the MME shall set the ePCO bit to "extended protocol configuration options supported" in the EPS network feature support IE of the ATTACH ACCEPT message.

If the UE indicates support for restriction on use of enhanced coverage in the ATTACH REQUEST message, and the network decides to restrict the use of enhanced coverage for the UE, then the MME shall set the RestrictEC bit to "Use of enhanced coverage is restricted" in the EPS network feature support IE of the ATTACH ACCEPT message.

If the UE has indicated support for the control plane data back-off timer, and the MME decides to activate the congestion control for transport of user data via the control plane, then the MME shall include the T3448 value IE in the ATTACH ACCEPT message.

If the UE indicates support for dual connectivity with NR in the ATTACH REQUEST message, and the MME decides to restrict the use of dual connectivity with NR for the UE, then the MME shall set the RestrictDCNR bit to "Use of dual connectivity with NR is restricted" in the EPS network feature support IE of the ATTACH ACCEPT message.

If the UE indicates support for N1 mode in the ATTACH REQUEST message and the MME supports inter-system interworking with 5GS, the MME may set the IWK N26 bit to either:

- "interworking without N26 interface not supported" if the MME supports N26 interface; or

- "interworking without N26 interface supported" if the MME does not support N26 interface

in the EPS network feature support IE in the ATTACH ACCEPT message.

If the UE requests ciphering keys for ciphered broadcast assistance data in the ATTACH REQUEST message and the MME has valid ciphering key data applicable to the UE's subscription, then the MME shall include the ciphering key data in the Ciphering key data IE of the ATTACH ACCEPT message.

If due to operator policies unsecured redirection to a GERAN cell is not allowed in the current PLMN, the MME shall set the redir-policy bit to "Unsecured redirection to GERAN not allowed" in the Network policy IE of the ATTACH ACCEPT message.

The MME may include the T3447 value IE set to the service gap time value in the ATTACH ACCEPT message if:

- the UE has indicated support for service gap control; and

- a service gap time value is available in the EMM context.

If the network supports signalling for a maximum number of 15 EPS bearer contexts and the UE indicated support of signalling for a maximum number of 15 EPS bearer contexts in the ATTACH REQUEST message, then the MME shall set the 15 bearers bit to "Signalling for a maximum number of 15 EPS bearer contexts supported" in the EPS network feature support IE of the ATTACH ACCEPT message.

Upon receiving the ATTACH ACCEPT message, the UE shall stop timer T3410.

The GUTI reallocation may be part of the attach procedure. When the ATTACH REQUEST message includes the IMSI or IMEI, or the MME considers the GUTI provided by the UE is invalid, or the GUTI provided by the UE was assigned by another MME, the MME shall allocate a new GUTI to the UE. The MME shall include in the ATTACH ACCEPT message the new assigned GUTI together with the assigned TAI list. In this case the MME shall enter state EMM-COMMON-PROCEDURE-INITIATED as described in subclause 5.4.1.

For a shared network, the TAIs included in the TAI list can contain different PLMN identities. The MME indicates the selected core network operator PLMN identity to the UE in the GUTI (see 3GPP TS 23.251 [8B]).

If the ATTACH ACCEPT message contains a GUTI, the UE shall use this GUTI as the new temporary identity. The UE shall delete its old GUTI and store the new assigned GUTI. If no GUTI has been included by the MME in the ATTACH ACCEPT message, the old GUTI, if any available, shall be kept.

If A/Gb mode or Iu mode is supported in the UE, the UE shall set its TIN to "GUTI" when receiving the ATTACH ACCEPT message.

If the ATTACH ACCEPT message contains the T3412 extended value IE, then the UE shall use the value in T3412 extended value IE as periodic tracking area update timer (T3412). If the ATTACH ACCEPT message does not contain T3412 extended value IE, then the UE shall use the value in T3412 value IE as periodic tracking area update timer (T3412).

If the ATTACH ACCEPT message contains the T3324 value IE, then the UE shall use the included timer value for T3324 as specified in 3GPP TS 24.008 [13], subclause 4.7.2.8.

If the ATTACH ACCEPT message contains the DCN-ID IE, then the UE shall store the included DCN-ID value together with the PLMN code of the registered PLMN in a DCN-ID list in a non-volatile memory in the ME as specified in annex C.

The MME may also include a list of equivalent PLMNs in the ATTACH ACCEPT message. Each entry in the list contains a PLMN code (MCC+MNC). The UE shall store the list as provided by the network, and if the attach procedure is neither for emergency bearer services nor for access to RLOS, the UE shall remove from the list any PLMN code that is already in the list of "forbidden PLMNs" or in the list of "forbidden PLMNs for GPRS service". In addition, the UE shall add to the stored list the PLMN code of the registered PLMN that sent the list. The UE shall replace the stored list on each receipt of the ATTACH ACCEPT message. If the ATTACH ACCEPT message does not contain a list, then the UE shall delete the stored list.

If the attach procedure is neither for emergency bearer services nor for access to RLOS, and if the PLMN identity of the registered PLMN is a member of the list of "forbidden PLMNs" or the list of "forbidden PLMNs for GPRS service", any such PLMN identity shall be deleted from the corresponding list(s).

The network informs the UE about the support of specific features, such as IMS voice over PS session, location services (EPC-LCS, CS-LCS), emergency bearer services, or CIoT EPS optimizations, in the EPS network feature support information element. In a UE with IMS voice over PS capability, the IMS voice over PS session indicator and the emergency bearer services indicator shall be provided to the upper layers. The upper layers take the IMS voice over PS session indicator into account as specified in 3GPP TS 23.221 [8A], subclause 7.2a and subclause 7.2b, when selecting the access domain for voice sessions or calls. When initiating an emergency call, the upper layers also take both the IMS voice over PS session indicator and the emergency bearer services indicator into account for the access domain selection. In a UE with LCS capability, location services indicators (EPC-LCS, CS-LCS) shall be provided to the upper layers. When MO-LR procedure is triggered by the UE's application, those indicators are taken into account as specified in 3GPP TS 24.171 [13C].

If the RestrictDCNR bit is set to "Use of dual connectivity with NR is restricted" in the EPS network feature support IE of the ATTACH ACCEPT message, the UE shall provide the indication that dual connectivity with NR is restricted to the upper layers.

The UE supporting N1 mode shall operate in the mode for inter-system interworking with 5GS as follows:

- if the IWK N26 bit in the EPS network feature support IE is set to "interworking without N26 interface not supported", the UE shall operate in single-registration mode;

- if the IWK N26 bit in the EPS network feature support IE is set to "interworking without N26 interface supported" and the UE supports dual-registration mode, the UE may operate in dual-registration mode; or

NOTE 8: The registration mode used by the UE is implementation dependent.

- if the IWK N26 bit in the EPS network feature support IE is set to "interworking without N26 interface supported" and the UE only supports single-registration mode, the UE shall operate in single-registration mode.

The UE shall treat the interworking without N26 interface indicator as valid in the entire PLMN and equivalent PLMNs. The interworking procedures required for coordination between 5GMM and EMM without N26 interface are specified in 3GPP TS 24.501 [54].

If the redir-policy bit is set to "Unsecured redirection to GERAN not allowed" in the Network policy IE of the ATTACH ACCEPT message, the UE shall set the network policy on unsecured redirection to GERAN for the current PLMN to "Unsecured redirection to GERAN not allowed" and indicate to the lower layers that unsecured redirection to a GERAN cell is not allowed. If the redir-policy bit is set to "Unsecured redirection to GERAN allowed" or if the Network policy IE is not included in the ATTACH ACCEPT message, the UE shall set the network policy for the current PLMN to "Unsecured redirection to GERAN allowed" and indicate to the lower layers that unsecured redirection to a GERAN cell is allowed. The UE shall set the network policy on unsecured redirection to GERAN to "Unsecured redirection to GERAN not allowed" and indicate this to the lower layers when any of the following events occurs:

- the UE initiates an EPS attach or tracking area updating procedure in a PLMN different from the PLMN where the UE performed the last successful EPS attach or tracking area updating procedure;

- the UE is switched on; or

- the UICC containing the USIM is removed.

If the UE has initiated the attach procedure due to manual CSG selection and receives an ATTACH ACCEPT message; and the UE sent the ATTACH REQUEST message in a CSG cell, the UE shall check if the CSG ID and associated PLMN identity of the cell are contained in the Allowed CSG list. If not, the UE shall add that CSG ID and associated PLMN identity to the Allowed CSG list and the UE may add the HNB Name (if provided by lower layers) to the Allowed CSG list if the HNB Name is present in neither the Operator CSG list nor the Allowed CSG list.

When the UE receives the ATTACH ACCEPT message combined with the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message, and if the UE has requested PDN connectivity the UE shall forward the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message to the ESM sublayer. Upon receipt of an indication from the ESM sublayer that the default EPS bearer context has been activated, the UE shall send an ATTACH COMPLETE message together with an ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT message contained in the ESM message container information element to the network.

Additionally, the UE shall reset the attach attempt counter, enter state EMM-REGISTERED, and set the EPS update status to EU1 UPDATED.

If EMM-REGISTERED without PDN connection is supported by the UE and the MME, and the UE receives the ATTACH ACCEPT message combined with an ESM DUMMY MESSAGE, the UE shall send an ATTACH COMPLETE message together with an ESM DUMMY MESSAGE contained in the ESM message container information element to the network.

If the UE receives the ATTACH ACCEPT message from a PLMN for which a PLMN-specific attempt counter or PLMN-specific PS-attempt counter is maintained (see subclause 5.3.7b), then the UE shall reset these counters. If the UE maintains a counter for "SIM/USIM considered invalid for GPRS services", then the UE shall reset this counter.

When the UE receives any ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST messages during the attach procedure, and if the UE has requested PDN connectivity the UE shall forward the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message(s) to the ESM sublayer. The UE shall send a response to the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message(s) after successful completion of the attach procedure.

If the attach procedure was initiated in S101 mode, the lower layers are informed about the successful completion of the procedure.

Upon receiving an ATTACH COMPLETE message, the MME shall stop timer T3450, enter state EMM-REGISTERED and consider the GUTI sent in the ATTACH ACCEPT message as valid.

If the T3448 value IE is present in the received ATTACH ACCEPT message, the UE shall:

- stop timer T3448 if it is running; and

- start timer T3448 with the value provided in the T3448 value IE.

If the UE is using EPS services with control plane CIoT EPS optimization, the T3448 value IE is present in the ATTACH ACCEPT message and the value indicates that this timer is either zero or deactivated, the UE shall consider this case as an abnormal case and proceed as if the T3448 value IE is not present.

If the UE has indicated "service gap control supported" in the ATTACH REQUEST message and:

- the ATTACH ACCEPT message contains the T3447 value IE, then the UE shall store the new T3447 value, erase any previous stored T3447 value if exists and use the new T3447 value with the T3447 timer next time it is started; or

- the ATTACH ACCEPT message does not contain the T3447 value IE, then the UE shall erase any previous stored T3447 value if exists and stop the T3447 timer if running.

In WB-S1 mode, if the UE has set the RACS bit to "RACS supported" in the UE network capability IE of the ATTACH REQUEST message, the MME may include a UE radio capability ID IE or a UE radio capability ID deletion indication IE in the ATTACH ACCEPT message.

In WB-S1 mode, if the UE has set the RACS bit to "RACS supported" in the UE network capability IE of the ATTACH REQUEST message and the ATTACH ACCEPT message includes:

- a UE radio capability ID deletion indication IE set to "Network-assigned UE radio capability IDs deletion requested", the UE shall delete any network-assigned UE radio capability IDs associated with the registered PLMN stored at the UE, then the UE shall, after the completion of the ongoing attach procedure, initiate a tracking area updating procedure as specified in subclause 5.5.3 over the existing NAS signalling connection; and

- a UE radio capability ID IE, the UE shall store the UE radio capability ID as specified in annex C.

\*\*\*\*\* Next change \*\*\*\*\*

##### 5.5.1.2.5B Attach for initiating a PDN connection for emergency bearer services not accepted by the network

If the network cannot accept an attach request with attach type not set to "EPS emergency attach" and including a PDN CONNECTIVITY REQUEST message with request type set to "emergency", the UE shall perform the procedures as described in subclause 5.5.1.2.5. Then if the UE is in the same selected PLMN where the last attach request was attempted, the UE shall:

a) inform the upper layers of the failure of the procedure; or

NOTE 1: This can result in the upper layers requesting establishment of a CS emergency call (if not already attempted in the CS domain) or other implementation specific mechanisms, e.g. procedures specified in 3GPP TS 24.229 [13D] can result in the emergency call being attempted to another IP-CAN.

b) attempt EPS attach for emergency bearer services including the PDN CONNECTIVITY REQUEST message.

If the network cannot accept an attach request with attach type not set to "EPS emergency attach" and including a PDN CONNECTIVITY REQUEST message with request type set to "handover of emergency bearer services", the UE shall perform the procedures as described in subclause 5.5.1.2.5. Then if the UE is in the same selected PLMN or equivalent PLMN where the last attach request was attempted, the UE shall attempt EPS attach for emergency bearer services including the PDN CONNECTIVITY REQUEST message.

If the attach request with attach type not set to "EPS emergency attach" for initiating a PDN connection for emergency bearer services fails due to abnormal case a) in subclause 5.5.1.2.6, the UE shall perform the actions as described in subclause 5.5.1.2.6 and inform the upper layers of the failure to access the network.

NOTE 2: This can result in the upper layers requesting establishment of a CS emergency call (if not already attempted in the CS domain) or other implementation specific mechanisms, e.g. procedures specified in 3GPP TS 24.229 [13D] can result in the emergency call being attempted to another IP-CAN.

If the attach request with attach type not set to "EPS emergency attach" and including a PDN CONNECTIVITY REQUEST message with request type set to "emergency" fails due to abnormal cases b), c) or d) in subclause 5.5.1.2.6, the UE shall perform the procedures as described in subclause 5.5.1.2.6. Then if the UE is in the same selected PLMN where the last attach request was attempted, the UE shall:

a) inform the upper layers of the failure of the procedure; or

NOTE 3: This can result in the upper layers requesting establishment of a CS emergency call (if not already attempted in the CS domain) or other implementation specific mechanisms, e.g. procedures specified in 3GPP TS 24.229 [13D] can result in the emergency call being attempted to another IP-CAN.

b) attempt EPS attach for emergency bearer services including the PDN CONNECTIVITY REQUEST message.

If the attach request with attach type not set to "EPS emergency attach" and including a PDN CONNECTIVITY REQUEST message with request type set to "handover of emergency bearer services" fails due to abnormal cases b), c), d) or o) in subclause 5.5.1.2.6, the UE shall perform the procedures as described in subclause 5.5.1.2.6. Then if the UE is in the same selected PLMN or equivalent PLMN where the last attach request was attempted, the UE shall attempt EPS attach for emergency bearer services including the PDN CONNECTIVITY REQUEST message.

\*\*\*\*\* Next change \*\*\*\*\*

##### 5.5.1.2.6 Abnormal cases in the UE

The following abnormal cases can be identified:

a) Access barred because of access class barring, EAB, ACDC or NAS signalling connection establishment rejected by the network without "Extended wait time" received from lower layers

 In WB-S1 mode, if access is barred for "originating signalling" (see 3GPP TS 36.331 [22]), the attach procedure shall not be started. The UE stays in the current serving cell and applies the normal cell reselection process. The attach procedure is started as soon as possible, i.e. when access for "originating signalling" is granted on the current cell or when the UE moves to a cell where access for "originating signalling" is granted.

 In NB-S1 mode, if access is barred for "originating signalling" (see 3GPP TS 36.331 [22]), the attach procedure shall not be started. The UE stays in the current serving cell and applies the normal cell reselection process. Further UE behaviour is implementation specific, e.g. the attach procedure is started again after an implementation dependent time.

 In NB-S1 mode, if access is barred for "originating signalling" (see 3GPP TS 36.331 [22]), a request for an exceptional event is received from the upper layers, then the attach procedure shall be started.

NOTE 1: In NB-S1 mode, the EMM layer cannot receive the access barring alleviation indication from the lower layers (see 3GPP TS 36.331 [22]).

 If access is barred because of access class barring for "originating signalling" (see 3GPP TS 36.331 [22]), ACDC is applicable to the request from the upper layers and the UE supports ACDC, then the attach procedure shall be started.

 If access is barred for a certain ACDC category (see 3GPP TS 36.331 [22]), a request with a higher ACDC category is received from the upper layers and the UE supports ACDC, then the attach procedure shall be started.

 If an access request for an uncategorized application is barred due to ACDC (see 3GPP TS 36.331 [22]), a request with a certain ACDC category is received from the upper layers and the UE supports ACDC, then the attach procedure shall be started.

b) Lower layer failure or release of the NAS signalling connection without "Extended wait time" and without "Extended wait time CP data" received from lower layers before the ATTACH ACCEPT or ATTACH REJECT message is received

 The attach procedure shall be aborted, and the UE shall proceed as described below.

c) T3410 timeout

 The UE shall abort the attach procedure. The NAS signalling connection, if any, shall be released locally.

NOTE 2: The NAS signalling connection can also be released if the UE deems that the network has failed the authentication check as specified in subclause 5.4.2.7.

 The UE shall proceed as described below.

d) ATTACH REJECT, other EMM cause values than those treated in subclause 5.5.1.2.5, and cases of EMM cause values #22, #25 and #31, if considered as abnormal cases according to subclause 5.5.1.2.5

 Upon reception of the EMM cause #19 "ESM failure", if the UE is not configured for NAS signalling low priority and the ESM cause value received in the PDN CONNECTIVITY REJECT message is not #54 "PDN connection does not exist", the UE may set the attach attempt counter to 5. Subsequently, if the UE needs to retransmit the ATTACH REQUEST message to request PDN connectivity towards a different APN, the UE may stop T3411 or T3402, if running, and send the ATTACH REQUEST message. If the UE needs to attempt EPS attach to request transfer of a PDN connection for emergency bearer services by including a PDN CONNECTIVITY REQUEST message with request type set to "handover of emergency bearer services", the UE shall stop T3411 or T3402, if running, and send the ATTACH REQUEST message.

NOTE 3: When receiving EMM cause #19 "ESM failure", coordination is required between the EMM and ESM sublayers in the UE to determine whether to set the attach attempt counter to 5.

 If the attach request is neither for emergency bearer services nor for initiating a PDN connection for emergency bearer services with attach type not set to "EPS emergency attach", upon reception of the EMM causes #95, #96, #97, #99 and #111 the UE should set the attach attempt counter to 5.

 The UE shall proceed as described below.

e) Change of cell into a new tracking area

 If a cell change into a new tracking area occurs before the attach procedure is completed, the attach procedure shall be aborted and re-initiated immediately. If a tracking area border is crossed when the ATTACH ACCEPT message has been received but before an ATTACH COMPLETE message is sent, the attach procedure shall be re-initiated. If a GUTI was allocated during the attach procedure, this GUTI shall be used in the attach procedure.

f) Mobile originated detach required

 The attach procedure shall be aborted, and the UE initiated detach procedure shall be performed.

g) Detach procedure collision

 If the UE receives a DETACH REQUEST message from the network in state EMM-REGISTERED-INITIATED and the detach type indicates "re-attach not required" and no EMM cause IE, or "re-attach not required" and the EMM cause value is not #2 "IMSI unknown in HSS", the detach procedure shall be progressed and the attach procedure shall be aborted. If the UE receives a DETACH REQUEST message from the network in state EMM-REGISTERED-INITIATED and the detach type indicates "re-attach required", the detach procedure shall be progressed and the UE shall locally release the NAS signalling connection, before re-initiating the attach procedure. Otherwise the attach procedure shall be progressed and the DETACH REQUEST message shall be ignored.

h) Transmission failure of ATTACH REQUEST message indication from lower layers

 The UE shall restart the attach procedure immediately.

i) Transmission failure of ATTACH COMPLETE message indication from lower layers

 If the current TAI is not in the TAI list, the UE shall restart the attach procedure.

 If the current TAI is still in the TAI list, it is up to the UE implementation how to re-run the ongoing procedure. The EMM sublayer notifies the ESM sublayer that the ESM message in the ESM message container IE of the ATTACH COMPLETE has failed to be transmitted.

j) If EMM-REGISTERED without PDN connection is not supported by the UE or the MME, and the ACTIVATE DEFAULT BEARER CONTEXT REQUEST message combined with the ATTACH ACCEPT is not accepted by the UE due to failure in the UE ESM sublayer, then the UE shall initiate the detach procedure by sending a DETACH REQUEST message to the network. Further UE behaviour is implementation specific.

 If EMM-REGISTERED without PDN connection is supported by the UE and the MME, and the ACTIVATE DEFAULT BEARER CONTEXT REQUEST message combined with the ATTACH ACCEPT is not accepted by the UE due to failure in the UE ESM sublayer, then the UE shall either send an ATTACH COMPLETE message together with an ACTIVATE DEFAULT EPS BEARER CONTEXT REJECT contained in the ESM message container information element to the network or initiate the detach procedure by sending a DETACH REQUEST message. Further UE behaviour is implementation specific.

k) Indication from the lower layers that an S101 mode to S1 mode handover has been cancelled (S101 mode only)

 The UE shall abort the attach procedure and enter state EMM-DEREGISTERED.NO-CELL-AVAILABLE.

l) "Extended wait time" from the lower layers

 If the ATTACH REQUEST message contained the low priority indicator set to "MS is configured for NAS signalling low priority", the UE shall start timer T3346 with the "Extended wait time" value and reset the attach attempt counter.

 If the ATTACH REQUEST message did not contain the low priority indicator set to "MS is configured for NAS signalling low priority", the UE is operating in NB-S1 mode and the UE is not a UE configured to use AC11 – 15 in selected PLMN, then the UE shall start timer T3346 with the "Extended wait time" value and reset the attach attempt counter.

 In other cases the UE shall ignore the "Extended wait time".

 The UE shall abort the attach procedure, stay in the current serving cell, change the state to EMM-DEREGISTERED.ATTEMPTING-TO-ATTACH and apply the normal cell reselection process.

 The UE shall proceed as described below.

la) "Extended wait time CP data" from the lower layers

 If the UE is operating in NB-S1 mode, the UE shall start the timer T3346 with the "Extended wait time CP data" value and reset the attach attempt counter.

 In other cases the UE shall ignore the "Extended wait time CP data".

 The UE shall abort the attach procedure, stay in the current serving cell, change the state to EMM-DEREGISTERED.ATTEMPTING-TO-ATTACH and apply the normal cell reselection process.

 The UE shall proceed as described below.

m) Timer T3346 is running

 The UE shall not start the attach procedure unless:

- the UE is a UE configured to use AC11 – 15 in selected PLMN;

- the UE needs to attach for emergency bearer services;

- the UE in NB-S1 mode is requested by the upper layer to transmit user data related to an exceptional event and

i) the UE is allowed to use exception data reporting (see the ExceptionDataReportingAllowed leaf of the NAS configuration MO in 3GPP TS 24.368 [15A] or the USIM file EFNASCONFIG in 3GPP TS 31.102 [17]); and

ii) timer T3346 was not started when NAS signalling connection was established with RRC establishment cause set to "MO exception data"; or

- the UE needs to attach without the NAS signalling low priority indication and if the timer T3346 was started due to rejection of a NAS request message (e.g. ATTACH REQUEST, TRACKING AREA UPDATE REQUEST or EXTENDED SERVICE REQUEST) which contained the low priority indicator set to "MS is configured for NAS signalling low priority".

 The UE stays in the current serving cell and applies the normal cell reselection process.

NOTE 4: It is considered an abnormal case if the UE needs to initiate an attach procedure while timer T3346 is running independent on whether timer T3346 was started due to an abnormal case or a non successful case.

 The UE shall proceed as described below.

n) If EMM-REGISTERED without PDN connection is supported by the UE and the MME, an ESM DUMMY MESSAGE is included in the ESM message container information element of the ATTACH REQUEST message and the UE receives the ATTACH ACCEPT message combined with a PDN CONNECTIVITY REJECT message, the UE shall send an ATTACH COMPLETE message together with an ESM DUMMY MESSAGE contained in the ESM message container information element to the network. Further UE behaviour is implementation specific.

o) Timer T3447 is running

 The UE shall not start the attach procedure unless:

- the UE is a UE configured to use AC11 – 15 in selected PLMN;

- the UE attempts to attach for emergency bearer services; or

- the UE attempts to attach without PDN connection request.

 The UE stays in the current serving cell and applies the normal cell reselection process. The attach request procedure is started, if still necessary, when timer T3447 expires.

For the cases b, c, d, l, la and m:

- Timer T3410 shall be stopped if still running.

- For the cases b, c, d, l when the "Extended wait time" is ignored, and la when the "Extended wait time CP data" is ignored, if the attach request is neither for emergency bearer services nor for initiating a PDN connection for emergency bearer services with attach type not set to "EPS emergency attach", the attach attempt counter shall be incremented, unless it was already set to 5.

- If the attach attempt counter is less than 5:

- for the cases l, la and m, the attach procedure is started, if still necessary, when timer T3346 expires or is stopped;

- for the cases b, c, d, l when the "Extended wait time" is ignored, and la when the "Extended wait time CP data" is ignore, if the attach request is neither for emergency bearer services nor for initiating a PDN connection for emergency bearer services with attach type not set to "EPS emergency attach", timer T3411 is started and the state is changed to EMM-DEREGISTERED.ATTEMPTING-TO-ATTACH. When timer T3411 expires the attach procedure shall be restarted, if still required by ESM sublayer.

- If the attach attempt counter is equal to 5:

- the UE shall delete any GUTI, TAI list, last visited registered TAI, list of equivalent PLMNs and KSI, shall set the update status to EU2 NOT UPDATED, and shall start timer T3402. The state is changed to EMM-DEREGISTERED.ATTEMPTING-TO-ATTACH or optionally to EMM-DEREGISTERED.PLMN-SEARCH in order to perform a PLMN selection according to 3GPP TS 23.122 [6]; and

- if A/Gb mode, Iu mode or N1 mode is supported by the UE:

- if A/Gb mode or Iu mode is supported by the UE, the UE shall in addition handle the GMM parameters GMM state, GPRS update status, P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number as specified in 3GPP TS 24.008 [13] for the abnormal case when a normal attach procedure fails and the attach attempt counter is equal to 5;

- if the UE is operating in single-registration mode, the UE shall in addition handle the 5GMM parameters 5GMM state, 5GS update status, 5G-GUTI, last visited registered TAI, TAI list and ngKSI as specified in 3GPP TS 24.501 [54] for the abnormal case when an initial registration procedure performed over 3GPP access fails and the registration attempt counter is equal to 5; and

- the UE shall attempt to select GERAN, UTRAN or NG-RAN radio access technology and proceed with appropriate GMM or 5GMM specific procedures. Additionally, the UE may disable the E-UTRA capability as specified in subclause 4.5.

\*\*\*\*\* Next change \*\*\*\*\*

###### 5.5.1.3.4.2 Combined attach successful

The description for attach for EPS services as specified in subclause 5.5.1.2.4 shall be followed. In addition, the following description for attach for non-EPS services or "SMS only" applies.

The TMSI reallocation may be part of the combined attach procedure. The TMSI allocated is then included in the ATTACH ACCEPT message, together with the location area identification (LAI). In this case the MME shall start timer T3450 as described in subclause 5.4.1.4, and enter state EMM-COMMON-PROCEDURE-INITIATED. If the MME does not indicate "SMS only" in the ATTACH ACCEPT message, subject to operator policies the MME should allocate a TAI list that does not span more than one location area.

For a shared network in CS domain, the MME indicates the selected PLMN for CS domain in the LAI to the UE as specified in 3GPP TS 23.272 [9].

The UE, receiving an ATTACH ACCEPT message, stores the received location area identification, stops timer T3410, resets the location update attempt counter and sets the update status to U1 UPDATED. If the message contains an IMSI, the UE is not allocated any TMSI, and shall delete any TMSI accordingly. If the message contains a TMSI, the UE shall use this TMSI as the new temporary identity. The UE shall delete its old TMSI and shall store the new TMSI. If neither a TMSI nor an IMSI has been included by the network in the ATTACH ACCEPT message, the old TMSI, if any available, shall be kept.

If the UE maintains a counter for "SIM/USIM considered invalid for non-GPRS services" events (see subclause 5.3.7b), then the UE shall reset this counter.

If the UE requested "SMS only" in the Additional update type IE, or if the UE requested a combined attach for EPS and non-EPS services, but the network decides to accept the attach request for EPS services and "SMS only", the network shall indicate "SMS only" in the Additional update result IE. In addition, if the SMS services are provided via SMS in MME, the network shall provide a non-broadcast LAI in the ATTACH ACCEPT message. If a TMSI has to be allocated, then the network shall also provide a TMSI value which cannot cause any ambiguity with assigned TMSI values.

If the ATTACH ACCEPT message includes the Additional update result IE with value "SMS only", a UE operating in CS/PS mode 2 and a UE operating in CS/PS mode 1 with "IMS voice available" shall not attempt to use CS fallback for mobile originating services.

As an implementation option, if the ATTACH ACCEPT message does not include the Additional update result IE with value "SMS only" and the UE is not configured for NAS signalling low priority then the UE may stop timer T3246 if running.

If the ATTACH ACCEPT message includes the Additional update result IE with value "CS Fallback not preferred", this indicates to a UE operating in CS/PS mode 2 and a UE operating in CS/PS mode 1 with "IMS voice available" that it is attached for EPS and non-EPS services and that it can use CS fallback.

If the LAI contained in the ATTACH ACCEPT message is a member of the list of "forbidden location areas for regional provision of service" or the list of "forbidden location areas for roaming" then such entry shall be deleted.

If the PLMN identity for the CS domain which is provided as part of the LAI contained in the ATTACH ACCEPT message differs from the PLMN identity provided as part of the GUTI, the MME shall include the PLMN identity for the CS domain in the list of equivalent PLMNs in the ATTACH ACCEPT message.

The UE, when having requested PDN connectivity as contained in the ATTACH REQUEST and on receiving the ATTACH ACCEPT message combined with the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message, shall send an ATTACH COMPLETE message combined with an ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT message to the network.

Upon transmission of the ATTACH COMPLETE message the UE shall enter state EMM-REGISTERED and MM state MM-IDLE and set the EPS update status to EU1 UPDATED.

If the ATTACH ACCEPT message includes the Additional update result IE with value "SMS only" or "CS Fallback not preferred", a UE operating in CS/PS mode 1 with "IMS voice not available" shall attempt to select GERAN or UTRAN radio access technology and disable the E-UTRA capability (see subclause 4.5).

Upon receiving an ATTACH COMPLETE message, the MME shall stop timer T3450, enter state EMM-REGISTERED.

NOTE: Upon receiving an ATTACH COMPLETE message, the MME sends an SGsAP-TMSI-REALLOCATION-COMPLETE message as specified in 3GPP TS 29.118 [16A].

After the UE performs intersystem change from N1 mode to S1 mode, if:

- the network supports SRVCC for IMS emergency sessions (see 3GPP TS 23.216 [8]);

- the UE has an emergency PDN connection;

- the UE has set the SRVCC to GERAN/UTRAN capability bit in the MS network capability IE to "SRVCC from UTRAN HSPA or E-UTRAN to GERAN/UTRAN supported; and

- the MME has neither an IMEI nor an IMEISV for the UE;

then the MME shall initiate the identification procedure (see subclause 5.4.4) or the security mode control procedure (see subclause 5.4.3) with the UE.

\*\*\*\*\* Next change \*\*\*\*\*

###### 5.5.1.3.4.3 Combined attach successful for EPS services only

Apart from the actions on the tracking area updating attempt counter, the description for attach for EPS services as specified in subclause 5.5.1.2.4 shall be followed. In addition, the following description for attach for non-EPS services applies.

If, due to emergency services fallback (see 3GPP TS 23.502 [59], subclause 4.13.4), there is

a request for emergency services pending and the emergency bearer services indicator in the EPS network feature support IE indicates "emergency bearer services in S1 mode not supported",

then the UE shall skip the requirements defined below in the present subclause for the receipt of an ATTACH ACCEPT message including an EMM cause value, attempt to select GERAN or UTRAN radio access technology, select a setup message as defined in subclause 5.3.7, proceed with appropriate MM specific procedures, and send the setup message.

The UE receiving the ATTACH ACCEPT message takes one of the following actions depending on the EMM cause value:

#2 (IMSI unknown in HSS)

 The UE shall stop T3410 if still running and shall reset the tracking area updating attempt counter. The UE shall set the update status to U3 ROAMING NOT ALLOWED and shall delete any TMSI, LAI and ciphering key sequence number. The UE shall enter state EMM-REGISTERED.NORMAL-SERVICE. The new MM state is MM IDLE. The USIM shall be considered as invalid for non-EPS services until the UE is switched off, the UICC containing the USIM is removed, or the timer T3245 expires as described in subclause 5.3.7a. If the UE maintains a counter for "SIM/USIM considered invalid for non-GPRS services", then the UE shall set this counter to UE implementation-specific maximum value.

 If, due to emergency services fallback (see 3GPP TS 23.502 [59]), there is a request for CS fallback call pending (see subclause 5.3.7), the UE shall attempt to select GERAN or UTRAN radio access technology and attempt emergency call setup.

#16 (MSC temporarily not reachable); or

#17 (Network failure)

 The UE shall stop timer T3410 if still running, and shall enter state MM IDLE. The tracking area updating attempt counter shall be incremented, unless it was already set to 5.

 If the tracking area updating attempt counter is less than 5:

- the UE shall start timer T3411, shall set the EPS update status to EU1 UPDATED and shall enter state EMM-REGISTERED.ATTEMPTING-TO-UPDATE-MM. When timer T3411 expires the combined tracking area updating procedure indicating "combined TA/LA updating with IMSI attach" is triggered.

 If the tracking area updating attempt counter is equal to 5:

- a UE operating in CS/PS mode 2 of operation and a UE operating in CS/PS mode 1 of operation with "IMS voice available" shall start timer T3402, shall set the EPS update status to EU1 UPDATED and shall enter state EMM-REGISTERED.ATTEMPTING-TO-UPDATE-MM. When timer T3402 expires the combined tracking area updating procedure indicating "combined TA/LA updating with IMSI attach" is triggered;

- a UE operating in CS/PS mode 1 of operation with "IMS voice not available" shall attempt to select GERAN or UTRAN radio access technology and proceed with appropriate MM or GMM specific procedures and disable the E-UTRA capability (see subclause 4.5).

#18 (CS domain not available)

 The UE shall stop timer T3410 if still running, shall reset the tracking area updating attempt counter, shall set the EPS update status to EU1 UPDATED and shall enter state EMM-REGISTERED.NORMAL-SERVICE.

 The UE shall enter state MM IDLE and shall set the update status to U2 NOT UPDATED.

 A UE in CS/PS mode 1 of operation with "IMS voice not available" shall attempt to select GERAN or UTRAN radio access technology and disable the E-UTRA capability (see subclause 4.5).

 A UE in CS/PS mode 2 of operation and a UE operating in CS/PS mode 1 of operation with "IMS voice available" may provide a notification to the user or the upper layers that the CS domain is not available.

 The UE shall not attempt combined attach or combined tracking area updating procedures with current PLMN until switching off the UE or the UICC containing the USIM is removed.

#22 (Congestion)

 The UE shall stop the timer T3410 if still running. The tracking area updating attempt counter shall be set to 5. The UE shall start the timer T3402, shall set the EPS update status to EU1 UPDATED, shall enter state EMM-REGISTERED.ATTEMPTING-TO-UPDATE-MM, and shall enter state MM IDLE.

Other EMM cause values and the case that no EMM cause IE was received are considered as abnormal cases. The combined attach procedure shall be considered as failed for non-EPS services. The behaviour of the UE in those cases is specified in subclause 5.5.1.3.6.

\*\*\*\*\* Next change \*\*\*\*\*

##### 5.5.1.3.5 Combined attach not accepted by the network

If the attach request can neither be accepted by the network for EPS nor for non-EPS services, the MME shall send an ATTACH REJECT message to the UE including an appropriate EMM cause value. If EMM-REGISTERED without PDN connection is not supported by the UE or the MME, the attach request included a PDN CONNECTIVITY REQUEST message, and the attach procedure fails due to a default EPS bearer setup failure, an ESM procedure failure or operator determined barring, the MME shall:

- combine the ATTACH REJECT message with a PDN CONNECTIVITY REJECT message contained in the ESM message container information element. In this case the EMM cause value in the ATTACH REJECT message shall be set to #19, "ESM failure"; or

- send the ATTACH REJECT message with the EMM cause set to #15 "No suitable cells in tracking area", if the PDN connectivity reject is due to ESM cause #29 subject to operator policies (see 3GPP TS 29.274 [16D] for further details). In this case, the network may additionally include the Extended EMM cause IE with value "E-UTRAN not allowed".

If the attach request is rejected due to NAS level mobility management congestion control, the network shall set the EMM cause value to #22 "congestion" and assign a back-off timer T3346.

If the attach request is rejected due to service gap control as specified in subclause 5.3.17 i.e. the T3447 timer is running, the network shall set the EMM cause value to #22 "congestion" and may assign a back-off timer T3346 with the remaining time of the running T3447 timer.

Based on operator policy, if the attach request is rejected due to core network redirection for CIoT optimizations, the network shall set the EMM cause value to #31 "Redirection to 5GCN required".

NOTE 1: The network can take into account the UE’s N1 mode capability, the 5GS CIoT network behaviour supported by the UE or the 5GS CIoT network behaviour supported by the 5GCN to determine the rejection with the EMM cause value #31 "Redirection to 5GCN required".

Upon receiving the ATTACH REJECT message, if the message is integrity protected or contains a reject cause other than EMM cause value #25, the UE shall stop timer T3410 and enter MM state MM IDLE.

If the ATTACH REJECT message with EMM cause #25 was received without integrity protection, then the UE shall discard the message.

The UE shall take the following actions depending on the EMM cause value received in the ATTACH REJECT message.

#3 (Illegal UE);

#6 (Illegal ME); or

#8 (EPS services and non-EPS services not allowed);

 The UE shall set the EPS update status to EU3 ROAMING NOT ALLOWED (and shall store it according to subclause5.1.3.3) and shall delete any GUTI, last visited registered TAI, TAI list and eKSI.

 The UE shall consider the USIM as invalid for EPS and non-EPS services until switching off or the UICC containing the USIM is removed or the timer T3245 expires as described in subclause 5.3.7a. Additionally, the UE shall delete the list of equivalent PLMNs and shall enter the state EMM-DEREGISTERED.NO-IMSI. If the message has been successfully integrity checked by the NAS and the UE maintains a counter for "SIM/USIM considered invalid for GPRS services", then the UE shall set this counter to UE implementation-specific maximum value. If the message has been successfully integrity checked by the NAS and the UE maintains a counter for "SIM/USIM considered invalid for non-GPRS services", then the UE shall set this counter to UE implementation-specific maximum value.

 If A/Gb mode or Iu mode is supported by the UE, the UE shall in addition handle the MM parameters update status, TMSI, LAI and ciphering key sequence number, and the GMM parameters GMM state, GPRS update status, P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number as specified in 3GPP TS 24.008 [13] for the case when the combined attach procedure is rejected with the GMM cause with the same value.

 For the EMM cause value #3 or #6, if the UE is operating in single-registration mode, the UE shall in addition handle the 5GMM parameters 5GMM state, 5GS update status, 5G-GUTI, last visited registered TAI, TAI list and ngKSI as specified in 3GPP TS 24.501 [54] for the case when the initial registration procedure performed over 3GPP access is rejected with the 5GMM cause with the same value.

 For the EMM cause value #8, if the UE is operating in single-registration mode, the UE shall in addition set the 5GMM state to 5GMM-DEREGISTERED, 5GS update status to 5U3 ROAMING NOT ALLOWED, and shall delete any 5G-GUTI, last visited registered TAI, TAI list and ngKSI.

#7 (EPS services not allowed);

 The UE shall set the EPS update status to EU3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.3) and shall delete any GUTI, last visited registered TAI, TAI list and eKSI. The UE shall consider the USIM as invalid for EPS services until switching off or the UICC containing the USIM is removed or the timer T3245 expires as described in subclause 5.3.7a. Additionally, the UE shall enter the state EMM-DEREGISTERED. If the message has been successfully integrity checked by the NAS and the UE maintains a counter for "SIM/USIM considered invalid for GPRS services", then the UE shall set this counter to UE implementation-specific maximum value.

 A UE which is already IMSI attached for non-EPS services is still IMSI attached for non-EPS services and shall set the update status to U2 NOT UPDATED.

 The UE shall attempt to select GERAN or UTRAN radio access technology and shall proceed with the appropriate MM specific procedure according to the MM service state. The UE shall not reselect E-UTRAN radio access technology until switching off or the UICC containing the USIM is removed.

 If A/Gb mode or Iu mode is supported by the UE, the UE shall in addition handle the GMM parameters GMM state, GPRS update status, P-TMSI, P-TMSI signature, RAI and GPRS ciphering key sequence number as specified in 3GPP TS 24.008 [13] for the case when the combined attach procedure is rejected with the GMM cause with the same value.

 If the UE is operating in single-registration mode, the UE shall in addition handle the 5GMM parameters 5GMM state, 5GS update status, 5G-GUTI, last visited registered TAI, TAI list and ngKSI as specified in 3GPP TS 24.501 [54] for the case when the initial registration procedure performed over 3GPP access is rejected with the 5GMM cause with the same value.

#11 (PLMN not allowed); or

#35 (Requested service option not authorized in this PLMN);

 The UE shall set the EPS update status to EU3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.3) and shall delete any GUTI, last visited registered TAI, TAI list and eKSI, and reset the attach attempt counter. The UE shall delete the list of equivalent PLMNs and enter the state EMM-DEREGISTERED.PLMN-SEARCH.

 The UE shall store the PLMN identity in the "forbidden PLMN list" and if the UE is configured to use timer T3245 (see 3GPP TS 24.368 [15A] or 3GPP TS 31.102 [17]) then the UE shall start timer T3245 and proceed as described in subclause 5.3.7a. If the message has been successfully integrity checked by the NAS and the UE maintains a PLMN-specific attempt counter for that PLMN, then the UE shall set this counter to the UE implementation-specific maximum value.

 The UE shall perform a PLMN selection according to 3GPP TS 23.122 [6].

 If A/Gb mode or Iu mode is supported by the UE, the UE shall in addition handle the MM parameters update status, TMSI, LAI, ciphering key sequence number and location update attempt counter, and the GMM parameters GMM state, GPRS update status, P-TMSI, P-TMSI signature, RAI, GPRS ciphering key sequence number and GPRS attach attempt counter as specified in 3GPP TS 24.008 [13] for the case when the combined attach procedure is rejected with the GMM cause value #11 and no RR connection exists.

 For the EMM cause value #11, if the UE is operating in single-registration mode, the UE shall in addition handle the 5GMM parameters 5GMM state, 5GS update status, 5G-GUTI, last visited registered TAI, TAI list and ngKSI as specified in 3GPP TS 24.501 [54] for the case when the initial registration procedure performed over 3GPP access is rejected with the 5GMM cause with the same value.

 For the EMM cause value #35, if the UE is operating in single-registration mode, the UE shall in addition set the 5GMM state to 5GMM-DEREGISTERED, 5GS update status to 5U3 ROAMING NOT ALLOWED, and shall delete any 5G-GUTI, last visited registered TAI, TAI list and ngKSI.

#12 (Tracking area not allowed);

 The UE shall set the EPS update status to EU3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.3) and shall delete any GUTI, last visited registered TAI, TAI list and eKSI. The UE shall reset the attach attempt counter and enter the state EMM-DEREGISTERED.LIMITED-SERVICE.

 The UE shall store the current TAI in the list of "forbidden tracking areas for regional provision of service". If the ATTACH REJECT message is not integrity protected, the UE shall memorize the current TAI was stored in the list of "forbidden tracking areas for regional provision of service" for non-integrity protected NAS reject message.

 If A/Gb mode or Iu mode is supported by the UE, the UE shall in addition handle the MM parameters update status, TMSI, LAI, ciphering key sequence number and location update attempt counter, and the GMM parameters GMM state, GPRS update status, P-TMSI, P-TMSI signature, RAI, GPRS ciphering key sequence number and GPRS attach attempt counter as specified in 3GPP TS 24.008 [13] for the case when the combined attach procedure is rejected with the GMM cause with the same value.

 If the UE is operating in single-registration mode, the UE shall in addition handle the 5GMM parameters 5GMM state, 5GS update status, 5G-GUTI, last visited registered TAI, TAI list and ngKSI as specified in 3GPP TS 24.501 [54] for the case when the initial registration procedure performed over 3GPP access is rejected with the 5GMM cause with the same value.

#13 (Roaming not allowed in this tracking area);

 The UE shall set the EPS update status to EU3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.3) and shall delete any GUTI, last visited registered TAI, TAI list and eKSI. The UE shall delete the list of equivalent PLMNs and reset the attach attempt counter. Additionally the UE enter the state EMM-DEREGISTERED.LIMITED-SERVICE or optionally EMM-DEREGISTERED.PLMN-SEARCH.

 The UE shall store the current TAI in the list of "forbidden tracking areas for roaming". If the ATTACH REJECT message is not integrity protected, the UE shall memorize the current TAI was stored in the list of "forbidden tracking areas for roaming" for non-integrity protected NAS reject message.

 If the UE is registered in N1 mode and operating in dual-registration mode, the PLMN that the UE chooses to register in is specified in 3GPP TS 24.501 [54] subclause 4.8.3. Otherwise the UE shall perform a PLMN selection according to 3GPP TS 23.122 [6].

 If A/Gb mode or Iu mode is supported by the UE, the UE shall in addition handle the MM parameters update status, TMSI, LAI, ciphering key sequence number and location update attempt counter, and the GMM parameters GMM state, GPRS update status, P-TMSI, P-TMSI signature, RAI, GPRS ciphering key sequence number and GPRS attach attempt counter as specified in 3GPP TS 24.008 [13] for the case when the combined attach procedure is rejected with the GMM cause with the same value.

 If the UE is operating in single-registration mode, the UE shall in addition handle the 5GMM parameters 5GMM state, 5GS update status, 5G-GUTI, last visited registered TAI, TAI list and ngKSI as specified in 3GPP TS 24.501 [54] for the case when the initial registration procedure performed over 3GPP access is rejected with the 5GMM cause with the same value.

#14 (EPS services not allowed in this PLMN);

 The UE shall set the EPS update status to EU3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.3) and shall delete any GUTI, last visited registered TAI, TAI list and eKSI. Additionally the UE shall reset the attach attempt counter and enter the state EMM-DEREGISTERED.PLMN-SEARCH.

 The UE shall store the PLMN identity in the "forbidden PLMNs for GPRS service" list and if the UE is configured to use timer T3245 (see 3GPP TS 24.368 [15A] or 3GPP TS 31.102 [17]) then the UE shall start timer T3245 and proceed as described in subclause 5.3.7a. If the message has been successfully integrity checked by the NAS and the UE maintains a PLMN-specific PS-attempt counter for that PLMN, then the UE shall set this counter to the UE implementation-specific maximum value.

 A UE operating in CS/PS mode 1 or CS/PS mode 2 of operation which is already IMSI attached for non-EPS services is still IMSI attached for non-EPS services and shall set the update status to U2 NOT UPDATED.

 A UE operating in CS/PS mode 1 of operation and supporting A/Gb or Iu mode may select GERAN or UTRAN radio access technology and proceed with the appropriate MM specific procedure according to the MM service state. In this case, the UE shall disable the E-UTRA capability (see subclause 4.5).

 A UE operating in CS/PS mode 1 of operation and supporting A/Gb or Iu mode may perform a PLMN selection according to 3GPP TS 23.122 [6].

 A UE operating in CS/PS mode 1 of operation and supporting S1 mode only, or operating in CS/PS mode 2 of operation shall delete the list of equivalent PLMNs and shall perform a PLMN selection according to 3GPP TS 23.122 [6].

 If A/Gb mode or Iu mode is supported by the UE, the UE shall in addition handle the GMM parameters GMM state, GPRS update status, P-TMSI, P-TMSI signature, RAI, GPRS ciphering key sequence number and GPRS attach attempt counter as specified in 3GPP TS 24.008 [13] for the case when the combined attach procedure is rejected with the GMM cause with the same value.

 If the UE is operating in single-registration mode, the UE shall in addition set the 5GMM state to 5GMM-DEREGISTERED, 5GS update status to 5U3 ROAMING NOT ALLOWED, and shall delete any 5G-GUTI, last visited registered TAI, TAI list and ngKSI.

#15 (No suitable cells in tracking area);

 The UE shall set the EPS update status to EU3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.3) and shall delete any GUTI, last visited registered TAI, TAI list and eKSI. Additionally the UE shall reset the attach attempt counter and enter the state EMM-DEREGISTERED.LIMITED-SERVICE.

 The UE shall store the current TAI in the list of "forbidden tracking areas for roaming". If the ATTACH REJECT message is not integrity protected, the UE shall memorize the current TAI was stored in the list of "forbidden tracking areas for roaming" for non-integrity protected NAS reject message. Additionally, the UE shall proceed as follows:

- if the UE is in WB-S1 mode and the Extended EMM cause IE with value "E-UTRAN not allowed" is included in the ATTACH REJECT message, the UE supports "E-UTRA Disabling for EMM cause #15", and the "E-UTRA Disabling Allowed for EMM cause #15" parameter as specified in 3GPP TS 24.368 [15A] or 3GPP TS 31.102 [17] is present and set to enabled, then the UE shall disable the E-UTRA capability as specified in subclause 4.5 and search for a suitable cell in another location area or 5GS tracking area;

- if the UE is in NB-S1 mode and the Extended EMM cause IE with value "NB-IoT not allowed" is included in the ATTACH REJECT message, then the UE may disable the NB-IoT capability as specified in subclause 4.9 and search for a suitable cell in E-UTRAN radio access technology;

- otherwise, the UE shall search for a suitable cell in another tracking area or in another location area according to 3GPP TS 36.304 [21].

 If A/Gb mode or Iu mode is supported by the UE, the UE shall in addition handle the MM parameters update status, TMSI, LAI, ciphering key sequence number and location update attempt counter, and the GMM parameters GMM state, GPRS update status, P-TMSI, P-TMSI signature, RAI, GPRS ciphering key sequence number and GPRS attach attempt counter as specified in 3GPP TS 24.008 [13] for the case when the combined attach procedure is rejected with the GMM cause with the same value.

 If the UE is operating in single-registration mode, the UE shall in addition handle the 5GMM parameters 5GMM state, 5GS update status, 5G-GUTI, last visited registered TAI, TAI list and ngKSI as specified in 3GPP TS 24.501 [54] for the case when the initial registration procedure performed over 3GPP access is rejected with the 5GMM cause with the same value.

#22 (Congestion);

 If the T3346 value IE is present in the ATTACH REJECT message and the value indicates that this timer is neither zero nor deactivated, the UE shall proceed as described below; otherwise it shall be considered as an abnormal case and the behaviour of the UE for this case is specified in subclause 5.5.1.3.6.

 The UE shall abort the attach procedure, reset the attach attempt counter, set the EPS update status to EU2 NOT UPDATED and enter state EMM-DEREGISTERED.ATTEMPTING-TO-ATTACH.

 The UE shall stop timer T3346 if it is running.

 If the ATTACH REJECT message is integrity protected, the UE shall start timer T3346 with the value provided in the T3346 value IE.

 If the ATTACH REJECT message is not integrity protected, the UE shall start timer T3346 with a random value from the default range specified in 3GPP TS 24.008 [13].

 The UE stays in the current serving cell and applies the normal cell reselection process. The attach procedure is started if still needed when timer T3346 expires or is stopped.

 If A/Gb mode or Iu mode is supported by the UE, the UE shall in addition handle the GMM parameters GMM state, GPRS update status and GPRS attach attempt counter as specified in 3GPP TS 24.008 [13] for the case when the combined attach procedure is rejected with the GMM cause with the same value.

 If the UE is operating in single-registration mode, the UE shall in addition handle the 5GMM parameters 5GMM state, 5GS update status and registration attempt counter as specified in 3GPP TS 24.501 [54] for the case when the initial registration procedure performed over 3GPP access is rejected with the 5GMM cause with the same value.

#25 (Not authorized for this CSG);

 EMM cause #25 is only applicable when received from a CSG cell. EMM cause #25 received from a non-CSG cell is considered as an abnormal case and the behaviour of the UE is specified in subclause 5.5.1.3.6.

 The UE shall set the EPS update status to EU3 ROAMING NOT ALLOWED (and store it according to subclause 5.1.3.3). Additionally, the UE shall reset the attach attempt counter and shall enter the state EMM-DEREGISTERED.LIMITED-SERVICE.

 If the CSG ID and associated PLMN identity of the cell where the UE has sent the ATTACH REQUEST message are contained in the Allowed CSG list, the UE shall remove the entry corresponding to this CSG ID and associated PLMN identity from the Allowed CSG list.

 If the CSG ID and associated PLMN identity of the cell where the UE has sent the ATTACH REQUEST message are contained in the Operator CSG list, the UE shall apply the procedures defined in 3GPP TS 23.122 [6] subclause 3.1A.

 The UE shall search for a suitable cell according to 3GPP TS 36.304 [21].

 If A/Gb mode or Iu mode is supported by the UE, the UE shall in addition handle the MM parameters update status and location update attempt counter, and GMM parameters GMM state, GPRS update status and GPRS attach attempt counter as specified in 3GPP TS 24.008 [13] for the case when the combined attach procedure is rejected with the GMM cause with the same value.

 If the UE is operating in single-registration mode, the UE shall in addition set the 5GMM state to 5GMM-DEREGISTERED and set the 5GS update status to 5U3 ROAMING NOT ALLOWED.

#31 (Redirection to 5GCN required);

 EMM cause #31 received by a UE that has not indicated support for CIoT optimizations is considered as an abnormal case and the behaviour of the UE is specified in subclause 5.5.1.3.6.

 The UE shall set the EPS update status to EU3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.3) and shall delete any GUTI, last visited registered TAI, TAI list and eKSI. Additionally, the UE shall reset the attach attempt counter.

 The UE shall enable N1 mode capability for 3GPP access if it was disabled and disable the E-UTRA capability (see subclause 4.5) and enter state EMM-DEREGISTERED.NO-CELL-AVAILABLE.

 If the UE is operating in single-registration mode, the UE shall in addition handle the 5GMM parameters 5GMM state, 5GS update status, 5G-GUTI, last visited registered TAI, TAI list and ngKSI as specified in 3GPP TS 24.501 [54] for the case when the initial registration procedure performed over 3GPP access is rejected with the 5GMM cause with the same value.

#42 (Severe network failure);

 The UE shall set the EPS update status to EU2 NOT UPDATED, and shall delete any GUTI, last visited registered TAI, TAI list, eKSI, and list of equivalent PLMNs, and set the attach attempt counter to 5. The UE shall start an implementation specific timer, setting its value to 2 times the value of T as defined in 3GPP TS 23.122 [6]. While this timer is running, the UE shall not consider the PLMN + RAT combination that provided this reject cause as a candidate for PLMN selection. The UE then enters state EMM-DEREGISTERED.PLMN-SEARCH in order to perform a PLMN selection according to 3GPP TS 23.122 [6].

 If A/Gb mode or Iu mode is supported by the UE, the UE shall in addition set the GMM state to GMM-DEREGISTERED, GPRS update status to GU2 NOT UPDATED signature, RAI and GPRS ciphering key sequence number TMSI and ciphering key sequence number.

 If the UE is operating in single-registration mode, the UE shall in addition set the 5GMM state to 5GMM-DEREGISTERED, 5GS update status to 5U2 NOT UPDATED, and shall delete any 5G-GUTI, last visited registered TAI, TAI list and ngKSI.

Other values are considered as abnormal cases. The behaviour of the UE in those cases is specified in subclause 5.5.1.3.6.

\*\*\*\*\* Next change \*\*\*\*\*

#### 5.5.2.1 General

The detach procedure is used:

- by the UE to detach for EPS services only;

- by the UE to disconnect from the last remaining PDN it is connected to if EMM-REGISTERED without PDN connection is not supported by the UE or the MME;

- by the UE in CS/PS mode 1 or CS/PS mode 2 of operation to detach for both EPS services and non-EPS services or for non-EPS services only via a combined detach procedure;

- by the network to inform the UE that it is detached for EPS services or non-EPS services or both;

- by the network to disconnect the UE from the last remaining PDN to which it is connected if EMM-REGISTERED without PDN connection is not supported by the UE or the MME; and

- by the network to inform the UE to re-attach to the network and re-establish all PDN connections.

NOTE 1: After a successful completion of an inter-system change of the UE from S1 mode to non-3GPP access, if the non-3GPP network provides PDN connectivity to the same EPC and EMM-REGISTERED without PDN connection is not supported by the UE or the MME, the MME performs a local detach of the UE.

NOTE 2: If EMM-REGISTERED without PDN connection is supported by the UE and the MME, the detach procedure is not triggered when disconnecting the UE from the last remaining PDN to which it is connected.

The detach procedure also applies to the UE which is IMSI attached for "SMS only".

The detach procedure with appropriate detach type shall be invoked by the UE if the UE is switched off, the USIM card is removed from the UE, the UE wishes to detach for EPS services, the UE wishes to detach for non-EPS services or as part of the eCall inactivity procedure defined in subclause 5.5.4.

If the detach procedure is triggered due to USIM removal, the UE shall indicate "switch off" in the detach type IE.

When upper layers indicate that emergency bearer services are no longer required, the UE if still attached for emergency bearer services, may perform a detach followed by a re-attach to regain normal services, if the UE is in or moves to a suitable cell.

If a detach is requested by the HSS for a UE that has bearers for emergency services, the MME shall not send a DETACH REQUEST message to the UE, and shall follow the procedures in subclause 6.4.4.1 for a UE that has bearers for emergency services.

If the detach procedure for EPS services is performed, the EPS bearer context(s), if any, for this particular UE are deactivated locally without peer-to-peer signalling between the UE and the MME.

If the UE supports A/Gb mode or Iu mode or both, the UE shall store the TIN in the non-volatile memory in the ME, as described in annex C, for a subsequent attach procedure.

The UE is allowed to initiate the detach procedure even if the timer T3346 is running.

The network proceeds with the detach procedure even if NAS level mobility management congestion control is active.

\*\*\*\*\* Next change \*\*\*\*\*

##### 5.5.2.2.1 UE initiated detach procedure initiation

The detach procedure is initiated by the UE by sending a DETACH REQUEST message (see example in figure 5.5.2.2.1.1). The Detach type IE included in the message indicates whether detach is due to a "switch off" or not. The Detach type IE also indicates whether the detach is for EPS services only, for non-EPS services only, or for both. If the UE has a mapped EPS security context as the current EPS security context, the UE shall set the type of security context flag to "mapped security context". Otherwise, the UE shall set the type of security context flag to "native security context".

If the UE has a valid GUTI, the UE shall populate the EPS mobile identity IE with the valid GUTI. If the UE does not have a valid GUTI, the UE shall populate the EPS mobile identity IE with its IMSI.

If the UE does not have a valid GUTI and it does not have a valid IMSI, then the UE shall populate the EPS mobile identity IE with its IMEI.

NOTE: During the attach for emergency bearer services or attach for access to RLOS when the UE (with no USIM or invalid USIM) is in EMM-REGISTERED-INITIATED STATE, the UE has neither a valid GUTI nor a valid IMSI.

If the detach is not due to switch off and the UE is in the state EMM-REGISTERED or EMM-REGISTERED-INITIATED, timer T3421 shall be started in the UE after the DETACH REQUEST message has been sent. If the detach type indicates that the detach is for non-EPS services only the UE shall enter the state EMM-REGISTERED.IMSI-DETACH-INITIATED, otherwise the UE shall enter the state EMM-DEREGISTERED-INITIATED. If the detach type indicates that the detach is for non-EPS services or both EPS and non-EPS services, the UE shall enter the state MM IMSI DETACH PENDING.

If the UE to be switched off is not operating in NB-S1 mode and not operating in WB-S1 mode in any enhanced coverage CE mode, the UE shall try for a period of 5 seconds to send the DETACH REQUEST message. If the UE to be switched off:

- is operating in NB-S1 mode, then the UE should try for at least a period of 85 seconds to send the DETACH REQUEST; or

- is operating in WB-S1 mode in any enhanced coverage CE mode, then the UE should try for at least a period of 14 seconds to send the DETACH REQUEST.

During this period, the UE may be switched off as soon as the DETACH REQUEST message has been sent.

After the last DETACH REQUEST message is sent, the UE shall proceed as follows:

- if the current EPS security context is a native EPS security context, then the UE shall store the current EPS security context as specified in annex C and mark it as valid;

- else if the current EPS security context is a mapped EPS security context and a non-current full native EPS security context exists, then the UE shall store the non-current EPS security context as specified in annex C and mark it as valid, and finally the UE shall delete any mapped EPS security context or partial native EPS security context.



Figure 5.5.2.2.1.1: UE initiated detach procedure

\*\*\*\*\* Next change \*\*\*\*\*

##### 5.5.2.3.5 Abnormal cases on the network side

The following abnormal cases can be identified:

a) T3422 time-out

 On the first expiry of the timer, the network shall retransmit the DETACH REQUEST message and shall start timer T3422. This retransmission is repeated four times, i.e. on the fifth expiry of timer T3422, the detach procedure shall be aborted. If the detach type is "IMSI detach", or "re-attach not required" and the EMM cause value is #2 "IMSI unknown in HSS", the network shall not change the current EMM state; otherwise the network shall change to state EMM-DEREGISTERED.

b) Lower layer failure

 The detach procedure is aborted. If the detach type indicates "IMSI detach", or "re-attach not required" and the EMM cause value is #2 "IMSI unknown in HSS", the network shall not change the current EMM state; otherwise the network shall change to state EMM-DEREGISTERED.

c) Detach procedure collision

 If the network receives a DETACH REQUEST message with "switch off" indication, before the network initiated detach procedure has been completed, both procedures shall be considered completed.

 If the network receives a DETACH REQUEST message without "switch off" indication, before the network initiated detach procedure has been completed, the network shall send a DETACH ACCEPT message to the UE.

d) Detach and attach procedure collision

 If the network receives an ATTACH REQUEST message before the network initiated detach procedure with detach type "re-attach not required" with no EMM cause IE, or "re-attach not required" and the EMM cause value not #2 "IMSI unknown in HSS", has been completed, the network shall ignore the ATTACH REQUEST message. If the Detach type IE, sent in the DETACH REQUEST message, indicates "re-attach required" the detach procedure is aborted and the attach procedure shall be progressed after the EPS bearer context(s) have been deleted. If the Detach type IE, sent in DETACH REQUEST message, indicates "IMSI detach", or "re-attach not required" and the EMM cause value is #2 "IMSI unknown in HSS", the detach procedure is aborted and the attach procedure shall be progressed.

e) Detach and tracking area updating procedure collision

 If the Detach type IE, sent in DETACH REQUEST message, indicates "re-attach not required" with no EMM cause IE, or "re-attach not required" with EMM cause other than #2 "IMSI unknown in HSS" or indicates "re-attach required", and the network receives a TRACKING AREA UPDATE REQUEST message before the network initiated detach procedure has been completed, the detach procedure shall be progressed, i.e. the TRACKING AREA UPDATE REQUEST message shall be ignored.

 If the Detach type IE, sent in DETACH REQUEST message, indicates "re-attach not required" with EMM cause #2 "IMSI unknown in HSS" or indicates "IMSI detach" and the network receives a TRACKING AREA UPDATE REQUEST message before the network initiated detach procedure has been completed, the network shall abort the detach procedure, shall stop T3422 and shall progress the tracking area updating procedure.

f) Detach and service request procedure collision

 If the network receives a SERVICE REQUEST message or an EXTENDED SERVICE REQUEST message for packet services before the network initiated detach procedure has been completed (e.g. the DETACH REQUEST message is pending to be sent to the UE) and the DETACH REQUEST contains detach type "re-attach not required" with EMM cause #2 "IMSI unknown in HSS" or detach type "IMSI detach", the network shall progress both procedures. If the DETACH REQUEST message contains detach type "re-attach not required" with no EMM cause IE, or "re-attach not required" with EMM cause other than #2 "IMSI unknown in HSS" or detach type "re-attach required", the network shall progress the detach procedure.

 If the network receives an EXTENDED SERVICE REQUEST message for CS fallback, but not for CS fallback for emergency call, before the network initiated detach procedure has been completed (e.g. the DETACH REQUEST message is pending to be sent to the UE) and the DETACH REQUEST contains detach type "re-attach not required" with EMM cause #2 "IMSI unknown in HSS" or detach type "IMSI detach", the network shall ignore the EXTENDED SERVICE REQUEST message and progress the detach procedure.

 If the network receives an EXTENDED SERVICE REQUEST message for CS fallback for emergency call before the network initiated detach procedure has been completed (e.g. the DETACH REQUEST message is pending to be sent to the UE) and the DETACH REQUEST contains detach type "re-attach not required" with EMM cause #2 "IMSI unknown in HSS" or detach type "IMSI detach", the network shall progress both procedures.

g) Lower layers indication of non-delivered NAS PDU due to handover

 If the DETACH REQUEST message could not be delivered due to an intra MME handover and the target TA is included in the TAI list, then upon successful completion of the intra MME handover the MME shall retransmit the DETACH REQUEST message. If a failure of the handover procedure is reported by the lower layer and the S1 signalling connection exists, the MME shall retransmit the DETACH REQUEST message.

\*\*\*\*\* Next change \*\*\*\*\*

#### 5.5.3.1 General

The tracking area updating procedure is always initiated by the UE and is used for the following purposes:

- normal tracking area updating to update the registration of the actual tracking area of a UE in the network;

- combined tracking area updating to update the registration of the actual tracking area for a UE in CS/PS mode 1 or CS/PS mode 2 of operation;

- periodic tracking area updating to periodically notify the availability of the UE to the network;

- IMSI attach for non-EPS services when the UE is attached for EPS services. This procedure is used by a UE in CS/PS mode 1 or CS/PS mode 2 of operation;

- in various cases of inter-system change from Iu mode to S1 mode or from A/Gb mode to S1 mode;

- in various cases of inter-system change from N1 mode to S1 mode if the UE operates in single-registration mode and as described in 3GPP TS 24.501 [54];

- S101 mode to S1 mode inter-system change;

- MME load balancing;

- to update certain UE specific parameters in the network;

- recovery from certain error cases;

- to indicate that the UE enters S1 mode after CS fallback or 1xCS fallback;

- to indicate to the network that the UE has selected a CSG cell whose CSG identity and associated PLMN identity are not included in the UE's Allowed CSG list or in the UE's Operator CSG list;

- to indicate the current radio access technology to the network for the support of terminating access domain selection for voice calls or voice sessions; and

- to indicate to the network that the UE has locally released EPS bearer context(s).

Details on the conditions for the UE to initiate the tracking area updating procedure are specified in subclause 5.5.3.2.2 and subclause 5.5.3.3.2.

While a UE has a PDN connection for emergency bearer services, the UE shall not perform manual CSG selection.

If control plane CIoT EPS optimization is not used by the UE, a UE initiating the tracking area updating procedure in EMM-IDLE mode may request the network to re-establish the radio and S1 bearers for all active EPS bearer contexts during the procedure. If control plane CIoT EPS optimization is used by the UE, a UE initiating the tracking area updating procedure in EMM-IDLE mode may request the network to re-establish the radio and S1 bearers for all active EPS bearer contexts associated with PDN connections established without control plane only indication during the procedure.

In a shared network, the UE shall choose one of the PLMN identities as specified in 3GPP TS 23.122 [6]. The UE shall construct the TAI of the cell from this chosen PLMN identity and the TAC received for this PLMN identity on the broadcast system information. The chosen PLMN identity shall be indicated to the E-UTRAN (see 3GPP TS 36.331 [22]). Whenever a TRACKING AREA UPDATE REJECT message with the EMM cause #11 "PLMN not allowed" is received by the UE, the chosen PLMN identity shall be stored in the "forbidden PLMN list" and if the UE is configured to use timer T3245 (see 3GPP TS 24.368 [15A] or 3GPP TS 31.102 [17]) then the UE shall start timer T3245 and proceed as described in subclause 5.3.7a. Whenever a TRACKING AREA UPDATE REJECT message with the EMM cause #14 "EPS services not allowed in this PLMN" is received by the UE, the chosen PLMN identity shall be stored in the "forbidden PLMNs for GPRS service". Whenever a TRACKING AREA UPDATE REJECT message is received by the UE with the EMM cause #12 "tracking area not allowed", #13 "roaming not allowed in this tracking area", or #15 "no suitable cells in tracking Area", the constructed TAI shall be stored in the suitable list.

In a shared network, if TRACKING AREA UPDATE REJECT is received as a response to a tracking area updating procedure initiated in EMM-CONNECTED mode, the UE need not update forbidden lists.

A tracking area updating attempt counter is used to limit the number of subsequently rejected tracking area update attempts. The tracking area updating attempt counter shall be incremented as specified in subclause 5.5.3.2.6. Depending on the value of the tracking area updating attempt counter, specific actions shall be performed. The tracking area updating attempt counter shall be reset when:

- a normal or periodic tracking area updating or a combined tracking area updating procedure is successfully completed;

- a normal or periodic tracking area updating or a combined tracking area updating procedure is rejected with EMM cause #11, #12, #13, #14, #15, #25 or #35:

- a combined attach procedure or a combined tracking area updating procedure is completed for EPS services only with cause #2 or #18; or

- a new PLMN is selected.

Additionally the tracking area updating attempt counter shall be reset when the UE is in substate EMM-REGISTERED.ATTEMPTING-TO-UPDATE or EMM-REGISTERED.ATTEMPTING-TO-UPDATE-MM, and:

- a new tracking area is entered;

- timer T3402 expires; or

- timer T3346 is started.

\*\*\*\*\* Next change \*\*\*\*\*

##### 5.5.3.2.2 Normal and periodic tracking area updating procedure initiation

The UE in state EMM-REGISTERED shall initiate the tracking area updating procedure by sending a TRACKING AREA UPDATE REQUEST message to the MME,

a) when the UE detects entering a tracking area that is not in the list of tracking areas that the UE previously registered in the MME, unless the UE is configured for "AttachWithIMSI" as specified in 3GPP TS 24.368 [15A] or 3GPP TS 31.102 [17] and is entering a tracking area in a new PLMN that is neither the registered PLMN nor in the list of equivalent PLMNs;

b) when the periodic tracking area updating timer T3412 expires;

c) when the UE enters EMM-REGISTERED.NORMAL-SERVICE and the UE's TIN indicates "P-TMSI";

d) when the UE performs an inter-system change from S101 mode to S1 mode and has no user data pending;

e) when the UE receives an indication from the lower layers that the RRC connection was released with cause "load balancing TAU required";

f) when the UE deactivated EPS bearer context(s) locally while in EMM-REGISTERED, because it could not establish a NAS signalling connection, and then returns to EMM-REGISTERED.NORMAL-SERVICE and no EXTENDED SERVICE REQUEST message, CONTROL PLANE SERVICE REQUEST message or DETACH REQUEST message with detach type is "EPS detach" or "combined EPS/IMSI detach" is pending to be sent by the UE;

g) when the UE changes any one of the UE network capability information, the MS network capability information or the N1 UE network capability information;

h) when the UE changes the UE specific DRX parameter (in WB-S1 mode or NB-S1 mode);

i) when the UE receives an indication of "RRC Connection failure" from the lower layers and has no signalling or user uplink data pending (i.e. when the lower layer requests NAS signalling connection recovery);

j) when the UE enters S1 mode after 1xCS fallback or 1xSRVCC;

k) when due to manual CSG selection the UE has selected a CSG cell whose CSG identity and associated PLMN identity are not included in the UE's Allowed CSG list or in the UE's Operator CSG list;

l) when the UE reselects an E-UTRAN cell while it was in GPRS READY state or PMM-CONNECTED mode;

m) when the UE supports SRVCC to GERAN or UTRAN or supports vSRVCC to UTRAN and changes the mobile station classmark 2 or the supported codecs, or the UE supports SRVCC to GERAN and changes the mobile station classmark 3;

n) when the UE changes the radio capability for GERAN, or cdma2000® or both;

o) when the UE's usage setting or the voice domain preference for E-UTRAN change in the UE;

NOTE 1: For the change of UE's usage setting or the voice domain preference for E-UTRAN which results in disabling UE's E-UTRA capability, the UE can skip sending TRACKING AREA UPDATE REQUEST message and directly perform disabling of UE's E-UTRA capability.

p) when the UE activates mobility management for IMS voice termination as specified in 3GPP TS 24.008 [13], annex P.2, and the TIN indicates "RAT-related TMSI";

q) when the UE performs an inter-system change from A/Gb mode to S1 mode and the TIN indicates "RAT-related TMSI", but the UE is required to perform tracking area updating for IMS voice termination as specified in 3GPP TS 24.008 [13], annex P.4;

r) upon reception of a paging indication using S-TMSI and the UE is in state EMM-REGISTERED.ATTEMPTING-TO-UPDATE;

s) when the UE needs to update the network with EPS bearer context status due to local de-activation of EPS bearer context(s) as specified in subclause 6.5.1.4A;

t) when the UE needs to request the use of PSM or needs to stop the use of PSM;

u) when the UE needs to request the use of eDRX or needs to stop the use of eDRX;

v) when a change in the eDRX usage conditions at the UE requires different extended DRX parameters;

w) when a change in the PSM usage conditions at the UE requires a different timer T3412 value or different timer T3324 value;

NOTE 2: A change in the PSM or eDRX usage conditions at the UE can include e.g. a change in the UE configuration, a change in requirements from upper layers or the battery running low at the UE.

x) when the CIoT EPS optimizations the UE needs to use, change in the UE;

y) when the Default\_DCN\_ID value changes, as specified in 3GPP TS 24.368 [15A] or in USIM file NASCONFIG as specified in 3GPP TS 31.102 [17];

NOTE 3: The tracking area updating procedure is initiated after deleting the DCN-ID list as specified in annex C.

z) when the UE performs inter-system change from N1 mode to S1 mode in EMM-IDLE mode, the UE operates in single-registration mode, and conditions specified in 3GPP TS 24.501 [54] apply;

za) when the UE in EMM-IDLE mode changes the radio capability for E-UTRAN;

zb) when the UE needs to request new ciphering keys for ciphered broadcast assistance data;

zc) when the UE in EMM-IDLE mode changes the radio capability for NG-RAN;

zd) when the UE performs inter-system change from N1 mode to S1 mode in EMM-CONNECTED mode;

ze) in WB-S1 mode, when the applicable UE radio capability ID for the current UE radio configuration changes due to a revocation of the network-assigned UE radio capability IDs by the serving PLMN; or

zf) when the UE needs to use the WUS assistance, stop to use the WUS assistance, or change the conditions for using the WUS assistance.

If case b) is the only reason for initiating the normal and periodic tracking area updating procedure, the UE shall indicate "periodic updating" in the EPS update type IE; otherwise the UE shall indicate "TA updating".

For cases n, za and zc, the UE shall include a UE radio capability information update needed IE in the TRACKING AREA UPDATE REQUEST message.

If the UE is in the EMM-CONNECTED mode and the UE changes the radio capability for E-UTRAN or for NG-RAN, the UE may locally release the established NAS signalling connection and enter the EMM-IDLE mode. Then, the UE shall initiate the tracking area updating procedure including a UE radio capability information update needed IE in the TRACKING AREA UPDATE REQUEST message.

For case l, if the TIN indicates "RAT-related TMSI", the UE shall set the TIN to "P-TMSI" before initiating the tracking area updating procedure.

For case r, the "active" flag in the EPS update type IE shall be set to 1. If a UE is only using EPS services with control plane CIoT EPS optimization, the "signalling active" flag in the Additional update type IE shall be set to 1.

If the UE is using only control plane CIoT EPS optimization, the case i only applies to the case that the UE has indicated to the network that subsequent to the uplink data transmission a downlink data transmission is expected during the transport of uplink user data via the control plane procedure (see subclause 6.6.4).

If the UE has to request resources for ProSe direct discovery or Prose direct communication (see 3GPP TS 36.331 [22]), then the UE shall set the "active" flag to 1 in the TRACKING AREA UPDATE REQUEST message.

If the UE does not have any established PDN connection, the "active" flag in the EPS update type IE shall be set to 0.

When the UE has user data pending and performs an inter-system change from S101 mode to S1 mode to a tracking area included in the TAI list stored in the UE, the UE shall perform a service request procedure instead of a tracking area updating procedure.

When initiating a tracking area updating procedure while in S1 mode, the UE shall use the current EPS NAS integrity key to integrity protect the TRACKING AREA UPDATE REQUEST message, unless the UE is performing inter-system change from N1 mode to S1 mode.

In order to indicate its UE specific DRX parameter for WB-S1 mode while in E-UTRAN coverage, the UE shall send the TRACKING AREA UPDATE REQUEST message containing the UE specific DRX parameter in the DRX parameter IE to the network, with the exception of the case if the UE had indicated its DRX parameter for WB-S1 mode (3GPP TS 24.008 [13]) to the network while in GERAN or UTRAN coverage. In this case, when the UE enters E-UTRAN coverage and initiates a tracking area updating procedure, the UE shall not include the UE specific DRX parameter in the DRX parameter IE in the TRACKING AREA UPDATE REQUEST message.

In NB-S1 mode, a UE that wishes to use or change a UE specific DRX parameter in NB-S1 mode shall include its requested value in every TRACKING AREA UPDATE REQUEST message except when initiating the periodic tracking area updating procedure.

If the UE supports eDRX and requests the use of eDRX, the UE shall include the extended DRX parameters IE in the TRACKING AREA UPDATE REQUEST message.

If the UE supports PSM and requests the use of PSM, the UE shall include the T3324 value IE with a requested timer value in the TRACKING AREA UPDATE REQUEST message. When the UE includes the T3324 value IE and the UE indicates support for extended periodic timer value in the MS network feature support IE, it may also include the T3412 extended value IE to request a particular T3412 value to be allocated.

If a UE supporting CIoT EPS optimizations in NB-S1 mode initiates the tracking area updating procedure for EPS services and "SMS only", the UE shall indicate "SMS only" in the Additional update type IE and shall set the EPS update type IE to "TA updating".

If the UE supports S1-U data transfer and multiple user plane radio bearers (see 3GPP TS 36.306 [44], 3GPP TS 36.331 [22]) in NB-S1 mode, then the UE shall set the Multiple DRB support bit to "Multiple DRB supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

If the UE is in NB-S1 mode, then the UE shall set the Control plane CIoT EPS optimization bit to "Control plane CIoT EPS optimization supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message. If the UE is capable of NB-N1 mode, then the UE shall set the Control plane CIoT 5GS optimization bit to "Control plane CIoT 5GS optimization supported" in the N1 UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

If the UE supports control plane MT-EDT, then the UE shall set the CP-MT-EDT bit to "Control plane Mobile Terminated-Early Data Transmission supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

If the UE supports user plane MT-EDT, then the UE shall set the UP-MT-EDT bit to "User plane Mobile Terminated-Early Data Transmission supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

If the UE has to request resources for V2X communication over PC5 (see 3GPP TS 23.285 [47]), then the UE shall set the "active" flag to 1 in the TRACKING AREA UPDATE REQUEST message.

After sending the TRACKING AREA UPDATE REQUEST message to the MME, the UE shall start timer T3430 and enter state EMM-TRACKING-AREA-UPDATING-INITIATED (see example in figure 5.5.3.2.2.1). If timer T3402 is currently running, the UE shall stop timer T3402. If timer T3411 is currently running, the UE shall stop timer T3411. If timer T3442 is currently running, the UE shall stop timer T3442.

For all cases except cases z and zd:

1) if the UE supports neither A/Gb mode nor Iu mode, the UE shall include a valid GUTI in the Old GUTI IE in the TRACKING AREA UPDATE REQUEST message. In addition, the UE shall include Old GUTI type IE with GUTI type set to "native GUTI"; or

2) if the UE supports A/Gb mode or Iu mode or both, the UE shall handle the Old GUTI IE as follows:

- If the TIN indicates "P-TMSI" and the UE holds a valid P-TMSI and RAI, the UE shall map the P-TMSI and RAI into the Old GUTI IE, and include Old GUTI type IE with GUTI type set to "mapped GUTI". If a P-TMSI signature is associated with the P-TMSI, the UE shall include it in the Old P-TMSI signature IE. Additionally, if the UE holds a valid GUTI, the UE shall indicate the GUTI in the Additional GUTI IE.

NOTE 4: The mapping of the P-TMSI and RAI to the GUTI is specified in 3GPP TS 23.003 [2].

- If the TIN indicates "GUTI" or "RAT-related TMSI" and the UE holds a valid GUTI, the UE shall indicate the GUTI in the Old GUTI IE, and include Old GUTI type IE with GUTI type set to "native GUTI".

If a UE has established PDN connection(s) and uplink user data pending to be sent via user plane when it initiates the tracking area updating procedure, or uplink signalling not related to the tracking area updating procedure when the UE does not support control plane CIoT EPS optimization, it may set the "active" flag in the TRACKING AREA UPDATE REQUEST message to indicate the request to establish the user plane to the network and to keep the NAS signalling connection after the completion of the tracking area updating procedure.

If a UE is using EPS services with control plane CIoT EPS optimization and has user data pending to be sent via control plane over MME but no user data pending to be sent via user plane, or uplink signalling not related to the tracking area updating procedure, the UE may set the "signalling active" flag in the TRACKING AREA UPDATE REQUEST message to indicate the request to keep the NAS signalling connection after the completion of the tracking area updating procedure.

For all cases except cases z and zd, if the UE has a current EPS security context, the UE shall include the eKSI (either KSIASME or KSISGSN) in the NAS Key Set Identifier IE in the TRACKING AREA UPDATE REQUEST message. Otherwise, the UE shall set the NAS Key Set Identifier IE to the value "no key is available". If the UE has a current EPS security context, the UE shall integrity protect the TRACKING AREA UPDATE REQUEST message with the current EPS security context. Otherwise the UE shall not integrity protect the TRACKING AREA UPDATE REQUEST message.

When the tracking area updating procedure is initiated in EMM-IDLE mode to perform an inter-system change from A/Gb mode or Iu mode to S1 mode and the TIN is set to "P-TMSI", the UE shall include the GPRS ciphering key sequence number applicable for A/Gb mode or Iu mode and a nonceUE in the TRACKING AREA UPDATE REQUEST message.

When the tracking area updating procedure is initiated in EMM-CONNECTED mode to perform an inter-system change from A/Gb mode or Iu mode to S1 mode, the UE shall derive the EPS NAS keys from the mapped K'ASME using the selected NAS algorithms, nonceMME and KSISGSN (to be associated with the mapped K'ASME) provided by lower layers as indicated in 3GPP TS 33.401 [19]. The UE shall reset both the uplink and downlink NAS COUNT counters of the mapped EPS security context which shall be taken into use. If the UE has a non-current native EPS security context, the UE shall include the KSIASME in the Non-current native NAS key set identifier IE and its associated GUTI, as specified above, either in the Old GUTI IE or in the Additional GUTI IE of the TRACKING AREA UPDATE REQUEST message. The UE shall set the TSC flag in the Non-current native NAS key set identifier IE to "native security context".

For the case z, the TRACKING AREA UPDATE REQUEST message shall be integrity protected using the 5G NAS security context available in the UE. The UE shall include a GUTI, mapped from 5G-GUTI (see 3GPP TS 23.501 [58] and 3GPP TS 23.003 [2]), in the Old GUTI IE in the TRACKING AREA UPDATE REQUEST message. In addition, the UE shall include Old GUTI type IE with GUTI set to "Native GUTI", and the UE shall include a UE status IE with a 5GMM registration status set to "UE is in 5GMM-REGISTERED state". Additionally, if the UE holds a valid GUTI, the UE shall indicate the GUTI in the Additional GUTI IE.

NOTE 5: The value of the EMM registration status included by the UE in the UE status IE is not used by the MME.

For the case zd, the TRACKING AREA UPDATE REQUEST message shall be integrity protected using the mapped EPS security context as derived when triggering the handover to E-UTRAN (see subclause 4.4.2.2). The UE shall include a GUTI, mapped from 5G-GUTI (see 3GPP TS 23.501 [58] and 3GPP TS 23.003 [2]), in the Old GUTI IE in the TRACKING AREA UPDATE REQUEST message. In addition, the UE shall include Old GUTI type IE with GUTI set to "Native GUTI", and the UE shall include a UE status IE with a 5GMM registration status set to "UE is in 5GMM-REGISTERED state". Additionally, if the UE holds a valid GUTI, the UE shall indicate the GUTI in the Additional GUTI IE. If the UE has a non-current native EPS security context, the UE shall include the KSIASME in the Non-current native NAS key set identifier IE of the TRACKING AREA UPDATE REQUEST message. The UE shall set the TSC flag in the Non-current native NAS key set identifier IE to "native security context".

NOTE 6: The value of the EMM registration status included by the UE in the UE status IE is not used by the MME.

When the tracking area updating procedure is initiated in EMM-IDLE mode, the UE may also include an EPS bearer context status IE in the TRACKING AREA UPDATE REQUEST message, indicating which EPS bearer contexts are active in the UE. The UE shall include the EPS bearer context status IE in TRACKING AREA UPDATE REQUEST message:

a) for the case f;

b) for the case s;

c) for the case z;

d) if the UE has established PDN connection(s) of "non IP" or Ethernet PDN type; and

e) if the UE:

1) locally deactivated at least one dedicated EPS bearer context upon an inter-system mobility from WB-S1 mode to NB-S1 mode in EMM-IDLE mode;

2) locally deactivated at least one dedicated EPS bearer context upon an inter-system change from WB-N1 mode to NB-S1 mode in EMM-IDLE mode for the UE operating in single-registration mode (see subclause 6.4.2.1); or

3) locally deactivated at least one default EPS bearer context upon an inter-system change from N1 mode to NB-S1 mode in EMM-IDLE mode for the UE operating in single-registration mode (see subclause 6.5.0).

If the UE initiates the first tracking area updating procedure following an attach in A/Gb mode or Iu mode, the UE shall include a UE radio capability information update needed IE in the TRACKING AREA UPDATE REQUEST message.

If the UE initiates the first tracking area updating procedure following an initial registration in N1 mode and the UE is operating in the single-registration mode, the UE shall include a UE radio capability information update needed IE in the TRACKING AREA UPDATE REQUEST message.

For all cases except case b, if the UE supports SRVCC to GERAN/UTRAN, the UE shall set the SRVCC to GERAN/UTRAN capability bit in the MS network capability IE to "SRVCC from UTRAN HSPA or E-UTRAN to GERAN/UTRAN supported".

For all cases except case b, if the UE supports vSRVCC from S1 mode to Iu mode, then the UE shall set the H.245 after handover capability bit in the UE network capability IE to "H.245 after SRVCC handover capability supported" and additionally set the SRVCC to GERAN/UTRAN capability bit in the MS network capability IE to "SRVCC from UTRAN HSPA or E-UTRAN to GERAN/UTRAN supported" in the TRACKING AREA UPDATE REQUEST message.

For all cases except case b, if the UE supports ProSe direct discovery, then the UE shall set the ProSe bit to "ProSe supported" and set the ProSe direct discovery bit to "ProSe direct discovery supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

For all cases except case b, if the UE supports ProSe direct communication, then the UE shall set the ProSe bit to "ProSe supported" and set the ProSe direct communication bit to "ProSe direct communication supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

For all cases except case b, if the UE supports acting as a ProSe UE-to-network relay, then the UE shall set the ProSe bit to "ProSe supported" and set the ProSe UE-to-network relay bit to "acting as a ProSe UE-to-network relay supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

If the UE supports NB-S1 mode, Non-IP or Ethernet PDN type, N1 mode, or if the UE supports DNS over (D)TLS (see 3GPP TS 33.501 [24]), then the UE shall support the extended protocol configuration options IE.

NOTE 7: Support of DNS over (D)TLS is based on the informative requirements as specified in 3GPP TS 33.501 [24].

For all cases except case b, if the UE supports the extended protocol configuration options IE, then the UE shall set the ePCO bit to "extended protocol configuration options supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

For all cases except case b, if the UE supports V2X communication over E-UTRAN-PC5, then the UE shall set the V2X PC5 bit to "V2X communication over E-UTRAN-PC5 supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

For all cases except case b, if the UE supports V2X communication over NR-PC5, then the UE shall set the V2X NR-PC5 bit to "V2X communication over NR-PC5 supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

For all cases except case b, if the UE supports the restriction on use of enhanced coverage, then the UE shall set the RestrictEC bit to "Restriction on use of enhanced coverage supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

For all cases except case b, if the UE supports the control plane data back-off timer T3448, the UE shall set the CP backoff bit to "backoff timer for transport of user data via the control plane supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

For all cases except case b, if the UE supports dual connectivity with NR, then the UE shall set the DCNR bit to "dual connectivity with NR supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message and shall include the UE additional security capability IE in the TRACKING AREA UPDATE REQUEST message.

For all cases except case b, if the UE supports SGC, then the UE shall set the SGC bit to "service gap control supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

For all cases except case b, if the UE supports signalling for a maximum number of 15 EPS bearer contexts, then the UE shall set the 15 bearers bit to "Signalling for a maximum number of 15 EPS bearer contexts supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

For all cases except cases b and zb, if the UE supports ciphered broadcast assistance data and the UE needs to obtain new ciphering keys, the UE shall include the Additional information requested IE with the CipherKey bit set to "ciphering keys for ciphered broadcast assistance data requested" in the TRACKING AREA UPDATE REQUEST message.

For case ee, the UE shall include the Additional information requested IE with the CipherKey bit set to "ciphering keys for ciphered broadcast assistance data requested" in the TRACKING AREA UPDATE REQUEST message.

For case a, if the UE supports ciphered broadcast assistance data and the UE detects entering a tracking area for which one or more ciphering keys stored at the UE is not applicable, the UE should include the Additional information requested IE with the CipherKey bit set to "ciphering keys for ciphered broadcast assistance data requested" in the TRACKING AREA UPDATE REQUEST message.

For case b, if the UE supports ciphered broadcast assistance data and the remaining validity time for one or more ciphering keys stored at the UE is less than timer T3412, the UE should include the Additional information requested IE with the CipherKey bit set to "ciphering keys for ciphered broadcast assistance data requested" in the TRACKING AREA UPDATE REQUEST message.

For all cases except case b, if the UE supports N1 mode, the UE shall set the N1mode bit to "N1 mode supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message and shall include the UE additional security capability IE in the TRACKING AREA UPDATE REQUEST message.

For all cases except case b, in WB-S1 mode, if the UE supports RACS the UE shall set the RACS bit to "RACS supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

For cases n, za and zc, in WB-S1 mode, if the UE supports RACS and the UE has an applicable UE radio capability ID for the new UE radio configuration in the selected PLMN, the UE shall set the URCIDA bit to "UE radio capability ID available" in the UE radio capability ID availability IE of the TRACKING AREA UPDATE REQUEST message.

For all cases except cases b, n, za and zc, in WB-S1 mode, if the UE has an applicable UE radio capability ID for the current UE radio configuration in the selected PLMN, the UE shall set the URCIDA bit to "UE radio capability ID available" in the UE radio capability ID availability IE of the TRACKING AREA UPDATE REQUEST message.

For all cases except case b, if the UE supports WUS assistance, then the UE shall set the WUSA bit to "WUS assistance supported" in the UE network capability IE, and if the UE is not attaching for emergency bearer services, the UE may include its UE paging probability information in the Requested WUS assistance information IE in the TRACKING AREA UPDATE REQUEST message.



Figure 5.5.3.2.2.1: Tracking area updating procedure

\*\*\*\*\* Next change \*\*\*\*\*

##### 5.5.3.2.4 Normal and periodic tracking area updating procedure accepted by the network

If the tracking area update request has been accepted by the network, the MME shall send a TRACKING AREA UPDATE ACCEPT message to the UE. If the MME assigns a new GUTI for the UE, a GUTI shall be included in the TRACKING AREA UPDATE ACCEPT message. In this case, the MME shall start timer T3450 and enter state EMM-COMMON-PROCEDURE-INITIATED as described in subclause 5.4.1. The MME may include a new TAI list for the UE in the TRACKING AREA UPDATE ACCEPT message. The MME shall not assign a TAI list containing both tracking areas in NB-S1 mode and tracking areas in WB-S1 mode.

NOTE 1: When assigning the TAI list, the MME can take into account the eNodeB's capability of support of CIoT EPS optimization.

If the UE has included the UE network capability IE or the MS network capability IE or both in the TRACKING AREA UPDATE REQUEST message, the MME shall store all octets received from the UE, up to the maximum length defined for the respective information element.

NOTE 2: This information is forwarded to the new MME during inter-MME handover or to the new SGSN during inter-system handover to A/Gb mode or Iu mode.

NOTE 3: For further details concerning the handling of the MS network capability and UE network capability in the MME see also 3GPP TS 23.401 [10].

In NB-S1 mode, if the tracking area update request is accepted by the network, the MME shall set the EMC BS bit to zero in the EPS network feature support IE included in the TRACKING AREA UPDATE ACCEPT message to indicate that support of emergency bearer services in NB-S1 mode is not available.

If a UE radio capability information update needed IE is included in the TRACKING AREA UPDATE REQUEST message, the MME shall delete the stored UE radio capability information or the UE radio capability ID, if any.

If the UE specific DRX parameter was included in the DRX Parameter IE in the TRACKING AREA UPDATE REQUEST message, the network shall replace any stored UE specific DRX parameter with the received parameter and use it for the downlink transfer of signalling and user data in WB-S1 mode.

In NB-S1 mode, if the DRX parameter in NB-S1 mode IE was included in the TRACKING AREA UPDATE REQUEST message, the MME shall provide to the UE the Negotiated DRX parameter in NB-S1 mode IE in the TRACKING AREA UPDATE ACCEPT message. The MME shall replace any stored UE specific DRX parameter in NB-S1 mode with the negotiated DRX parameter and use it for the downlink transfer of signalling and user data in NB-S1 mode.

NOTE 4: In NB-S1 mode, if a DRX parameter was included in the Negotiated DRX parameter in NB-S1 mode IE in the TRACKING AREA UPDATE ACCEPT message, then the UE stores and uses the received DRX parameter in NB-S1 mode (see 3GPP TS 36.304 [21]). If the UE has included the DRX parameter in NB-S1 mode IE in the TRACKING AREA UPDATE REQUEST message, but did not receive a DRX parameter in the Negotiated DRX parameter in NB-S1 mode IE, or if the Negotiated DRX parameter in NB-S1 mode IE was not included in the TRACKING AREA UPDATE ACCEPT message, then the UE uses the cell specific DRX value in NB-S1 mode (see 3GPP TS 36.304 [21]).If the UE requests "control plane CIoT EPS optimization" in the Additional update type IE, indicates support of control plane CIoT EPS optimization in the UE network capability IE and the MME decides to accept the requested CIoT EPS optimization and the tracking area update request, the MME shall indicate "control plane CIoT EPS optimization supported" in the EPS network feature support IE.

In NB-S1 mode, if the UE requested "SMS only" in the Additional update type IE, supports NB-S1 mode only and the MME decides to accept the tracking area update request for EPS services and "SMS only", the MME shall indicate "SMS only" in the Additional update result IE and shall set the EPS update type IE to "TA updating" in the TRACKING AREA UPDATE ACCEPT message.

The MME shall include the extended DRX parameters IE in the TRACKING AREA UPDATE ACCEPT message only if the extended DRX parameters IE was included in the TRACKING AREA UPDATE REQUEST message, and the MME supports and accepts the use of eDRX.

If:

- the UE supports WUS assistance; and

- the MME supports and accepts the use of WUS assistance,

then the MME shall determine the negotiated UE paging probability information for the UE, store it in the EMM context of the UE, and if the UE is not attaching for emergency bearer services, the MME shall include it in the Negotiated WUS assistance information IE in the TRACKING AREA UPDATE ACCEPT message. The MME may take into account the UE paging probability information received in the Requested WUS assistance information IE when determining the negotiated UE paging probability information for the UE.

NOTE 4: Besides the UE paging probability information requested by the UE, the MME can take local configuration or previous statistical information for the UE into account when determining the negotiated UE paging probability information for the UE (see 3GPP TS 23.401 [10]).

If the UE indicates support for EMM-REGISTERED without PDN connection in the TRACKING AREA UPDATE REQUEST message and the MME supports EMM-REGISTERED without PDN connection, the MME shall indicate this in the EPS network feature support IE of the TRACKING AREA UPDATE ACCEPT message. The UE and the MME shall use the information whether the peer entity supports EMM-REGISTERED without PDN connection as specified in the present clause 5 and in clause 6.

If an EPS bearer context status IE is included in the TRACKING AREA UPDATE REQUEST message, the MME shall deactivate all those EPS bearer contexts locally (without peer-to-peer signalling between the MME and the UE) which are in ESM state BEARER CONTEXT ACTIVE or BEARER CONTEXT MODIFY PENDING on the network side, but are indicated by the UE as being in ESM state BEARER CONTEXT INACTIVE. If a default EPS bearer context is marked as inactive in the EPS bearer context status IE included in the TRACKING AREA UPDATE REQUEST message, and this default bearer is not associated with the last remaining PDN connection of the UE in the MME, the MME shall locally deactivate all EPS bearer contexts associated to the PDN connection with the default EPS bearer context without peer-to-peer ESM signalling to the UE. If the default bearer is associated with the last remaining PDN connection of the UE in the MME, and EMM-REGISTERED without PDN connection is supported by the UE and the MME, the MME shall locally deactivate all EPS bearer contexts associated to the PDN connection with the default EPS bearer context without peer-to-peer ESM signalling to the UE.

If the EPS bearer context status IE is included in the TRACKING AREA UPDATE REQUEST, the MME shall include an EPS bearer context status IE in the TRACKING AREA UPDATE ACCEPT message, indicating which EPS bearer contexts are active in the MME except for the case no EPS bearer context exists on the network side.

If the EPS update type IE included in the TRACKING AREA UPDATE REQUEST message indicates "periodic updating", and the UE was previously successfully attached for EPS and non-EPS services, subject to operator policies the MME should allocate a TAI list that does not span more than one location area.

The MME shall indicate "combined TA/LA updated" or "combined TA/LA updated and ISR activated" in the EPS update result IE in the TRACKING AREA UPDATE ACCEPT message, if the following conditions apply:

- the EPS update type IE included in the TRACKING AREA UPDATE REQUEST message indicates "periodic updating" and the UE was previously successfully attached for EPS and non-EPS services; and

- location area updating for non-EPS services as specified in 3GPP TS 29.118 [16A] is successful.

The MME may include T3412 extended value IE in the TRACKING AREA UPDATE ACCEPT message only if the UE indicates support of the extended periodic timer T3412 in the MS network feature support IE in the TRACKING AREA UPDATE REQUEST message.

The MME shall include the T3324 value IE in the TRACKING AREA UPDATE ACCEPT message only if the T3324 value IE was included in the TRACKING AREA UPDATE REQUEST message, and the MME supports and accepts the use of PSM.

If the MME supports and accepts the use of PSM, and the UE included the T3412extended value IE in the TRACKING AREA UPDATE REQUEST message, then the MME shall take into account the T3412 value requested when providing the T3412 value IE and the T3412 extended value IE in the TRACKING AREA UPDATE ACCEPT message.

NOTE 5: Besides the value requested by the MS, the MME can take local configuration or subscription data provided by the HSS into account when selecting a value for T3412 (see 3GPP TS 23.401 [10] subclause 4.3.17.3).

If the MME includes the T3324 value IE indicating a value other than deactivated in the TRACKING AREA UPDATE ACCEPT message, then the MME shall indicate in the EPS update result IE in the TRACKING AREA UPDATE ACCEPT message that ISR is not activated.

Also, during the tracking area updating procedure without the "active" flag set, if the MME has deactivated EPS bearer context(s) locally for any reason, the MME shall inform the UE of the deactivated EPS bearer context(s) by including the EPS bearer context status IE in the TRACKING AREA UPDATE ACCEPT message.

Also, during the tracking area updating procedure with the "active" flag set, if the MME has deactivated EPS bearer context(s) associated with control plane only indication locally for any reason, the MME shall inform the UE of the deactivated EPS bearer context(s) by including the EPS bearer context status IE in the TRACKING AREA UPDATE ACCEPT message.

If the TRACKING AREA UPDATE ACCEPT message contains the DCN-ID IE, then the UE shall store the included DCN-ID value together with the PLMN code of the registered PLMN in a DCN-ID list in a non-volatile memory in the ME as specified in annex C.

If due to regional subscription restrictions or access restrictions the UE is not allowed to access the TA, but it has a PDN connection for emergency bearer services established, the MME may accept the TRACKING AREA UPDATE REQUEST message and deactivate all non-emergency EPS bearer contexts by initiating an EPS bearer context deactivation procedure when the tracking area updating procedure is initiated in EMM-CONNECTED mode. When the tracking area updating procedure is initiated in EMM-IDLE mode, the MME locally deactivates all non-emergency EPS bearer contexts and informs the UE via the EPS bearer context status IE in the TRACKING AREA UPDATE ACCEPT message. The MME shall not deactivate the emergency EPS bearer contexts. The network shall consider the UE to be attached for emergency bearer services only and shall indicate in the EPS update result IE in the TRACKING AREA UPDATE ACCEPT message that ISR is not activated.

If a TRACKING AREA UPDATE REQUEST message is received from a UE with a LIPA PDN connection, and if:

- a GW Transport Layer Address IE value identifying a L-GW is provided by the lower layer together with the TRACKING AREA UPDATE REQUEST message, and the P-GW address included in the EPS bearer context of the LIPA PDN Connection is different from the provided GW Transport Layer Address IE value (see 3GPP TS 36.413 [23]); or

- no GW Transport Layer Address is provided together with the TRACKING AREA UPDATE REQUEST message by the lower layer,

then the MME locally deactivates all EPS bearer contexts associated with the LIPA PDN connection. Furthermore, the MME takes one of the following actions:

- if no active EPS bearer contexts remain for the UE, the MME shall not accept the tracking area update request as specified in subclause 5.5.3.2.5;

- if active EPS bearer contexts remain for the UE and the TRACKING AREA UPDATE REQUEST message is accepted, the MME informs the UE via the EPS bearer context status IE in the TRACKING AREA UPDATE ACCEPT message that EPS bearer contexts were locally deactivated.

If a TRACKING AREA UPDATE REQUEST message is received from a UE with a SIPTO at the local network PDN connection, is accepted by the network, the following different cases can be distinguished:

1) If the PDN connection is a SIPTO at the local network PDN connection with collocated L-GW and if:

- a SIPTO L-GW Transport Layer Address IE value identifying a L-GW is provided by the lower layer together with the TRACKING AREA UPDATE REQUEST message, and the P-GW address included in the EPS bearer context of the SIPTO at the local network PDN connection is different from the provided SIPTO L-GW Transport Layer Address IE value (see 3GPP TS 36.413 [23]); or

- no SIPTO L-GW Transport Layer Address is provided together with the TRACKING AREA UPDATE REQUEST message by the lower layer,

2) If the PDN connection is a SIPTO at the local network PDN connection with stand-alone GW and if:

- a LHN-ID value is provided by the lower layer together with the TRACKING AREA UPDATE REQUEST message, and the LHN-ID stored in the EPS bearer context of the SIPTO at the local network PDN connection is different from the provided LHN-ID value (see 3GPP TS 36.413 [23]); or

- no LHN-ID value is provided together with the TRACKING AREA UPDATE REQUEST message by the lower layer,

then the MME takes one of the following actions:

- if the SIPTO at the local network PDN connection is the last remaining PDN connection for the UE, and EMM-REGISTERED without PDN connection is not supported by the UE or the MME, then the MME shall upon completion of the tracking area updating procedure detach the UE by using detach type "re-attach required" (see subclause 5.5.2.3.1);

- if the SIPTO at the local network PDN connection is the last remaining PDN connection for the UE, and EMM-REGISTERED without PDN connection is supported by the UE and the MME, then the MME shall upon completion of the tracking area updating procedure initiate an EPS bearer context deactivation procedure with ESM cause #39 "reactivation requested" for the default EPS bearer context of the SIPTO at the local network PDN connection (see subclause 6.4.4.2); and

- if a PDN connection remains that is not SIPTO at the local network PDN connection, the MME shall upon completion of the tracking area updating procedure initiate an EPS bearer context deactivation procedure with ESM cause #39 "reactivation requested" for the default EPS bearer context of each SIPTO at the local network PDN connection (see subclause 6.4.4.2);

For a SIPTO at the local network PDN connection with stand-alone GW, the conditions to deactivate ISR are specified in 3GPP TS 23.401 [10], subclause 4.3.5.6.

For a shared network, the TAIs included in the TAI list can contain different PLMN identities. The MME indicates the selected core network operator PLMN identity to the UE in the GUTI (see 3GPP TS 23.251 [8B]).

If the "active" flag is set in the TRACKING AREA UPDATE REQUEST message and control plane CIoT EPS optimization is not used by the MME, the MME shall re-establish the radio and S1 bearers for all active EPS bearer contexts. If the "active" flag is set in the TRACKING AREA UPDATE REQUEST message and control plane CIoT EPS optimization is used by the MME, the MME shall re-establish the radio and S1 bearers for all active EPS bearer contexts associated with PDN connections established without Control plane only indication.

If the "signalling active" flag is set in the TRACKING AREA UPDATE REQUEST message and control plane CIoT EPS optimization is used by the MME, the MME shall not immediately release the NAS signalling connection after the completion of the tracking area updating procedure.

If the "active" flag is not set in the TRACKING AREA UPDATE REQUEST message and control plane CIoT EPS optimization is not used by the MME, the MME may also re-establish the radio and S1 bearers for all active EPS bearer contexts due to downlink pending data or downlink pending signalling. If the "active" flag is not set in the TRACKING AREA UPDATE REQUEST message and control plane CIoT EPS optimization is used by the MME, the MME may also re-establish the radio and S1 bearers for all active EPS bearer contexts associated with PDN connections established without Control plane only indication due to downlink pending data or downlink pending signalling.

If the MME supports NB-S1 mode, Non-IP or Ethernet PDN type, inter-system change with 5GS, or the network wants to enforce the use of DNS over (D)TLS (see 3GPP TS 33.501 [24]), then the MME shall support the extended protocol configuration options IE.

NOTE 6: Support of DNS over (D)TLS is based on the informative requirements as specified in 3GPP TS 33.401 [19] and it is implemented based on the operator requirement.

If the MME supports the extended protocol configuration options IE and the UE indicated support of the extended protocol configuration options IE, then the MME shall set the ePCO bit to "extended protocol configuration options supported" in the EPS network feature support IE of the TRACKING AREA UPDATE ACCEPT message.

If the UE indicates support for restriction on use of enhanced coverage in the TRACKING AREA UPDATE REQUEST message, and the network decides to restrict the use of enhanced coverage for the UE, then the MME shall set the RestrictEC bit to "Use of enhanced coverage is restricted" in the EPS network feature support IE of the TRACKING AREA UPDATE ACCEPT message.

The MME may indicate the header compression configuration status IE in the TRACKING AREA UPDATE ACCEPT message for each established EPS bearer context using control plane CIoT EPS optimisation.

If the UE has indicated support for the control plane data back-off timer, and the MME decides to activate the congestion control for transport of user data via the control plane, then the MME shall include the T3448 value IE in the TRACKING AREA UPDATE ACCEPT message.

If the UE indicates support for dual connectivity with NR in the TRACKING AREA UPDATE REQUEST message, and the MME decides to restrict the use of dual connectivity with NR for the UE, then the MME shall set the RestrictDCNR bit to "Use of dual connectivity with NR is restricted" in the EPS network feature support IE of the TRACKING AREA UPDATE ACCEPT message.

If the UE indicates support for N1 mode in the TRACKING AREA UPDATE REQUEST message and the MME supports inter-system interworking with 5GS, the MME may set the IWK N26 bit to either:

- "interworking without N26 interface not supported" if the MME supports N26 interface; or

- "interworking without N26 interface supported" if the MME does not support N26 interface

in the EPS network feature support IE in the TRACKING AREA UPDATE ACCEPT message.

If due to operator policies unsecured redirection to a GERAN cell is not allowed in the current PLMN, the MME shall set the redir-policy bit to "Unsecured redirection to GERAN not allowed" in the Network policy IE of the TRACKING AREA UPDATE ACCEPT message.

If the UE has indicated support for service gap control, a service gap time value is available in the EMM context, the MME may include the T3447 value IE set to the service gap time value in the TRACKING AREA UPDATE ACCEPT message.

If the network supports signalling for a maximum number of 15 EPS bearer contexts and the UE indicated support of signalling for a maximum number of 15 EPS bearer contexts in the TRACKING AREA UPDATE REQUEST message, then the MME shall set the 15 bearers bit to "Signalling for a maximum number of 15 EPS bearer contexts supported" in the EPS network feature support IE of the TRACKING AREA UPDATE ACCEPT message.

If the UE requests ciphering keys for ciphered broadcast assistance data in the TRACKING AREA UPDATE REQUEST message and the MME has valid ciphering key data applicable to the UE's subscription, then the MME shall include the ciphering key data in the Ciphering key data IE of the TRACKING AREA UPDATE ACCEPT message.

Upon receiving a TRACKING AREA UPDATE ACCEPT message, the UE shall stop timer T3430, reset the service request attempt counter, tracking area updating attempt counter, enter state EMM-REGISTERED and set the EPS update status to EU1 UPDATED. If the message contains a GUTI, the UE shall use this GUTI as new temporary identity for EPS services and shall store the new GUTI. If no GUTI was included by the MME in the TRACKING AREA UPDATE ACCEPT message, the old GUTI shall be used. If the UE receives a new TAI list in the TRACKING AREA UPDATE ACCEPT message, the UE shall consider the new TAI list as valid and the old TAI list as invalid; otherwise, the UE shall consider the old TAI list as valid.

If the UE receives the TRACKING AREA UPDATE ACCEPT message from a PLMN for which a PLMN-specific attempt counter or PLMN-specific PS-attempt counter is maintained (see subclause 5.3.7b), then the UE shall reset these counters. If the UE maintains a counter for "SIM/USIM considered invalid for GPRS services", then the UE shall reset this counter.

If the TRACKING AREA UPDATE ACCEPT message contains the T3412 extended value IE, then the UE shall use the T3412 extended value IE as periodic tracking area update timer (T3412). If the TRACKING AREA UPDATE ACCEPT contains T3412 value IE, but not T3412 extended value IE, then the UE shall use value in T3412 value IE as periodic tracking area update timer (T3412). If neither T3412 value IE nor T3412 extended value IE is included, the UE shall use the value currently stored, e.g. from a prior ATTACH ACCEPT or TRACKING AREA UPDATE ACCEPT message.

If the TRACKING AREA UPDATE ACCEPT message contains the T3324 value IE, then the UE shall use the timer value for T3324 as specified in 3GPP TS 24.008 [13], subclause 4.7.2.8.

If the UE had initiated the tracking area updating procedure in EMM-IDLE mode to perform an inter-system change from A/Gb mode or Iu mode to S1 mode and the nonceUE was included in the TRACKING AREA UPDATE REQUEST message, the UE shall delete the nonceUE upon receipt of the TRACKING AREA UPDATE ACCEPT message.

If an EPS bearer context status IE is included in the TRACKING AREA UPDATE ACCEPT message, the UE shall deactivate all those EPS bearers contexts locally (without peer-to-peer signalling between the UE and the MME) which are active in the UE, but are indicated by the MME as being inactive. If a default EPS bearer context is marked as inactive in the EPS bearer context status IE included in the TRACKING AREA UPDATE ACCEPT message, and this default bearer is not associated with the last remaining PDN connection in the UE, the UE shall locally deactivate all EPS bearer contexts associated to the PDN connection with the default EPS bearer context without peer-to-peer ESM signalling to the MME. If only the PDN connection for emergency bearer services remains established, the UE shall consider itself attached for emergency bearer services only. If the default bearer is associated with the last remaining PDN connection of the UE in the MME, and EMM-REGISTERED without PDN connection is supported by the UE and the MME, the UE shall locally deactivate all EPS bearer contexts associated to the PDN connection with the default EPS bearer context without peer-to-peer ESM signalling to the UE.

If an EPS bearer context status IE is included in the TRACKING AREA UPDATE ACCEPT message, the UE may choose to ignore all those EPS bearers which are indicated by the MME as being active but are inactive at the UE.

The MME may also include a list of equivalent PLMNs in the TRACKING AREA UPDATE ACCEPT message. Each entry in the list contains a PLMN code (MCC+MNC). The UE shall store the list as provided by the network, and if there is no PDN connection for emergency bearer services or PDN connection for RLOS established, the UE shall remove from the list any PLMN code that is already in the list of "forbidden PLMNs" or in the list of "forbidden PLMNs for GPRS service". If the UE is not attached for emergency bearer services and there is a PDN connection for emergency bearer services established, the UE shall remove from the list of equivalent PLMNs any PLMN code present in the list of forbidden PLMNs or in the list of "forbidden PLMNs for GPRS service" when the PDN connection for emergency bearer services is released. In addition, the UE shall add to the stored list the PLMN code of the registered PLMN that sent the list. The UE shall replace the stored list on each receipt of the TRACKING AREA UPDATE ACCEPT message. If the TRACKING AREA UPDATE ACCEPT message does not contain a list, then the UE shall delete the stored list.

If the UE is neither attached for emergency bearer services nor attached for access to RLOS, and if the PLMN identity of the registered PLMN is a member of the list of "forbidden PLMNs" or the list of "forbidden PLMNs for GPRS service", any such PLMN identity shall be deleted from the corresponding list(s).

The network may also indicate in the EPS update result IE in the TRACKING AREA UPDATE ACCEPT message that ISR is active. If the UE is attached for emergency bearer services, the network shall indicate in the EPS update result IE in the TRACKING AREA UPDATE ACCEPT message that ISR is not activated. If the TRACKING AREA UPDATE ACCEPT message contains:

i) no indication that ISR is activated, the UE shall set the TIN to "GUTI" and shall stop the periodic routing area update timer T3312 or T3323, if running;

ii) an indication that ISR is activated, then:

- if the UE is required to perform routing area updating for IMS voice termination as specified in 3GPP TS 24.008 [13], annex P.5, the UE shall set the TIN to "GUTI" and shall stop the periodic routing area update timer T3312 or T3323, if running;

- if the UE had initiated the tracking area updating procedure due to a change in UE network capability or change in DRX parameters, the UE shall set the TIN to "GUTI" and shall stop the periodic routing area update timer T3312 or T3323, if running;

- if the UE had initiated the tracking area updating procedure due to a change in the UE's usage setting or the voice domain preference for E-UTRAN, the UE shall set the TIN to "GUTI" and shall stop the periodic routing area update timer T3312 or T3323, if running; or

- the UE shall regard a previously assigned P-TMSI and RAI as valid and registered with the network. If the TIN currently indicates "P-TMSI" and the periodic routing area update timer T3312 is running or is deactivated, the UE shall set the TIN to "RAT-related TMSI". If the TIN currently indicates "P-TMSI" and the periodic routing area update timer T3312 has already expired, the UE shall set the TIN to "GUTI".

The network informs the UE about the support of specific features, such as IMS voice over PS session, location services (EPC-LCS, CS-LCS), emergency bearer services, or CIoT EPS optimizations, in the EPS network feature support information element. In a UE with IMS voice over PS capability, the IMS voice over PS session indicator and the emergency bearer services indicator shall be provided to the upper layers. The upper layers take the IMS voice over PS session indicator into account as specified in 3GPP TS 23.221 [8A], subclause 7.2a and subclause 7.2b, when selecting the access domain for voice sessions or calls. When initiating an emergency call, the upper layers also take both the IMS voice over PS session indicator and the emergency bearer services indicator into account for the access domain selection. When the UE determines via the IMS voice over PS session indicator that the network does not support IMS voice over PS sessions in S1 mode, then the UE shall not locally release any persistent EPS bearer context. When the UE determines via the emergency bearer services indicator that the network does not support emergency bearer services in S1 mode, then the UE shall not locally release any emergency EPS bearer context if there is a radio bearer associated with that context. In a UE with LCS capability, location services indicators (EPC-LCS, CS-LCS) shall be provided to the upper layers. When MO-LR procedure is triggered by the UE's application, those indicators are taken into account as specified in 3GPP TS 24.171 [13C].

If the RestrictDCNR bit is set to "Use of dual connectivity with NR is restricted" in the EPS network feature support IE of the TRACKING AREA UPDATE ACCEPT message, the UE shall provide the indication that dual connectivity with NR is restricted to the upper layers.

The UE supporting N1 mode shall operate in the mode for inter-system interworking with 5GS as follows:

- if the IWK N26 bit in the EPS network feature support IE is set to "interworking without N26 interface not supported", the UE shall operate in single-registration mode;

- if the IWK N26 bit in the EPS network feature support IE is set to "interworking without N26 interface supported" and the UE supports dual-registration mode, the UE may operate in dual-registration mode; or

NOTE 7: The registration mode used by the UE is implementation dependent.

- if the IWK N26 bit in the EPS network feature support IE is set to "interworking without N26 interface supported" and the UE only supports single-registration mode, the UE shall operate in single-registration mode.

The UE shall treat the interworking without N26 interface indicator as valid in the entire PLMN and equivalent PLMNs. The interworking procedures required for coordination between 5GMM and EMM without N26 interface are specified in 3GPP TS 24.501 [54].

If the redir-policy bit is set to "Unsecured redirection to GERAN not allowed" in the Network policy IE of the TRACKING AREA UPDATE ACCEPT message, the UE shall set the network policy on unsecured redirection to GERAN for the current PLMN to "Unsecured redirection to GERAN not allowed" and indicate to the lower layers that unsecured redirection to a GERAN cell is not allowed. If the redir-policy bit is set to "Unsecured redirection to GERAN allowed" or if the Network policy IE is not included in the TRACKING AREA UPDATE ACCEPT message, the UE shall set the network policy on unsecured redirection to GERAN for the current PLMN to "Unsecured redirection to GERAN allowed" and indicate to the lower layers that unsecured redirection to a GERAN cell is allowed. The UE shall set the network policy on unsecured redirection to GERAN to "Unsecured redirection to GERAN not allowed" and indicate this to the lower layers when any of the following events occurs:

- the UE initiates an EPS attach or tracking area updating procedure in a PLMN different from the PLMN where the UE performed the last successful EPS attach or tracking area updating procedure;

- the UE is switched on; or

- the UICC containing the USIM is removed.

If the UE has initiated the tracking area updating procedure due to manual CSG selection and receives a TRACKING AREA UPDATE ACCEPT message, and the UE sent the TRACKING AREA UPDATE REQUEST message in a CSG cell, the UE shall check if the CSG ID and associated PLMN identity of the cell where the UE has sent the TRACKING AREA UPDATE REQUEST message are contained in the Allowed CSG list. If not, the UE shall add that CSG ID and associated PLMN identity to the Allowed CSG list and the UE may add the HNB Name (if provided by lower layers) to the Allowed CSG list if the HNB Name is present in neither the Operator CSG list nor the Allowed CSG list.

If the TRACKING AREA UPDATE ACCEPT message contained a GUTI, the UE shall return a TRACKING AREA UPDATE COMPLETE message to the MME to acknowledge the received GUTI.

If the UE which was previously successfully attached for EPS and non-EPS services receives the TRACKING AREA UPDATE ACCEPT message with EPS update result IE indicating "combined TA/LA updated" or "combined TA/LA updated and ISR activated" as the response of the TRACKING AREA UPDATE REQUEST message with EPS update type IE indicating "periodic updating", the UE shall behave as follows:

- If the TRACKING AREA UPDATE ACCEPT message contains an IMSI, the UE is not allocated any TMSI, and shall delete any old TMSI accordingly.

- If the TRACKING AREA UPDATE ACCEPT message contains a TMSI, the UE shall use this TMSI as new temporary identity. The UE shall delete its old TMSI and shall store the new TMSI. In this case, a TRACKING AREA UPDATE COMPLETE message is returned to the network to confirm the received TMSI.

- If neither a TMSI nor an IMSI has been included by the network in the TRACKING AREA UPDATE ACCEPT message, the old TMSI, if any is available, shall be kept.

If the header compression configuration status is included in the TRACKING AREA UPDATE ACCEPT message, the UE shall stop using header compression and decompression for those EPS bearers using Control plane CIoT EPS optimisation for which the MME indicated that the header compression configuration is not used.

If the T3448 value IE is present in the received TRACKING AREA UPDATE ACCEPT message, the UE shall:

- stop timer T3448 if it is running; and

- start timer T3448 with the value provided in the T3448 value IE.

If the UE is using EPS services with control plane CIoT EPS optimization, the T3448 value IE is present in the TRACKING AREA UPDATE ACCEPT message and the value indicates that this timer is either zero or deactivated, the UE shall consider this case as an abnormal case and proceed as if the T3448 value IE is not present.

If the UE in EMM-IDLE mode initiated the tracking area updating procedure and the TRACKING AREA UPDATE ACCEPT message does not include the T3448 value IE and if timer T3448 is running, then the UE shall stop timer T3448.

If the UE has indicated "service gap control supported" in the TRACKING AREA UPDATE REQUEST message and:

- the TRACKING AREA UPDATE ACCEPT message contains the T3447 value IE, then the UE shall store the new T3447 value, erase any previous stored T3447 value if exists and use the new T3447 value with the T3447 timer next time it is started; or

- the TRACKING AREA UPDATE ACCEPT message does not contain the T3447 value IE, then the UE shall erase any previous stored T3447 value if exists and stop the T3447 timer if running.

Upon receiving a TRACKING AREA UPDATE COMPLETE message, the MME shall stop timer T3450 and change to state EMM-REGISTERED. The GUTI, if sent in the TRACKING AREA UPDATE ACCEPT message, shall be considered as valid.

NOTE 8: Upon receiving a TRACKING AREA UPDATE COMPLETE message, if a new TMSI was included in the TRACKING AREA UPDATE ACCEPT message, the MME sends an SGsAP-TMSI-REALLOCATION-COMPLETE message as specified in 3GPP TS 29.118 [16A].

For inter-system change from A/Gb mode to S1 mode or Iu mode to S1 mode in EMM-IDLE mode, if the UE has included an eKSI in the NAS Key Set Identifier IE indicating a current EPS security context in the TRACKING AREA UPDATE REQUEST message by which the TRACKING AREA UPDATE REQUEST message is integrity protected, the MME shall take one of the following actions:

- if the MME retrieves the current EPS security context as indicated by the eKSI and GUTI sent by the UE, the MME shall integrity check the TRACKING AREA UPDATE REQUEST message using the current EPS security context and integrity protect the TRACKING AREA UPDATE ACCEPT message using the current EPS security context;

- if the MME cannot retrieve the current EPS security context as indicated by the eKSI and GUTI sent by the UE, and if the UE has included a valid GPRS ciphering key sequence number, the MME shall create a new mapped EPS security context as specified in 3GPP TS 33.401 [19], and then perform a security mode control procedure to indicate the use of the new mapped EPS security context to the UE (see subclause 5.4.3.2); or

- if the UE has not included an Additional GUTI IE, the MME may treat the TRACKING AREA UPDATE REQUEST message as in the previous item, i.e. as if it cannot retrieve the current EPS security context.

NOTE 9: The handling described above at failure to retrieve the current EPS security context or if no Additional GUTI IE was provided does not preclude the option for the MME to perform an EPS authentication procedure and create a new native EPS security context.

For inter-system change from A/Gb mode to S1 mode or Iu mode to S1 mode in EMM-IDLE mode, if the UE has not included a valid eKSI in the NAS Key Set Identifier IE and has included a valid GPRS ciphering key sequence number in the TRACKING AREA UPDATE REQUEST message, the MME shall create a new mapped EPS security context as specified in 3GPP TS 33.401 [19], and then perform a security mode control procedure to indicate the use of the new mapped EPS security context to the UE (see subclause 5.4.3.2).

NOTE 10: This does not preclude the option for the MME to perform an EPS authentication procedure and create a new native EPS security context.

For inter-system change from N1 mode to S1 mode in EMM-IDLE mode, if the UE has included an eKSI in the NAS Key Set Identifier IE indicating a 5G NAS security context in the TRACKING AREA UPDATE REQUEST message by which the TRACKING AREA UPDATE REQUEST message is integrity protected, the MME shall take actions as specified in subclause 4.4.2.3.

For inter-system change from A/Gb mode to S1 mode or Iu mode to S1 mode in EMM-CONNECTED mode, the MME shall integrity check TRACKING AREA UPDATE REQUEST message using the current K'ASME as derived when triggering the handover to E-UTRAN (see subclause 4.4.2.2). The MME shall verify the received UE security capabilities in the TRACKING AREA UPDATE REQUEST message. The MME shall then take one of the following actions:

- if the TRACKING AREA UPDATE REQUEST does not contain a valid KSIASME in the Non-current native NAS key set identifier IE, the MME shall remove the non-current native EPS security context, if any, for any GUTI for this UE. The MME shall then integrity protect and cipher the TRACKING AREA UPDATE ACCEPT message using the security context based on K'ASME and take the mapped EPS security context into use; or

- if the TRACKING AREA UPDATE REQUEST contains a valid KSIASME in the Non-current native NAS key set identifier IE, the MME may initiate a security mode control procedure to take the corresponding native EPS security context into use.

For inter-system change from N1 mode to S1 mode in EMM-CONNECTED mode, the MME shall integrity check TRACKING AREA UPDATE REQUEST message using the current K'ASME as derived when triggering the handover to E-UTRAN (see subclause 4.4.2.2). The MME shall verify the received UE security capabilities in the TRACKING AREA UPDATE REQUEST message. The MME shall then take one of the following actions:

- if the TRACKING AREA UPDATE REQUEST does not contain a valid KSIASME in the Non-current native NAS key set identifier IE, the MME shall remove the non-current native EPS security context, if any, for any GUTI for this UE. The MME shall then integrity protect and cipher the TRACKING AREA UPDATE ACCEPT message using the security context based on K'ASME and take the mapped EPS security context into use; or

- if the TRACKING AREA UPDATE REQUEST contains a valid KSIASME in the Non-current native NAS key set identifier IE, the MME may initiate a security mode control procedure to take the corresponding native EPS security context into use.

In WB-S1 mode, if the UE has set the RACS bit to "RACS supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message, the MME may include a UE radio capability ID IE or a UE radio capability ID deletion indication IE in the TRACKING AREA UPDATE ACCEPT message. In this case the MME shall enter state EMM-COMMON-PROCEDURE-INITIATED as described in subclause 5.4.1.

In WB-S1 mode, if the UE has set the RACS bit to "RACS supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message and the TRACKING AREA UPDATE ACCEPT message includes:

- a UE radio capability ID deletion indication IE set to "Network-assigned UE radio capability IDs deletion requested", the UE shall:

a) delete any network-assigned UE radio capability IDs associated with the registered PLMN stored at the UE;

b) send a TRACKING AREA UPDATE COMPLETE message to the network to acknowledge the received UE radio capability ID deletion indication IE; and

c) after the completion of the ongoing tracking area updating procedure, initiate a tracking area updating procedure as specified in subclause 5.5.3 over the existing NAS signalling connection; and

- a UE radio capability ID IE, the UE shall:

a) store the UE radio capability ID as specified in annex C; and

b) send a TRACKING AREA UPDATE COMPLETE message to the network to acknowledge the received UE radio capability ID IE.

\*\*\*\*\* Next change \*\*\*\*\*

##### 5.5.3.2.6 Abnormal cases in the UE

The following abnormal cases can be identified:

a) Access barred because of access class barring, EAB, ACDC or NAS signalling connection establishment rejected by the network without "Extended wait time" received from lower layers

 In WB-S1 mode, if the tracking area updating procedure is started in response to a paging request from the network, access class barring, EAB or ACDC is not applicable.

 In NB-S1 mode, if the tracking area updating procedure is started in response to a paging request from the network, access barring is not applicable.

 In WB-S1 mode, if access is barred for "originating signalling" (see 3GPP TS 36.331 [22]), the tracking area updating procedure shall not be started. The UE stays in the current serving cell and applies the normal cell reselection process. The tracking area updating procedure is started as soon as possible and if still necessary, e.g. when access for "originating signalling" is granted on the current cell or when the UE moves to a cell where access for "originating signalling" is granted.

 In NB-S1 mode, if access is barred for "originating signalling" (see 3GPP TS 36.331 [22]), the tracking area updating procedure shall not be started. The UE stays in the current serving cell and applies the normal cell reselection process. Further UE behaviour is implementation specific, e.g. the tracking area updating procedure is started again after an implementation dependent time.

 In NB-S1 mode, if access is barred for "originating signalling" (see 3GPP TS 36.331 [22]), a request for an exceptional event is received from the upper layers, then the tracking area updating procedure shall be started.

NOTE 1: In NB-S1 mode, the EMM layer cannot receive the access barring alleviation indication from the lower layers (see 3GPP TS 36.331 [22]).

 If access is barred because of access class barring for "originating signalling" (see 3GPP TS 36.331 [22]) and if:

- one of the MO MMTEL voice call is started, MO MMTEL video call is started or MO SMSoIP is started conditions is satisfied;

- the upper layers request to send a mobile originated SMS over NAS or SMS over S102; or

- the upper layers request user plane radio resources, ACDC is applicable to the request and the UE supports ACDC.

 then the tracking area updating procedure shall be started according to subclause 5.5.3.2.2. The call type used shall be per annex D of this document.

NOTE 2: If more than one of MO MMTEL voice call is started, MO MMTEL video call is started or MO SMSoIP is started conditions are satisfied, it is left to UE implementation to determine the call type based on Annex D of this document.

 If access is barred for a certain ACDC category (see 3GPP TS 36.331 [22]), and if the upper layers request user plane radio resources for a higher ACDC category and the UE supports ACDC, then the tracking area updating procedure shall be started according to subclause 5.5.3.2.2.

 If an access request for an uncategorized application is barred due to ACDC (see 3GPP TS 36.331 [22]), and if the upper layers request user plane radio resources for a certain ACDC category and the UE supports ACDC, then the tracking area updating procedure shall be started according to subclause 5.5.3.2.2.

 If the trigger for the tracking area updating procedure is the response to a paging request from the network and the NAS signalling connection establishment is rejected by the network, the tracking area updating procedure shall not be started. The UE stays in the current serving cell and applies normal cell reselection process. The tracking area updating procedure may be started if it is still necessary when access for "terminating calls" is granted or because of a cell change.

b) Lower layer failure or release of the NAS signalling connection without "Extended wait time" and without "Extended wait time CP data" received from lower layers before the TRACKING AREA UPDATE ACCEPT or TRACKING AREA UPDATE REJECT message is received

 The tracking area updating procedure shall be aborted, and the UE shall proceed as described below.

c) T3430 timeout

 The UE shall abort the procedure. The NAS signalling connection, if any, shall be released locally.

NOTE 3: The NAS signalling connection can also be released if the UE deems that the network has failed the authentication check as specified in subclause 5.4.2.7.

 The UE shall proceed as described below.

d) TRACKING AREA UPDATE REJECT, other causes than those treated in subclause 5.5.3.2.5, and cases of EMM cause values #22, #25 and #31, if considered as abnormal cases according to subclause 5.5.3.2.5

 If the tracking area updating request is not for initiating a PDN connection for emergency bearer services, upon reception of the EMM causes #95, #96, #97, #99 and #111 the UE should set the tracking area updating attempt counter to 5.

 The UE shall proceed as described below.

e) Change of cell into a new tracking area

 If a cell change into a new tracking area occurs before the tracking area updating procedure is completed, the tracking area updating procedure shall be aborted and re-initiated immediately. The UE shall set the EPS update status to EU2 NOT UPDATED.

 The UE shall proceed as described below.

f) Tracking area updating and detach procedure collision

 EPS detach containing detach type "re-attach required" or "re-attach not required":

 If the UE receives a DETACH REQUEST message before the tracking area updating procedure has been completed, the tracking area updating procedure shall be aborted and the detach procedure shall be progressed. If the DETACH REQUEST message contains detach type "re-attach not required" and EMM cause #2 "IMSI unknown in HSS", the UE will follow the procedure as described below for the detach type "IMSI detach".

 EPS detach containing detach type "IMSI detach":

 If the UE receives a DETACH REQUEST message before the tracking area updating procedure has been completed, the DETACH REQUEST message shall be ignored and tracking area updating procedure shall be progressed.

 The UE shall proceed as described below.

g) Tracking area updating and GUTI reallocation procedure collision

 If the UE receives a GUTI REALLOCATION COMMAND message before the tracking area updating procedure has been completed, this message shall be ignored and the tracking area updating procedure shall be progressed.

h) Transmission failure of TRACKING AREA UPDATE REQUEST message indication from lower layers

 The tracking area updating procedure shall be aborted and re-initiated immediately. The UE shall set the EPS update status to EU2 NOT UPDATED.

i) Transmission failure of TRACKING AREA UPDATE COMPLETE message indication with TAI change from lower layers

 If the current TAI is not in the TAI list, the tracking area updating procedure shall be aborted and re-initiated immediately. The UE shall set the EPS update status to EU2 NOT UPDATED.

 If the current TAI is still part of the TAI list, it is up to the UE implementation how to re-run the ongoing procedure.

j) Transmission failure of TRACKING AREA UPDATE COMPLETE message indication without TAI change from lower layers

 It is up to the UE implementation how to re-run the ongoing procedure.

k) "Extended wait time" from the lower layers

 If the TRACKING AREA UPDATE REQUEST message contained the low priority indicator set to "MS is configured for NAS signalling low priority", the UE shall start timer T3346 with the "Extended wait time" value and reset the tracking area updating attempt counter.

 If the TRACKING AREA UPDATE REQUEST message did not contain the low priority indicator set to "MS is configured for NAS signalling low priority", the UE is operating in NB-S1 mode and the UE is not a UE configured to use AC11 – 15 in selected PLMN, then the UE shall start timer T3346 with the "Extended wait time" value and reset the tracking area updating attempt counter.

 In other cases the UE shall ignore the "Extended wait time".

 The UE shall abort the tracking area updating procedure, stay in the current serving cell, set the EPS update status to EU2 NOT UPDATED, change the state to EMM-REGISTERED.ATTEMPTING-TO-UPDATE and apply the normal cell reselection process.

 If the UE had used eDRX before initiating tracking area updating procedure, then the UE shall continue to use the eDRX with the extended DRX parameters IE received during the last attach or tracking area updating procedure.

 The UE shall proceed as described below.

ka) "Extended wait time CP data" from the lower layers

 If the UE is operating in NB-S1 mode and supports the timer T3448, the UE shall start the timer T3448 with the "Extended wait time CP data" value. If the UE is operating in NB-S1 mode and does not support the timer T3448, the UE shall start the timer T3346 with the "Extended wait time CP data" value and reset the tracking area updating attempt counter.

 In other cases the UE shall ignore the "Extended wait time CP data".

 The UE shall abort the tracking area updating procedure, stay in the current serving cell, set the EPS update status to EU2 NOT UPDATED, change the state to EMM-REGISTERED.ATTEMPTING-TO-UPDATE and apply the normal cell reselection process.

 If the UE had used eDRX before initiating tracking area updating procedure, then the UE shall continue to use the eDRX with the extended DRX parameters IE received during the last attach or tracking area updating procedure.

 The UE shall proceed as described below.

l) Timer T3346 is running

 The UE shall not start the tracking area updating procedure unless:

- the UE is in EMM-CONNECTED mode;

- the UE received a paging;

- the UE is a UE configured to use AC11 – 15 in selected PLMN;

- the UE has a PDN connection for emergency bearer services established or is establishing a PDN connection for emergency bearer services;

- the UE is requested by the upper layer for a CS fallback for emergency call or a 1xCS fallback for emergency call;

- the UE in NB-S1 mode is requested by the upper layer to transmit user data related to an exceptional event and

i) the UE is allowed to use exception data reporting (see the ExceptionDataReportingAllowed leaf of the NAS configuration MO in 3GPP TS 24.368 [15A] or the USIM file EFNASCONFIG in 3GPP TS 31.102 [17]); and

ii) timer T3346 was not started when NAS signalling connection was established with RRC establishment cause set to "MO exception data"; or

- the UE has a PDN connection established without the NAS signalling low priority indication or is establishing a PDN connection without the NAS signalling low priority indication, the timer T3402 and the timer T3411 are not running and the timer T3346 was started due to rejection of a NAS request message (e.g. ATTACH REQUEST, TRACKING AREA UPDATE REQUEST or EXTENDED SERVICE REQUEST) which contained the low priority indicator set to "MS is configured for NAS signalling low priority".

 The UE stays in the current serving cell and applies the normal cell reselection process.

NOTE 4: It is considered an abnormal case if the UE needs to initiate a tracking area updating procedure while timer T3346 is running independent on whether timer T3346 was started due to an abnormal case or a non successful case.

 If the TAI of the current serving cell is not included in the TAI list or the TIN indicates "P-TMSI", the UE shall set the EPS update status to EU2 NOT UPDATED and change to state EMM-REGISTERED.ATTEMPTING-TO-UPDATE.

 If the tracking area updating procedure needs to be initiated for an MO MMTEL voice call or an MO MMTEL video call is started, then a notification that the procedure was not initiated due to network congestion shall be provided to upper layers.

NOTE 5: This can result in the upper layers requesting establishment of the originating voice call on an alternative manner e.g. requesting establishment of a CS voice call (see 3GPP TS 24.173 [13E]).

 The UE shall proceed as described below.

la) Timer T3448 is running

 The UE shall not start the tracking area updating procedure with the "signalling active" flag set, unless:

- the UE is a UE configured to use AC11 – 15 in selected PLMN;

- the UE which is only using EPS services with control plane CIoT EPS optimization received a paging; or

- the UE in NB-S1 mode is requested by the upper layer to transmit user data related to an exceptional event and the UE is allowed to use exception data reporting (see the ExceptionDataReportingAllowed leaf of the NAS configuration MO in 3GPP TS 24.368 [15A] or the USIM file EFNASCONFIG in 3GPP TS 31.102 [17]).

 The UE stays in the current serving cell and applies the normal cell reselection process.

 The UE shall proceed as described below.

m) Mobile originated detach required

 Detach due to removal of USIM or due to switch off:

 The tracking area updating procedure shall be aborted, and the UE initiated detach procedure shall be performed.

 Detach not due to removal of USIM and not due to switch off:

 The UE initiated detach procedure shall be initiated after successful completion of the tracking area updating procedure.

o) Timer T3447 is running

 The UE shall not start the tracking area updating procedure with the "signalling active" flag set or the "active" flag set, unless:

- the UE received a paging;

- the UE is a UE configured to use AC11 – 15 in selected PLMN;

- the UE has a PDN connection for emergency bearer services established or is establishing a PDN connection for emergency bearer services;

 The UE stays in the current serving cell and applies the normal cell reselection process. The tracking area update request procedure is started, if still necessary, when timer T3447 expires.

p) Tracking area updating and paging procedure collision

 If the UE receives a CS SERVICE NOTIFICATION message before the tracking area updating procedure has been completed, the UE shall progress the tracking area updating procedure and respond to the CS SERVICE NOTIFICATION upon successful completion of the tracking area updating procedure.

For the cases b, c, d, e, f with detach type "re-attach required" or "re-attach not required" with EMM cause other than #2 "IMSI unknown in HSS", k and ka, the UE shall stop any ongoing transmission of user data.

For the cases b, c, d, k, ka, l and la, the UE shall proceed as follows:

 Timer T3430 shall be stopped if still running.

 For the cases b, c, d, la k when the "Extended wait time" is ignored, and ka when the "Extended wait time CP data" is ignored, if the tracking area updating request is not for initiating a PDN connection for emergency bearer services, the tracking area updating attempt counter shall be incremented, unless it was already set to 5.

 If the tracking area updating attempt counter is less than 5, the TAI of the current serving cell is included in the TAI list, the EPS update status is equal to EU1 UPDATED, the TIN does not indicate "P-TMSI" and the tracking area updating procedure is performed not due to an inter-system change from N1 mode to S1 mode and the tracking area updating procedure is not performed due to cases g, m, n, za, zc in subclause 5.5.3.2.2:

 the UE shall keep the EPS update status to EU1 UPDATED and enter state EMM-REGISTERED.NORMAL-SERVICE. The UE shall start timer T3411.

 If in addition the TRACKING AREA UPDATE REQUEST indicated "periodic updating" or if tracking area updating procedure was initiated to recover NAS signalling connection due to "RRC Connection failure" from the lower layers, none of the other reasons for initiating the tracking area updating procedure listed in subclause 5.5.3.2.2 was applicable, and the TRACKING AREA UPDATE REQUEST message did not include T3324 value IE, T3412 extended value IE or Extended DRX parameters IE, the timer T3411 may be stopped when the UE enters EMM-CONNECTED mode.

 If timer T3411 expires the tracking area updating procedure is triggered again.

 If the tracking area updating attempt counter is less than 5, and the TAI of the current serving cell is not included in the TAI list or the EPS update status is different to EU1 UPDATED or the TIN indicates "P-TMSI" or the tracking area updating procedure is performed due to an inter-system change from N1 mode to S1 mode or if the tracking area updating procedure is performed due to cases g, m, n, za, zc in subclause 5.5.3.2.2:

- for the cases k and l, the tracking area updating procedure is started, if still necessary, when timer T3346 expires or is stopped.

- for the case ka, if timer T3346 is started, the tracking area updating procedure is started, if still necessary, when timer T3346 expires or is stopped.

- for the case ka, if timer T3448 is started and the "signalling active" flag is set in the TRACKING AREA UPDATE REQUEST message, the tracking area updating procedure is started, if still necessary, when timer T3448 expires or is stopped.

- for the case la, if the "signalling active" flag is set in the TRACKING AREA UPDATE REQUEST message, the tracking area updating procedure is started, if still necessary, when timer T3448 expires or is stopped.

- for the cases b, c, d, k when the "Extended wait time" is ignored, and ka when the "Extended wait time CP data" is ignored, if the tracking area updating request is not for initiating a PDN connection for emergency bearer services, the UE shall start timer T3411, shall set the EPS update status to EU2 NOT UPDATED and change to state EMM-REGISTERED.ATTEMPTING-TO-UPDATE. When timer T3411 expires the tracking area updating procedure is triggered again.

 If A/Gb mode or Iu mode is supported by the UE, the UE shall in addition handle the GPRS update status as specified in 3GPP TS 24.008 [13] for the abnormal case when a normal or periodic routing area updating procedure fails and the routing area updating attempt counter is less than 5 and the GPRS update status is different from GU1 UPDATED.

 If the UE is operating in single-registration mode, the UE shall in addition handle the 5GS update status as specified in 3GPP TS 24.501 [54] for the abnormal cases when a registration procedure for mobility and periodic registration fails and the registration attempt counter is less than 5 and the 5GS update status is different from 5U1 UPDATED.

 If the tracking area updating attempt counter is equal to 5:

- the UE shall start timer T3402, shall set the EPS update status to EU2 NOT UPDATED;

- the UE shall delete the list of equivalent PLMNs and shall change to state EMM-REGISTERED.ATTEMPTING-TO-UPDATE or optionally to EMM-REGISTERED.PLMN-SEARCH in order to perform a PLMN selection according to 3GPP TS 23.122 [6]; and

- if A/Gb mode, Iu mode or N1 mode is supported by the UE:

- if A/Gb mode or Iu mode is supported by the UE, the UE shall in addition handle the GPRS update status as specified in 3GPP TS 24.008 [13] for the abnormal case when a normal or periodic routing area updating procedure fails and the routing area updating attempt counter is equal to 5;

- if the UE is operating in single-registration mode, the UE shall in addition handle the 5GS update status as specified in 3GPP TS 24.501 [54] for the abnormal case when a registration procedure for mobility or periodic registration update performed over 3GPP access fails and the registration attempt counter is equal to 5; and

- if the UE does not change to state EMM-REGISTERED.PLMN-SEARCH, the UE shall attempt to select GERAN. UTRAN or NG-RAN radio access technology.

 If a GERAN or UTRAN cell is selected:

- a UE in PS mode 1 or PS mode 2 of operation shall proceed with appropriate GMM specific procedures;

- a UE in CS/PS mode 1 or CS/PS mode 2 of operation shall proceed with appropriate MM or GMM specific procedures.

 If an NG-RAN cell is selected, the UE shall proceed with appropriate 5GMM specific procedures.

 Additionally, the UE may disable the E-UTRA capability as specified in subclause 4.5.

\*\*\*\*\* Next change \*\*\*\*\*

##### 5.5.3.2.7 Abnormal cases on the network side

The following abnormal cases can be identified:

a) If a lower layer failure occurs before the message TRACKING AREA UPDATE COMPLETE has been received from the UE and a GUTI has been assigned, the network shall abort the procedure, enter EMM-IDLE mode and shall consider both, the old and new GUTI as valid until the old GUTI can be considered as invalid by the network (see subclause 5.4.1.4). During this period the network may use the identification procedure followed by a GUTI reallocation procedure if the old GUTI is used by the UE in a subsequent message.

 The network may page with IMSI if paging with old and new S-TMSI fails. Paging with IMSI causes the UE to re-attach as described in subclause 5.6.2.2.2.

b) Protocol error

 If the TRACKING AREA UPDATE REQUEST message has been received with a protocol error, the network shall return a TRACKING AREA UPDATE REJECT message with one of the following EMM cause values:

 #96: invalid mandatory information element error;

 #99: information element non-existent or not implemented;

 #100: conditional IE error; or

 #111: protocol error, unspecified.

c) T3450 time-out

 On the first expiry of the timer, the network shall retransmit the TRACKING AREA UPDATE ACCEPT message and shall reset and restart timer T3450. The retransmission is performed four times, i.e. on the fifth expiry of timer T3450, the tracking area updating procedure is aborted. Both, the old and the new GUTI shall be considered as valid until the old GUTI can be considered as invalid by the network (see subclause 5.4.1.4). During this period the network acts as described for case a above.

d) TRACKING AREA UPDATE REQUEST received after the TRACKING AREA UPDATE ACCEPT message has been sent and before the TRACKING AREA UPDATE COMPLETE message is received

- If one or more of the information elements in the TRACKING AREA UPDATE REQUEST message differ from the ones received within the previous TRACKING AREA UPDATE REQUEST message, the previously initiated tracking area updating procedure shall be aborted if the TRACKING AREA UPDATE COMPLETE message has not been received and the new tracking area updating procedure shall be progressed; or

- if the information elements do not differ, then the TRACKING AREA UPDATE ACCEPT message shall be resent and the timer T3450 shall be restarted if a TRACKING AREA UPDATE COMPLETE message is expected. In that case, the retransmission counter related to T3450 is not incremented.

e) More than one TRACKING AREA UPDATE REQUEST received and no TRACKING AREA UPDATE ACCEPT or TRACKING AREA UPDATE REJECT message has been sent

- If one or more of the information elements in the TRACKING AREA UPDATE REQUEST message differs from the ones received within the previous TRACKING AREA UPDATE REQUEST message, the previously initiated tracking area updating procedure shall be aborted and the new tracking area updating procedure shall be progressed;

- if the information elements do not differ, then the network shall continue with the previous tracking area updating procedure and shall not treat any further this TRACKING AREA UPDATE REQUEST message.

f) Lower layers indication of non-delivered NAS PDU due to handover

 If the TRACKING AREA UPDATE ACCEPT message or TRACKING AREA UPDATE REJECT message could not be delivered due to an intra MME handover and the TAI of the target cell and the TAI of the source cell are the same, then upon successful completion of the intra MME handover the MME shall retransmit the TRACKING AREA UPDATE ACCEPT message or TRACKING AREA UPDATE REJECT message. If a failure of the handover procedure is reported by the lower layer and the S1 signalling connection exists, the MME shall retransmit the TRACKING AREA UPDATE ACCEPT message or TRACKING AREA UPDATE REJECT message.

g) DETACH REQUEST message received before the TRACKING AREA UPDATE ACCEPT message is sent or before the TRACKING AREA UPDATE COMPLETE message (in case of GUTI and/or TMSI was allocated) is received.

 Detach containing cause "switch off":

 The network shall abort the signalling for the tracking area updating procedure towards the UE and shall progress the detach procedure as described in subclause 5.5.2.2.

NOTE: Internally in the network, before processing the detach request, the MME can perform the necessary signalling procedures for the tracking area updating procedure before progressing the detach procedure.

 Detach containing other causes than "switch off":

 The network shall proceed with the tracking area updating procedure and shall progress the detach procedure after successful completion of the tracking area updating procedure.

h) If the TRACKING AREA UPDATE REQUEST message with EPS update type IE indicating "periodic updating" is received by the new MME which does not have the EMM context data related to the subscription, the new MME may send the TRACKING AREA UPDATE REJECT message with EMM cause value #10 "Implicitly detached"

\*\*\*\*\* Next change \*\*\*\*\*

##### 5.5.3.3.2 Combined tracking area updating procedure initiation

The UE operating in CS/PS mode 1 or CS/PS mode 2, in state EMM-REGISTERED, shall initiate the combined tracking area updating procedure:

a) when the UE that is attached for both EPS and non-EPS services detects entering a tracking area that is not in the list of tracking areas that the UE previously registered in the MME, unless the UE is configured for "AttachWithIMSI" as specified in 3GPP TS 24.368 [15A] or 3GPP TS 31.102 [17] and is entering a tracking area in a new PLMN that is neither the registered PLMN nor in the list of equivalent PLMNs;

b) when the UE that is attached for EPS services wants to perform an attach for non-EPS services. In this case the EPS update type IE shall be set to "combined TA/LA updating with IMSI attach";

c) when the UE performs an intersystem change from A/Gb mode to S1 mode and the EPS services were previously suspended in A/Gb mode;

d) when the UE performs an intersystem change from A/Gb or Iu mode to S1 mode, and the UE previously either performed a combined GPRS attach procedure, an IMSI attach procedure, a location area updating procedure or a combined routing area updating procedure, in A/Gb or Iu mode, or moved to A/Gb or Iu mode from S1 mode through an SRVCC handover or moved to Iu mode from S1 mode through an vSRVCC handover. In this case the EPS update type IE shall be set to "combined TA/LA updating with IMSI attach";

e) when the UE enters EMM-REGISTERED.NORMAL-SERVICE and the UE's TIN indicates "P-TMSI";

f) when the UE receives an indication from the lower layers that the RRC connection was released with cause "load balancing TAU required";

g) when the UE deactivated EPS bearer context(s) locally while in EMM-REGISTERED, because it was not able or not allowed to establish a NAS signalling connection, and then returns to EMM-REGISTERED.NORMAL-SERVICE and no EXTENDED SERVICE REQUEST message, CONTROL PLANE SERVICE REQUEST message or DETACH REQUEST message is pending to be sent by the UE;

h) when the UE changes any one of the UE network capability information, the MS network capability information or the N1 UE network capability information;

i) when the UE changes the UE specific DRX parameter;

j) when the UE receives an indication of "RRC Connection failure" from the lower layers and has no signalling or user uplink data pending (i.e. when the lower layer requests NAS signalling connection recovery);

k) when due to manual CSG selection the UE has selected a CSG cell whose CSG identity and associated PLMN identity are not included in the UE's Allowed CSG list or in the UE's Operator CSG list;

l) when the UE reselects an E-UTRAN cell while it was in GPRS READY state or PMM-CONNECTED mode;

m) when the UE supports SRVCC to GERAN or UTRAN or supports vSRVCC to UTRAN, and changes the mobile station classmark 2 or the supported codecs, or the UE supports SRVCC to GERAN and changes the mobile station classmark 3;

n) when the UE changes the radio capability for GERAN or cdma2000® or both;

o) when the UE's usage setting or the voice domain preference for E-UTRAN change in the UE;

p) when the UE activates mobility management for IMS voice termination as specified in 3GPP TS 24.008 [13], annex P.2, and the TIN indicates "RAT-related TMSI";

q) when the UE performs an intersystem change from A/Gb mode to S1 mode and the TIN indicates "RAT-related TMSI", but the UE is required to perform tracking area updating for IMS voice termination as specified in 3GPP TS 24.008 [13], annex P.4;

r) upon reception of a paging indication, if the UE is in state EMM-REGISTERED.ATTEMPTING-TO-UPDATE and the paging indication uses S-TMSI or it uses IMSI with domain indicator set to ″CS″;

s) when the UE needs to update the network with EPS bearer context status due to local de-activation of EPS bearer context(s) as specified in subclause 6.5.1.4A;

t) when the UE performs an intersystem change from A/Gb or Iu mode to S1 mode, and the UE has previously performed the MM connection establishment for CS fallback emergency calls (see 3GPP TS 24.008 [13], subclause 4.5.1.5a) without performing a location area updating procedure or combined routing area updating procedure while camping on a location area which is different from the stored location area. In this case, the EPS update type IE shall be set to "combined TA/LA updating with IMSI attach";

u) when the UE performs an intersystem change from A/Gb or Iu mode to S1 mode, and the MM update status is U2 NOT UPDATED. In this case the EPS update type IE shall be set to "combined TA/LA updating with IMSI attach";

v) when the UE needs to request the use of PSM or needs to stop the use of PSM;

w) when the UE needs to request the use of eDRX or needs to stop the use of eDRX;

x) when a change in the eDRX usage conditions at the UE requires different extended DRX parameters;

y) when a change in the PSM usage conditions at the UE requires a different timer T3412 value or different timer T3324 value;

NOTE 1: A change in the PSM or eDRX usage conditions at the UE can include e.g. a change in the UE configuration, a change in requirements from upper layers or the battery running low at the UE.

z) when the CIoT EPS optimizations the UE needs to use, change in the UE;

za) when the Default\_DCN\_ID value changes, as specified in 3GPP TS 24.368 [15A] or in USIM file NASCONFIG as specified in 3GPP TS 31.102 [17];

NOTE 2: The tracking area updating procedure is initiated after deleting the DCN-ID list as specified in annex C.

zb) when the UE performs inter-system change from N1 mode to S1 mode in EMM-IDLE mode, the UE operates in single-registration mode, and conditions specified in 3GPP TS 24.501 [54] apply;

zc) when the UE in EMM-IDLE mode changes the radio capability for E-UTRAN;

zd) when the UE performs inter-system change from N1 mode to S1 mode in EMM-CONNECTED mode;

ze) when the UE in EMM-IDLE mode changes the radio capability for NG-RAN;

zf) in WB-S1 mode, when the applicable UE radio capability ID for the current UE radio configuration changes due to a reselection to a new PLMN or a revocation of the network-assigned UE radio capability IDs by the serving PLMN; or

zg) when the UE needs to use the WUS assistance, stop to use the WUS assistance, or change the conditions for using the WUS assistance.

For case c, if the TIN indicates "RAT-related TMSI" and the EPS services were not resumed before returning to S1 mode, the UE shall set the TIN to "P-TMSI" before initiating the combined tracking area updating procedure.

For cases n, zc, ze and zf, the UE shall include a UE radio capability information update needed IE in the TRACKING AREA UPDATE REQUEST message.

If the UE is in the EMM-CONNECTED mode and the UE changes the radio capability for E-UTRAN or for NG-RAN, the UE may locally release the established NAS signalling connection and enter the EMM-IDLE mode. Then, the UE shall initiate the combined tracking area updating procedure including a UE radio capability information update needed IE in the TRACKING AREA UPDATE REQUEST message.

For case l, if the TIN indicates "RAT-related TMSI", the UE shall set the TIN to "P-TMSI" before initiating the combined tracking area updating procedure.

For case r, the "active" flag in the EPS update type IE shall be set to 1. If the paging is received for CS fallback, the UE shall send the EXTENDED SERVICE REQUEST message to the MME by using the existing NAS signalling connection after the completion of the tracking area updating procedure.

To initiate a combined tracking area updating procedure the UE sends the message TRACKING AREA UPDATE REQUEST to the network, starts timer T3430 and changes to state EMM-TRACKING-AREA-UPDATING-INITIATED. The value of the EPS update type IE in the message shall indicate "combined TA/LA updating" unless explicitly specified otherwise.

If the UE initiates the combined tracking area updating procedure for EPS services and "SMS only", the UE shall indicate "SMS only" in the additional update type IE.

The UE shall include the TMSI status IE if no valid TMSI is available. Furthermore, if the UE has stored a valid location area identification, the UE shall include it in the Old location area identification IE in the TRACKING AREA UPDATE REQUEST message.

If the UE has stored a valid TMSI, the UE shall include the TMSI based NRI container IE in the TRACKING AREA UPDATE REQUEST message.

The UE shall include the EPS bearer context status IE in TRACKING AREA UPDATE REQUEST message:

a) for the case g;

b) for the case s;

c) for the case zb;

d) if the UE has established PDN connection(s) of "non IP" or Ethernet PDN type; and

e) if the UE:

1) locally deactivated at least one dedicated EPS bearer context upon an inter-system mobility from WB-S1 mode to NB-S1 mode in EMM-IDLE mode;

2) locally deactivated at least one dedicated EPS bearer context upon an inter-system change from WB-N1 mode to NB-S1 mode in EMM-IDLE mode for the UE operating in single-registration mode (see subclause 6.4.2.1); or

3) locally deactivated at least one default EPS bearer context upon an inter-system change from N1 mode to NB-S1 mode in EMM-IDLE mode for the UE operating in single-registration mode (see subclause 6.5.0).

In WB-S1 mode, if the UE supports RACS the UE shall set the RACS bit to "RACS supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

For cases n, zc and ze, in WB-S1 mode, if the UE supports RACS and the UE has an applicable UE radio capability ID for the new UE radio configuration in the selected PLMN, the UE shall set the URCIDA bit to "UE radio capability ID available" in the UE radio capability ID availability IE of the TRACKING AREA UPDATE REQUEST message.

For all cases except cases n, zc and ze, in WB-S1 mode, if the UE has an applicable UE radio capability ID for the current UE radio configuration in the selected PLMN, the UE shall set the URCIDA bit to "UE radio capability ID available" in the UE radio capability ID availability IE of the TRACKING AREA UPDATE REQUEST message.

\*\*\*\*\* Next change \*\*\*\*\*

###### 5.5.3.3.4.2 Combined tracking area updating successful

The description for normal tracking area update as specified in subclause 5.5.3.2.4 shall be followed. In addition, the following description for location area updating applies.

The TMSI reallocation may be part of the combined tracking area updating procedure. The TMSI allocated is then included in the TRACKING AREA UPDATE ACCEPT message together with the location area identification (LAI). In this case the MME shall change to state EMM-COMMON-PROCEDURE-INITIATED and shall start the timer T3450 as described in subclause 5.4.1. The LAI may be included in the TRACKING AREA UPDATE ACCEPT message without TMSI. If the MME does not indicate "SMS only" in the TRACKING AREA UPDATE ACCEPT message, subject to operator policies the MME should allocate a TAI list that does not span more than one location area.

For a shared network in CS domain, the MME indicates the selected PLMN for CS domain in the LAI to the UE as specified in 3GPP TS 23.272 [9].

The UE, receiving a TRACKING AREA UPDATE ACCEPT message, stores the received location area identification, resets the location update attempt counter, sets the update status to U1 UPDATED and enters MM state MM IDLE.

If the UE maintains a counter for "SIM/USIM considered invalid for non-GPRS services" events (see subclause 5.3.7b), then the UE shall reset this counter.

If the LAI contained in the TRACKING AREA UPDATE ACCEPT message is a member of the list of "forbidden location areas for regional provision of service" or the list of "forbidden location areas for roaming" then such entry shall be deleted.

If the PLMN identity for the CS domain which is provided as part of the LAI contained in the TRACKING AREA UPDATE ACCEPT message differs from the PLMN identity provided as part of the GUTI, the MME shall include the PLMN identity for the CS domain in the list of equivalent PLMNs in the TRACKING AREA UPDATE ACCEPT message.

If the UE requested "SMS only" in the Additional update type IE, or if the UE requested a combined tracking area updating for EPS and non-EPS services, but the network decides to accept the tracking area update request for EPS services and "SMS only", the network shall indicate "SMS only" in the Additional update result IE. In addition, if the SMS services are provided via SMS in MME, the network shall, in the TRACKING AREA UPDATE ACCEPT message, provide a non-broadcast LAI and may indicate in the EPS update result IE that ISR is activated. If a TMSI has to be allocated, then the network shall also provide a TMSI which cannot cause any ambiguity with assigned TMSI values.

If the TRACKING AREA UPDATE ACCEPT message includes the Additional update result IE with value "SMS only", a UE operating in CS/PS mode 2 and a UE operating in CS/PS mode 1 with "IMS voice available" shall not attempt to use CS fallback for mobile originating services.

As an implementation option, if the TRACKING AREA UPDATE ACCEPT message does not include the Additional update result IE with value "SMS only" and the UE is not configured for NAS signalling low priority then the UE may stop timer T3246 if running.

If the TRACKING AREA UPDATE ACCEPT message includes the Additional update result IE with value "CS Fallback not preferred", this indicates to a UE operating in CS/PS mode 2 and a UE operating in CS/PS mode 1 with "IMS voice available" that it is attached for EPS and non-EPS services and that it can use CS fallback.

How to handle the old TMSI stored in the UE depends on the mobile identity included in the TRACKING AREA UPDATE ACCEPT message.

- If the TRACKING AREA UPDATE ACCEPT message contains an IMSI, the UE is not allocated any TMSI, and shall delete any old TMSI accordingly.

- If the TRACKING AREA UPDATE ACCEPT message contains a TMSI, the UE shall use this TMSI as new temporary identity. The UE shall delete its old TMSI and shall store the new TMSI. In this case, a TRACKING AREA UPDATE COMPLETE message is returned to the network to confirm the received TMSI.

- If neither a TMSI nor an IMSI has been included by the network in the TRACKING AREA UPDATE ACCEPT message, the old TMSI, if any is available, shall be kept.

NOTE 1: It is possible for UEs compliant with earlier versions of this specification to send a TRACKING AREA UPDATE COMPLETE message even if TMSI reallocation is not part of the combined tracking area updating procedure.

If the TRACKING AREA UPDATE ACCEPT message includes the Additional update result IE with value "SMS only" or "CS Fallback not preferred", a UE operating in CS/PS mode 1 with "IMS voice not available" shall attempt to select GERAN or UTRAN radio access technology and disable the E-UTRA capability (see subclause 4.5).

The network receiving a TRACKING AREA UPDATE COMPLETE message stops timer T3450, changes to state EMM-REGISTERED.

NOTE 2: Upon receiving a TRACKING AREA UPDATE COMPLETE message, if a new TMSI was included in the TRACKING AREA UPDATE ACCEPT message, the MME sends an SGsAP-TMSI-REALLOCATION-COMPLETE message as specified in 3GPP TS 29.118 [16A].

Unless the MME supporting N26 is in a deployment where it, after intersystem change from N1 mode to S1 mode, has an IMEI or an IMEISV for the UE, then after the UE performs intersystem change from N1 mode to S1 mode, if:

- the network supports SRVCC for IMS emergency sessions (see 3GPP TS 23.216 [8]);

- the UE has an emergency PDN connection;

- the UE has set the SRVCC to GERAN/UTRAN capability bit in the MS network capability IE to "SRVCC from UTRAN HSPA or E-UTRAN to GERAN/UTRAN supported; and

- the MME has neither an IMEI nor an IMEISV for the UE;

NOTE 3: The AMF can receive an IMEI from the UE and pass it to the MME during the intersystem change if the UE is emergency registered and the UE doesn't have a valid USIM or the UE's IMSI remains unauthenticated.

then the MME shall initiate the identification procedure (see subclause 5.4.4) or the security mode control procedure (see subclause 5.4.3) with the UE.

\*\*\*\*\* Next change \*\*\*\*\*

##### 5.6.1.2.2 UE is using EPS services with control plane CIoT EPS optimization

The UE shall send a CONTROL PLANE SERVICE REQUEST message, start T3417 and enter the state EMM-SERVICE-REQUEST-INITIATED.

For case a in subclause 5.6.1.1, the Control plane service type of the CONTROL PLANE SERVICE REQUEST message shall indicate "mobile terminating request". The UE may include the ESM DATA TRANSPORT message. The UE shall not include any ESM message other than ESM DATA TRANSPORT message.

For case b in subclause 5.6.1.1,

- if the UE has pending IP, non-IP or Ethernet user data that is to be sent via the control plane radio bearers, the Control plane service type of the CONTROL PLANE SERVICE REQUEST message shall indicate "mobile originating request". The UE shall include an ESM DATA TRANSPORT message in the ESM message container IE. If the UE supports the CP-EDT (see 3GPP TS 36.300 [20]), the UE shall provide the CONTROL PLANE SERVICE REQUEST message in the NAS request to the lower layer to establish a RRC connection as specified in subclause 5.3.1.1.

For cases b and m in subclause 5.6.1.1,

- if the UE has pending IP, non-IP or Ethernet user data that is to be sent via the user plane radio bearers, the UE shall set the Control plane service type of the CONTROL PLANE SERVICE REQUEST message to "mobile originating request" and the "active" flag in the Control plane service type IE to 1. The UE shall not include any ESM message container or NAS message container IE in the CONTROL PLANE SERVICE REQUEST message.

For case c in subclause 5.6.1.1, the UE shall set the Control plane service type of the CONTROL PLANE SERVICE REQUEST message to "mobile originating request". If the CONTROL PLANE SERVICE REQUEST message is:

- for sending SMS, the UE shall include the SMS message in the NAS message container IE and shall not include any ESM message container IE in the CONTROL PLANE SERVICE REQUEST message; and

- for sending signalling different from SMS, the UE shall not include any ESM message container or NAS message container IE in the CONTROL PLANE SERVICE REQUEST message.

\*\*\*\*\* Next change \*\*\*\*\*

#### 5.6.1.6 Abnormal cases in the UE

The following abnormal cases can be identified:

a) Access barred because of access class barring, EAB, ACDC or NAS signalling connection establishment rejected by the network without "Extended wait time" received from lower layers

 In WB-S1 mode, if the service request procedure is started in response to a paging request from the network, access class barring, EAB or ACDC is not applicable.

 In NB-S1 mode, if the service request procedure is started in response to a paging request from the network, access barring is not applicable.

 If the trigger for the service request procedure is the response to a paging request from the network and the NAS signalling connection establishment is rejected by the network, the service request procedure shall not be started. The UE stays in the current serving cell and applies normal cell reselection process. During an implementation dependent time period, the service request procedure may be started when access for "terminating calls" is granted or upon a cell change.

 If the service request was initiated for CS fallback and the access is barred for "mobile originating CS fallback" (see 3GPP TS 36.331 [22]) and the lower layer indicates "the barring is due to CSFB specific access barring information", the service request procedure shall not be started. The UE stays in the current serving cell and applies normal cell reselection process. The service request procedure may be started if it is still necessary, i.e. when access for "mobile originating CS fallback" is granted or because of a cell change.

 If the service request was initiated for CS fallback and a CS fallback cancellation request was not received and the access is barred for "mobile originating CS fallback" (see 3GPP TS 36.331 [22]) and the lower layer does not indicate "the barring is due to CSFB specific access barring information", the UE shall attempt to select GERAN or UTRAN radio access technology. If the UE finds a suitable GERAN or UTRAN cell, it then proceeds with the appropriate MM and CC specific procedures and the EMM sublayer shall not indicate the abort of the service request procedure to the MM sublayer. Otherwise the EMM sublayer shall indicate the abort of the service request procedure to the MM sublayer.

 If the service request was initiated for 1xCS fallback and the access is barred for "originating calls" (see 3GPP TS 36.331 [22]), the UE shall select cdma2000® 1x radio access technology. The UE then proceeds with appropriate cdma2000® 1x CS procedures.

 If the lower layer indicated the access was barred because of access class barring for "originating calls" (see 3GPP TS 36.331 [22]) and if:

- the service request is initiated due to a request from upper layers for user plane radio resources, and the MO MMTEL voice call is started, the MO MMTEL video call is started or the MO SMSoIP is started;

- the service request is initiated due to a mobile originated SMS over NAS or SMS over S102; or

- the service request is initiated due to a request from upper layers for user plane radio resources, ACDC is applicable to the request and the UE supports ACDC.

 then the service request procedure shall be started. The call type used shall be per annex D of this document.

NOTE 1: If more than one of MO MMTEL voice call is started, MO MMTEL video call is started or MO SMSoIP is started conditions are satisfied, it is left to UE implementation to determine the call type based on annex D of this document.

 If access is barred for a certain ACDC category (see 3GPP TS 36.331 [22]), and if the upper layers request user plane radio resources for a higher ACDC category and the UE supports ACDC, then the service request procedure shall be started.

 If an access request for an uncategorized application is barred due to ACDC (see 3GPP TS 36.331 [22]), and if the upper layers request user plane radio resources for a certain ACDC category and the UE supports ACDC, then the service request procedure shall be started.

 Otherwise:

- In WB-S1 mode, if access is barred for "originating calls" (see 3GPP TS 36.331 [22]), the service request procedure shall not be started. The UE stays in the current serving cell and applies normal cell reselection process. The service request procedure may be started if it is still necessary when access for "originating calls" is granted or because of a cell change.

- In NB-S1 mode, if access is barred for "originating calls" (see 3GPP TS 36.331 [22]), the service request procedure shall not be started. The UE stays in the current serving cell and applies normal cell reselection process. Further UE behaviour is implementation specific, e.g. the service request procedure is started again after an implementation dependent time; or

 In NB-S1 mode, if access is barred for "originating calls" (see 3GPP TS 36.331 [22]), and a request for an exceptional event is received from the upper layers, then the service request procedure shall be started.

NOTE 2: In NB-S1 mode, the EMM layer cannot receive the access barring alleviation indication from the lower layers (see 3GPP TS 36.331 [22]).

b) Lower layer failure or release of the NAS signalling connection without "Extended wait time", without "Extended wait time CP data", and without redirection indication received from lower layers before the service request procedure is completed (see subclause 5.6.1.4) or before SERVICE REJECT message is received

 If the service request was initiated for CS fallback and a CS fallback cancellation request was not received, the UE shall attempt to select GERAN or UTRAN radio access technology. If the UE finds a suitable GERAN or UTRAN cell, it then proceeds with the appropriate MM and CC specific procedures and the EMM sublayer shall not indicate the abort of the service request procedure to the MM sublayer. Otherwise the EMM sublayer shall indicate the abort of the service request procedure to the MM sublayer, and the UE shall also set the EPS update status to EU2 NOT UPDATED and enter the state EMM-REGISTERED.ATTEMPTING-TO-UPDATE.

 If the service request was initiated for CS fallback and a CS fallback cancellation request was received, the UE shall set the EPS update status to EU2 NOT UPDATED and enter the state EMM-REGISTERED.ATTEMPTING-TO-UPDATE.

 If the service request was initiated for 1xCS fallback, the UE shall either:

- attempt to select cdma2000® 1x radio access technology and proceed with appropriate cdma2000® 1x CS procedures. If the UE fails to select cdma2000® 1x radio access technology, the UE shall set the EPS update status to EU2 NOT UPDATED and enter the state EMM-REGISTERED.ATTEMPTING-TO-UPDATE; or

- set the EPS update status to EU2 NOT UPDATED and enter the state EMM-REGISTERED.ATTEMPTING-TO-UPDATE, and perform cell selection according to 3GPP TS 36.304 [21].

 If the service request was not initiated for CS fallback or 1xCS fallback, the UE shall enter state EMM-REGISTERED.

 The UE shall abort the service request procedure, stop timer T3417, T3417ext or T3417ext-mt and locally release any resources allocated for the service request procedure.

c) T3417 expired

 The UE shall enter the state EMM-REGISTERED.

 If the UE triggered the service request procedure in EMM-IDLE mode in order to obtain packet services, then the EMM sublayer shall increment the service request attempt counter, abort the procedure and release locally any resources allocated for the service request procedure. The service request counter shall not be incremented, if:

- the service request procedure is initiated to establish a PDN connection for emergency bearer services;

- the UE has a PDN connection for emergency bearer services established;

- the UE is a UE configured to use AC11 – 15 in selected PLMN;

- the service request is initiated in response to paging from the network; or

- the UE in NB-S1 mode is requested by the upper layer to transmit user data related to an exceptional event and the UE is allowed to use exception data reporting (see the ExceptionDataReportingAllowed leaf of the NAS configuration MO in 3GPP TS 24.368 [15A] or the USIM file EFNASCONFIG in 3GPP TS 31.102 [17]).

 If the service request attempt counter is greater than or equal to 5, the UE shall start timer T3325 (see 3GPP TS 24.008 [13]). Additionally if the service request was initiated for an "originating MMTEL voice" call type or an "originating MMTEL video" call type, a notification that the service request was not accepted and that timer T3325 is running shall be provided to the upper layers.

NOTE 3: This can result in the upper layers requesting establishment of a CS voice call (if not already attempted in the CS domain), or other implementation specific mechanisms (see 3GPP TS 24.173 [13E]).

 The UE shall not attempt service request until expiry of timer T3325 unless:

- the service request is initiated in response to paging from the network;

- the UE is a UE configured to use AC11 – 15 in selected PLMN;

- the service request is initiated to establish a PDN connection for emergency bearer services;

- the UE has a PDN connection for emergency bearer services established;

- the UE is registered in a new PLMN; or

- the UE in NB-S1 mode is requested by the upper layer to transmit user data related to an exceptional event and the UE is allowed to use exception data reporting (see the ExceptionDataReportingAllowed leaf of the NAS configuration MO in 3GPP TS 24.368 [15A] or the USIM file EFNASCONFIG in 3GPP TS 31.102 [17]).

 If the service request for "originating MMTEL voice" call type was triggered while T3325 is running, a notification that the service request was not accepted and that timer T3325 is running shall be provided to the upper layers.

NOTE 4: This can result in the upper layers requesting establishment of a CS voice call (if not already attempted in the CS domain), or other implementation specific mechanisms (see 3GPP TS 24.173 [13E]).

NOTE 5: The NAS signalling connection can also be released if the UE deems that the network has failed the authentication check as specified in subclause 5.4.2.7.

 If the UE triggered the service request procedure in order to obtain services other than packet services from EMM-IDLE mode, then the EMM sublayer shall abort the procedure and release locally any resources allocated for the service request procedure.

 If the UE triggered the service request procedure in EMM-CONNECTED mode, the EMM sublayer shall abort the procedure and consider the service request procedure with "active" flag set or the 1xCS fallback procedure as failed. The UE shall stay in EMM-CONNECTED mode.

d) T3417ext or T3417ext-mt expired

 If a CS fallback cancellation request was not received, the UE shall attempt to select GERAN or UTRAN radio access technology. If the UE finds a suitable GERAN or UTRAN cell, it then proceeds with the appropriate MM and CC specific procedures and the EMM sublayer shall not indicate the abort of the service request procedure to the MM sublayer. Otherwise the EMM sublayer shall indicate the abort of the service request procedure to the MM sublayer, and the UE shall also set the EPS update status to EU2 NOT UPDATED and enter the state EMM-REGISTERED.ATTEMPTING-TO-UPDATE.

 If a CS fallback cancellation request was received the UE shall set the EPS update status to EU2 NOT UPDATED and enter the state EMM-REGISTERED.ATTEMPTING-TO-UPDATE.

e) SERVICE REJECT received, other EMM cause values than those treated in subclause 5.6.1.5, and cases of EMM cause values #22, #25 and #31 if considered as abnormal cases according to subclause 5.6.1.5.

 If the service request was initiated for CS fallback and a CS fallback cancellation request was not received, the UE shall attempt to select GERAN or UTRAN radio access technology. If the UE finds a suitable GERAN or UTRAN cell, it then proceeds with the appropriate MM and CC specific procedures and the EMM sublayer shall not indicate the abort of the service request procedure to the MM sublayer. Otherwise the EMM sublayer shall indicate the abort of the service request procedure to the MM sublayer, and the UE shall also set the EPS update status to EU2 NOT UPDATED and enter the state EMM-REGISTERED.ATTEMPTING-TO-UPDATE.

 If the service request was initiated for CS fallback and a CS fallback cancellation request was received, the UE shall set the EPS update status to EU2 NOT UPDATED and enter the state EMM-REGISTERED.ATTEMPTING-TO-UPDATE.

 If the service request was initiated for 1xCS fallback, the UE shall select cdma2000® 1x radio access technology. The UE then proceeds with appropriate cdma2000® 1x CS procedures.

 If the service request was initiated for 1xCS fallback and the UE has dual Rx/Tx configuration and supports enhanced 1xCS fallback, then upon entering EMM-IDLE mode the UE shall perform tracking area updating procedure.

 If the service request was not initiated for CS fallback or 1xCS fallback, the UE shall enter state EMM-REGISTERED.

 The UE shall abort the service request procedure, stop timer T3417, T3417ext or T3417ext-mt and locally release any resources allocated for the service request procedure.

f) Tracking area updating procedure is triggered

 The UE shall abort the service request procedure, stop timer T3417, T3417ext or T3417ext-mt if running and perform the tracking area updating procedure. The "active" flag shall be set in the TRACKING AREA UPDATE REQUEST message. If the service request was initiated for CS fallback or 1xCS fallback, and the CS fallback cancellation request was not received, the UE shall send the EXTENDED SERVICE REQUEST message to the MME by using the existing NAS signalling connection after the completion of the tracking area updating procedure.

g) Switch off

 If the UE is in state EMM-SERVICE-REQUEST-INITIATED at switch off, the detach procedure shall be performed.

h) Detach procedure collision

 EPS detach containing detach type "re-attach required":

 If the UE receives a DETACH REQUEST message from the network in state EMM-SERVICE-REQUEST-INITIATED, the UE shall take the following actions:

- If the service request was initiated for CS fallback, the UE shall attempt to select GERAN or UTRAN radio access technology. If the UE finds a suitable GERAN or UTRAN cell, it then proceeds with the appropriate MM, CC and GMM specific procedures and the EMM sublayer shall not indicate the abort of the service request procedure to the MM sublayer. Otherwise the EMM sublayer shall indicate the abort of the service request procedure to the MM sublayer;

- If the service request was initiated for 1xCS fallback, the UE shall attempt to select cdma2000® 1x radio access technology. The UE then proceeds with appropriate cdma2000® 1x CS procedures; or

- If the service request was not initiated for CS fallback or 1xCS fallback, the detach procedure shall be progressed and the service request procedure shall be aborted.

 EPS detach containing detach type "re-attach not required":

 If the UE receives a DETACH REQUEST message from the network in state EMM-SERVICE-REQUEST-INITIATED, the UE shall take the following actions:

- If the DETACH REQUEST message contains an EMM cause other than #2 "IMSI unknown in HSS" or no EMM cause IE, the detach procedure shall be progressed and the service request procedure shall be aborted. Additionally, if the service request was initiated for CS fallback or 1xCS fallback, but not for CS fallback for emergency call or 1xCS fallback for emergency call, the EMM sublayer shall indicate to the MM sublayer or the cdma2000® upper layers that the CS fallback or 1xCS fallback procedure has failed; or

 If the DETACH REQUEST message contains EMM cause #2 "IMSI unknown in HSS", the UE will follow the procedure as described below for the detach type "IMSI detach".

 EPS detach containing detach type "IMSI detach":

 If the UE receives a DETACH REQUEST message from the network in state EMM-SERVICE-REQUEST-INITIATED, the UE shall take the following actions:

- if the service request was initiated for SMS over NAS or CS fallback, but not for CS fallback for emergency call, the UE shall abort the service request procedure and progress the detach procedure; or

- otherwise the UE shall progress both procedures.

i) Transmission failure of SERVICE REQUEST, CONTROL PLANE SERVICE REQUEST or EXTENDED SERVICE REQUEST message indication with TAI change from lower layers

 If the current TAI is not in the TAI list, the service request procedure shall be aborted to perform the tracking area updating procedure. The "active" flag shall be set in the TRACKING AREA UPDATE REQUEST message. If the service request was initiated for CS fallback or 1xCS fallback, and the CS fallback cancellation request was not received, the UE shall send the EXTENDED SERVICE REQUEST message to the MME by using the existing NAS signalling connection after the completion of the tracking area updating procedure.

 If the current TAI is still part of the TAI list, the UE shall restart the service request procedure.

j) Transmission failure of SERVICE REQUEST, CONTROL PLANE SERVICE REQUEST or EXTENDED SERVICE REQUEST message indication without TAI change from lower layers

 The UE shall restart the service request procedure.

k) Default or dedicated bearer set up failure

 If the lower layers indicate a failure to set up a radio bearer, the UE shall locally deactivate the EPS bearer as described in subclause 6.4.4.6.

l) "Extended wait time" from the lower layers

 The UE shall abort the service request procedure, enter state EMM-REGISTERED, and stop timer T3417, T3417ext or T3417ext-mt if still running.

 If the EXTENDED SERVICE REQUEST or CONTROL PLANE SERVICE REQUEST message contained the low priority indicator set to "MS is configured for NAS signalling low priority", the UE shall start timer T3346 with the "Extended wait time" value.

 If the SERVICE REQUEST message was sent by a UE configured for NAS signalling low priority, the UE shall start timer T3346 with the "Extended wait time" value.

 If the EXTENDED SERVICE REQUEST or CONTROL PLANE SERVICE REQUEST message did not contain the low priority indicator set to "MS is configured for NAS signalling low priority" or if the SERVICE REQUEST message was sent by a UE not configured for NAS signalling low priority, the UE is operating in NB-S1 mode and the UE is not a UE configured to use AC11 – 15 in selected PLMN, then the UE shall start timer T3346 with the "Extended wait time" value.

 In other cases the UE shall ignore the "Extended wait time".

 The UE stays in the current serving cell and applies normal cell reselection process. The service request procedure is started, if still necessary, when timer T3346 expires or is stopped.

 If the service request was initiated for CS fallback and a CS fallback cancellation request was not received, the UE in CS/PS mode 1 of operation shall attempt to select GERAN or UTRAN radio access technology. If the UE finds a suitable GERAN or UTRAN cell, it then proceeds with the appropriate MM and CC specific procedures and the EMM sublayer shall not indicate the abort of the service request procedure to the MM sublayer. Otherwise the EMM sublayer shall indicate the abort of the service request procedure to the MM sublayer.

NOTE 5: If the UE disables the E-UTRA capability, then subsequent mobile terminating calls could fail.

 If the service request was initiated for CS fallback for emergency call and a CS fallback cancellation request was not received, the UE may attempt to select GERAN or UTRAN radio access technology. It then proceeds with appropriate MM and CC specific procedures. The EMM sublayer shall not indicate the abort of the service request procedure to the MM sublayer.

 If the service request was initiated for 1xCS fallback, the UE shall select cdma2000® 1x radio access technology. The UE then proceeds with appropriate cdma2000® 1x CS procedures.

 If the service request was initiated for 1xCS fallback for emergency call, the UE may select cdma2000® 1x radio access technology. The UE then proceeds with appropriate cdma2000® 1x CS procedures.

 If the service request was initiated due to a request from the SMS entity to send an SMS and timer T3246 is not running, the UE, if operating in CS/PS mode 1 of operation, may select GERAN or UTRAN radio access technology. It then proceeds with the appropriate MM procedure.

NOTE 6: If the UE disables the E-UTRA capability, then subsequent mobile terminating calls could fail.

la) "Extended wait time CP data" from the lower layers

 The UE shall abort the service request procedure for transfer of user data via the control plane, enter state EMM-REGISTERED, and stop timer T3417 if still running.

 If the UE is operating in NB-S1 mode and supports the timer T3448, the UE shall start the timer T3448 with the "Extended wait time CP data" value. If the UE is operating in NB-S1 mode and does not support the timer T3448, the UE shall start the timer T3346 with the "Extended wait time CP data" value.

 In other cases the UE shall ignore the "Extended wait time CP data".

 The UE stays in the current serving cell and applies normal cell reselection process. The service request procedure for transfer of user data via the control plane is started, if still necessary, when the timer T3448 expires or is stopped.

m) Timer T3346 is running

 The UE shall not start the service request procedure unless:

- the UE receives a paging;

- the UE is a UE configured to use AC11 – 15 in selected PLMN;

- the UE has a PDN connection for emergency bearer services established or is establishing a PDN connection for emergency bearer services;

- the UE is requested by the upper layer for a CS fallback for emergency call or a 1xCS fallback for emergency call;

- the UE has a PDN connection established without the NAS signalling low priority indication or is establishing a PDN connection without the NAS signalling low priority indication and if the timer T3346 was started due to rejection of a NAS request message (e.g. ATTACH REQUEST, TRACKING AREA UPDATE REQUEST, EXTENDED SERVICE REQUEST or CONTROL PLANE SERVICE REQUEST) which contained the low priority indicator set to "MS is configured for NAS signalling low priority"; or

- the UE in NB-S1 mode is requested by the upper layer to transmit user data related to an exceptional event and:

- the UE is allowed to use exception data reporting (see the ExceptionDataReportingAllowed leaf of the NAS configuration MO in 3GPP TS 24.368 [15A] or the USIM file EFNASCONFIG in 3GPP TS 31.102 [17]); and

- timer T3346 was not started when NAS signalling connection was established with RRC establishment cause set to "MO exception data".

 If the UE is in EMM-IDLE mode, the UE stays in the current serving cell and applies normal cell reselection process. The service request procedure is started, if still necessary, when timer T3346 expires or is stopped.

 Upon upper layer's request for a mobile originated CS fallback which is not for emergency call, the UE in CS/PS mode 1 of operation shall attempt to select GERAN or UTRAN radio access technology. If the UE finds a suitable GERAN or UTRAN cell, it then proceeds with the appropriate MM and CC specific procedures and the EMM sublayer shall not indicate the abort of the service request procedure to the MM sublayer. Otherwise the EMM sublayer shall indicate the abort of the service request procedure to the MM sublayer.

NOTE 7: If the UE disables the E-UTRA capability, then subsequent mobile terminating calls could fail.

 Upon upper layer's request for a CS fallback for emergency call, the UE may select GERAN or UTRAN radio access technology. It then proceeds with appropriate MM and CC specific procedures. The EMM sublayer shall not indicate the abort of the service request procedure to the MM sublayer.

 Upon a request from the SMS entity to send an SMS and timer T3246 is not running, the UE, if operating in CS/PS mode 1 of operation, may select GERAN or UTRAN radio access technology. It then proceeds with the appropriate MM procedure.

NOTE 8: If the UE disables the E-UTRA capability, then subsequent mobile terminating calls could fail.

 Upon upper layer's request for a mobile originated 1x CS fallback which is not for emergency call, the UE shall select cdma2000® 1x radio access technology. The UE then proceeds with appropriate cdma2000® 1x CS call procedures.

 Upon upper layer's request for a 1xCS fallback for emergency call, the UE may select cdma2000® 1x radio access technology. The UE then proceeds with appropriate cdma2000® 1x CS call procedures.

 If the service request procedure was triggered for an MO MMTEL voice call is started, a notification that the service request procedure was not initiated due to congestion shall be provided to the upper layers.

NOTE 9: This can result in the upper layers requesting establishment of the originating voice call on an alternative manner e.g. requesting establishment of a CS voice call (see 3GPP TS 24.173 [13E]).

n) Failure to find a suitable GERAN or UTRAN cell, after release of the NAS signalling connection without "Extended wait time" and with redirection indication received from lower layers when the service request was initiated for CS fallback

 The EMM sublayer shall indicate the abort of the service request procedure to the MM sublayer, and the UE shall also set the EPS update status to EU2 NOT UPDATED and enter the state EMM-REGISTERED.ATTEMPTING-TO-UPDATE.

 The UE shall abort the service request procedure, stop timer T3417ext or T3417ext-mt and locally release any resources allocated for the service request procedure.

o) Timer T3448 is running

 The UE in EMM-IDLE mode shall not initiate the service request procedure for transport of user data via the control plane unless:

- the UE is a UE configured to use AC11 – 15 in selected PLMN;

- the UE which is only using EPS services with control plane CIoT EPS optimization received a paging; or

- the UE in NB-S1 mode is requested by the upper layer to transmit user data related to an exceptional event and the UE is allowed to use exception data reporting (see the ExceptionDataReportingAllowed leaf of the NAS configuration MO in 3GPP TS 24.368 [15A] or the USIM file EFNASCONFIG in 3GPP TS 31.102 [17]).

 The UE stays in the current serving cell and applies the normal cell reselection process.

p) Timer T3447 is running

 The UE shall not start any service request procedure unless:

- the UE receives a paging;

- the UE is a UE configured to use AC11 – 15 in selected PLMN;

- the UE has a PDN connection for emergency bearer services established or is establishing a PDN connection for emergency bearer services.

 The UE stays in the current serving cell and applies the normal cell reselection process. The service request procedure is started, if still necessary, when timer T3447 expires.

\*\*\*\*\* Next change \*\*\*\*\*

##### 5.6.2.2.1.2 Abnormal cases on the network side

The following abnormal case can be identified:

a) ATTACH REQUEST message received when paging procedure is ongoing.

 If an integrity-protected ATTACH REQUEST message is received from the UE and successfully integrity checked by the network, the network shall abort the paging procedure. If the ATTACH REQUEST message received is not integrity protected, or the integrity check is unsuccessful, the paging procedure shall be progressed. The paging procedure shall be aborted when the EPS authentication procedure performed during attach procedure is completed successfully.

\*\*\*\*\* Next change \*\*\*\*\*

##### 5.6.2.3.3 Abnormal cases on the network side

The following abnormal case can be identified:

a) Void

b) ATTACH REQUEST message received when paging procedure is ongoing.

 If an integrity-protected ATTACH REQUEST message is received from the UE and successfully integrity checked by the network, the network shall abort the paging procedure. If the ATTACH REQUEST message received is not integrity protected, or the integrity check is unsuccessful, the paging procedure shall be progressed. The paging procedure shall be aborted when the EPS authentication procedure performed during attach procedure is completed successfully.

c) TRACKING AREA UPDATE REQUEST message received in response to a CS SERVICE NOTIFICATION message

 If the network receives a TRACKING AREA UPDATE REQUEST message in response to a CS SERVICE NOTIFICATION message, the network shall progress the tracking area updating procedure.

NOTE: After completion of the tracking area updating procedure the UE can accept or reject the CS fallback by sending an EXTENDED SERVICE REQUEST message.

d) DETACH REQUEST message received in response to a CS SERVICE NOTIFICATION message

 If the network receives a DETACH REQUEST message with detach type "IMSI detach" or "combined EPS/IMSI detach" in response to a CS SERVICE NOTIFICATION message, the network shall progress the detach procedure.

\*\*\*\*\* Next change \*\*\*\*\*

#### 5.6.3.4 Abnormal cases in the UE

The following abnormal case can be identified:

a) Timer T3346 is running

 The UE shall not send an UPLINK NAS TRANSPORT message unless:

- the UE is a UE configured to use AC11 – 15 in selected PLMN;

- the UE has a PDN connection for emergency bearer services established; or

- the UE is configured for dual priority and has a PDN connection established without low access priority but the timer T3346 was started in response to NAS signalling request with low access priority.

- The UPLINK NAS TRANSPORT message can be sent, if still necessary, when timer T3346 expires or is stopped.

b) Timer T3447 is running

 The UE shall not send an UPLINK NAS TRANSPORT message when the UE is in EMM-CONNECTED mode after the UE attached without PDN connection, unless:

- the UE is a UE configured to use AC11 – 15 in the selected PLMN; or

- a network initiated signalling message has been received.

 The UPLINK NAS TRANSPORT message can be sent, if still necessary, when timer T3447 expires.

\*\*\*\*\* Next change \*\*\*\*\*

#### 5.6.4.4 Abnormal cases in the UE

The following abnormal case can be identified:

a) Timer T3346 is running

 The UE shall not send an UPLINK GENERIC NAS TRANSPORT message unless:

 the UE is a UE configured to use AC11 – 15 in selected PLMN;

- the UE has a PDN connection for emergency bearer services established; or

 the UE is configured for dual priority and has a PDN connection established without low access priority but the timer T3346 was started in response to NAS signalling request with low access priority.

The UPLINK GENERIC NAS TRANSPORT message can be sent, if still necessary, when timer T3346 expires or is stopped.

b) Timer T3447 is running

 The UE shall not send an UPLINK GENERIC NAS TRANSPORT message when the UE is in EMM-CONNECTED mode, unless:

- the UE is a UE configured to use AC11 – 15 in the selected PLMN;

- the UE has a PDN connection for emergency bearer services established; or

- a network initiated signalling message has been received.

The UPLINK GENERIC NAS TRANSPORT message can be sent, if still necessary, when timer T3447 expires.

\*\*\*\*\* Next change \*\*\*\*\*

### 6.2.2 IP address allocation via NAS signalling

The UE shall set the PDN type IE in the PDN CONNECTIVITY REQUEST message, based on its IP stack configuration if it requests IP connectivity (e.g. the per APN settings specified in 3GPP TS 23.401 [10]) as follows:

a)- A UE, which is IPv6 and IPv4 capable and

- has not been allocated an IP address for this APN, shall set the PDN type IE to IPv4v6.

- has been allocated an IPv4 address for this APN and received the ESM cause #52 "single address bearers only allowed", and is requesting an IPv6 address, shall set the PDN type IE to IPv6.

- has been allocated an IPv6 address for this APN and received the ESM cause #52 "single address bearers only allowed", and is requesting an IPv4 address, shall set the PDN type IE to IPv4.

b) A UE, which is only IPv4 capable, shall set the PDN type IE to IPv4.

c) A UE, which is only IPv6 capable, shall set the PDN type IE to IPv6.

d) When the IP version capability of the UE is unknown in the UE (as in the case when the MT and TE are separated and the capability of the TE is not known in the MT), the UE shall set the PDN type IE to IPv4v6.

If the UE wants to use DHCPv4 for IPv4 address assignment, it shall indicate that to the network within the Protocol Configuration Options IE in the PDN CONNECTIVITY REQUEST.

If the UE wants to get PDN connectivity for non-IP, the UE shall set the PDN type IE in the PDN CONNECTIVITY REQUEST message to "non IP". If the UE wants to get PDN connectivity for Ethernet, the UE shall set the PDN type IE in the PDN CONNECTIVITY REQUEST message to "Ethernet".

On receipt of the PDN CONNECTIVITY REQUEST message sent by the UE, the network when allocating an IP address shall take into account the PDN type IE, the operator policies of the home and visited network, and the user's subscription data and:

- if the UE requests for PDN type IPv4v6, but the subscription is limited to IPv4 only or IPv6 only for the requested APN, the network shall override the PDN type requested by the UE to be limited to a single address PDN type (IPv4 or IPv6). In the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message sent to the UE, the network shall set the PDN type value to either "IPv4" or "IPv6" and the ESM cause value to #50 "PDN type IPv4 only allowed", or #51 "PDN type IPv6 only allowed", respectively. The UE shall not subsequently initiate another UE requested PDN connectivity procedure to the same APN to obtain a PDN type different from the one allowed by the network until:

a) all EPS bearer contexts to the given APN are deactivated at the UE as a result of:

i) EPS bearer context synchronization during tracking area updating or service request procedure;

ii) an EPS bearer context deactivation procedure initiated by the network;

iii) a local EPS bearer context deactivation without NAS signalling as specified in subclause 6.4.4.6;

iv) a detach procedure; or

v) a tracking area updating procedure or service request procedure that is rejected with a cause which results in the UE entering state EMM-DEREGISTERED;

b) the PDN type which is used to access to the APN is changed;

NOTE 1: Request to send another PDN CONNECTIVITY REQUEST message with a specific PDN type has to come from upper layers.

- if the UE requests PDN type IPv4v6, but the PDN GW configuration dictates the use of IPv4 addressing only or IPv6 addressing only for this APN, the network shall override the PDN type requested by the UE to limit it to a single address PDN type (IPv4 or IPv6). In the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message sent to the UE, the network shall set the PDN type value to either "IPv4" or "IPv6" and the ESM cause value to #50 "PDN type IPv4 only allowed", or #51 "PDN type IPv6 only allowed", respectively. The UE shall not subsequently initiate another UE requested PDN connectivity procedure to the same APN to obtain a PDN type different from the one allowed by the network until:

a) all EPS bearer contexts to the given APN are deactivated at the UE and the network as a result of:

i) EPS bearer context synchronization during tracking area updating or service request procedure;

ii) an EPS bearer context deactivation procedure initiated by the network;

iii) a local EPS bearer context deactivation without NAS signalling as specified in subclause 6.4.4.6;

iv) a detach procedure; or

v) a tracking area updating procedure or service request procedure that is rejected with a cause which results in the UE entering state EMM-DEREGISTERED;

b) the PDN type which is used to access to the APN is changed;

NOTE 2: Request to send another PDN CONNECTIVITY REQUEST message with a specific PDN type has to come from upper layers.

- if the UE requests PDN type IPv4v6, but the operator uses single addressing per bearer, e.g. due to interworking with nodes of earlier releases, the network shall override the PDN type requested by the UE to a single IP version only. In the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message sent to the UE, the network shall set the PDN type value to either "IPv4" or "IPv6" and the ESM cause value to #52 "single address bearers only allowed". The UE should subsequently request another PDN connection for the other IP version using the UE requested PDN connectivity procedure to the same APN with a single address PDN type (IPv4 or IPv6) other than the one already activated;

NOTE 3: If the MT and TE are separated, the UE might not be able to use ESM cause #52 "single address bearers only allowed" as a trigger for activating a second single-IP-stack EPS bearer context.

- if the network sets the PDN type to IPv4 or IPv4v6, the network shall include an IPv4 address in the PDN address information. In this case, if the IPv4 address is to be configured using DHCPv4, the network shall set the IPv4 address to 0.0.0.0; and

- if the network sets the PDN type to IPv6 or IPv4v6, the network shall include the interface identifier that the UE shall use for the link local address in the PDN address information.

The network shall include the PDN type and the PDN address information within the PDN address IE in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message sent to the UE.

\*\*\*\*\* Next change \*\*\*\*\*

### 6.3.3 Abnormal cases in the UE

The following abnormal case can be identified:

a) ESM uplink message transmission failure indication by lower layers

 Unless the procedure descriptions in subclause 6.6 specify a different behaviour, the following applies:

 If lower layers indicate a TAI change, but the current TAI is not in the TAI list, the ESM procedure shall be aborted and re-initiated after successfully performing a tracking area updating procedure.

 If lower layers indicate a TAI change, but the current TAI is still part of the TAI list, it is up to the UE implementation how the ESM procedure is re-initiated.

 If lower layers indicate the TAI has not changed, it is up to the UE implementation how the ESM procedure is re-initiated.

NOTE 1: The ESM procedure can typically be re-initiated using a retransmission mechanism of the uplink message (the one that has previously failed to be transmitted) with new sequence number and message authentication code information thus avoiding to restart the whole procedure.

The case a) above does not apply to the ESM INFORMATION RESPONSE message.

NOTE 2: The ESM INFORMATION RESPONSE message cannot be subjected to a transmission failure by lower layers due to handover as no handover message can be accepted by the UE prior to reception of the ATTACH ACCEPT message (see 3GPP TS 36.331 [22]).

b) Transmission failure of the ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT message indication from EMM sublayer when the UE received any ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST messages during the attach procedure

 It is up to the UE implementation how the dedicated EPS bearer context activation procedure is re-initiated.

NOTE 3: The ESM procedure can typically be re-initiated using a retransmission mechanism of the ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message or ACTIVATE DEDICATED EPS BEARER CONTEXT REJECT message with new sequence number and message authentication code information thus avoiding to restart the whole procedure.

\*\*\*\*\* Next change \*\*\*\*\*

#### 6.4.1.6 Abnormal cases on the network side

The following abnormal cases can be identified:

a) Expiry of timer T3485:

 On the first expiry of the timer T3485, the MME shall resend the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST and shall reset and restart timer T3485. This retransmission is repeated four times, i.e. on the fifth expiry of timer T3485, the MME shall release possibly allocated resources for this activation and shall abort the procedure.

b) Lower layer indicates that the HeNB rejected the establishment of the default bearer (see 3GPP TS 36.413 [23]) for a LIPA PDN connection or SIPTO at the local network PDN connection due to a triggered handover:

 The MME shall enter the state BEARER CONTEXT INACTIVE, stop timer T3485 and reject the PDN connectivity request procedure including the ESM cause value #34 "service option temporarily out of order" in the PDN CONNECTIVITY REJECT message. The MME shall release possibly allocated resources for this activation.

\*\*\*\*\* Next change \*\*\*\*\*

##### 6.5.3.4.1 General

If the bearer resource allocation requested cannot be accepted by the network, the MME shall send a BEARER RESOURCE ALLOCATION REJECT message to the UE. The message shall contain the PTI and an ESM cause value indicating the reason for rejecting the UE requested bearer resource allocation.

The ESM cause value typically indicates one of the following:

#26: insufficient resources;

#30: request rejected by Serving GW or PDN GW;

#31: request rejected, unspecified;

#32: service option not supported;

#33: requested service option not subscribed;

#34: service option temporarily out of order;

#35: PTI already in use;

#37: EPS QoS not accepted;

#41: semantic error in the TFT operation;

#42: syntactical error in the TFT operation;

#43: invalid EPS bearer identity;

#44: semantic error(s) in packet filter(s);

#45: syntactical error(s) in packet filter(s);

#56: collision with network initiated request;

#59: unsupported QCI value;

#60: bearer handling not supported;

#65: maximum number of EPS bearers reached; or

#95 – 111: protocol errors.

If the bearer resource allocation requested is for an established LIPA PDN connection or SIPTO at the local network PDN connection, then the network shall reply with a BEARER RESOURCE ALLOCATION REJECT message with ESM cause #60 "bearer handling not supported".

If the requested new TFT is not available, then the BEARER RESOURCE ALLOCATION REJECT message shall be sent.

The TFT in the request message is checked by the network for different types of TFT IE errors as follows:

a) Semantic errors in TFT operations:

1) When the *TFT operation* is an operation other than "Create a new TFT".

 The network shall reject the allocation request with ESM cause #41 "semantic error in the TFT operation".

b) Syntactical errors in TFT operations:

1) When the *TFT operation* = "Create a new TFT" and the packet filter list in the TFT IE is empty.

2) When there are other types of syntactical errors in the coding of the TFT IE, such as a mismatch between the number of packet filters subfield, and the number of packet filters in the packet filter list.

 The network shall reject the allocation request with ESM cause #42 "syntactical error in the TFT operation".

c) Semantic errors in packet filters:

1) When a packet filter consists of conflicting packet filter components which would render the packet filter ineffective, i.e. no IP packet will ever fit this packet filter. How the network determines a semantic error in a packet filter is outside the scope of the present document.

2) When the resulting TFT does not contain any packet filter which applicable for the uplink direction.

 The network shall reject the allocation request with ESM cause #44 "semantic errors in packet filter(s)".

d) Syntactical errors in packet filters:

1) When the *TFT operation* = "Create a new TFT" and two or more packet filters in the resultant TFT would have identical packet filter identifiers.

2) When the *TFT operation* = "Create a new TFT" and two or more packet filters among all TFTs associated with the PDN connection would have identical packet filter precedence values.

3) When there are other types of syntactical errors in the coding of packet filters, such as the use of a reserved value for a packet filter component identifier.

 In case 2, if the old packet filters do not belong to the default EPS bearer context, the network shall not diagnose an error, shall further process the new request and, if it was processed successfully, shall delete the old packet filters which have identical filter precedence values. Furthermore, the network shall perform an EPS bearer context deactivation request procedure to deactivate the dedicated EPS bearer context(s) for which it has deleted the packet filters.

 In case 2, if one or more old packet filters belong to the default EPS bearer context, the network shall release the relevant PDN connection using the EPS bearer context deactivation procedure. If it is the last remaining PDN connection and EMM-REGISTERED without PDN connection is not supported by the UE or the MME, the network shall detach the UE using detach type "re-attach required".

 Otherwise the network shall reject the allocation request with ESM cause #45 "syntactical errors in packet filter(s)".

The network may include a Back-off timer value IE in the BEARER RESOURCE ALLOCATION REJECT message.

If the Back-off timer value IE is included and the ESM cause value is different from #26 "insufficient resources" and #65 "maximum number of EPS bearers reached", the network may include the Re-attempt indicator IE to indicate:

- whether the UE is allowed to attempt a secondary PDP context activation procedure in the PLMN for the same APN in A/Gb or Iu mode or a PDU session modification procedure in the PLMN for the same APN in N1 mode; and

- whether another attempt in A/Gb and Iu mode, in S1 mode or in N1 mode is allowed in an equivalent PLMN.

Upon receipt of a BEARER RESOURCE ALLOCATION REJECT message, the UE shall stop the timer T3480, release the traffic flow aggregate description associated to the PTI value, and enter the state PROCEDURE TRANSACTION INACTIVE.

\*\*\*\*\* Next change \*\*\*\*\*

#### 6.5.4.2 UE requested bearer resource modification procedure initiation

In order to request the modification of bearer resources for one traffic flow aggregate, the UE shall send a BEARER RESOURCE MODIFICATION REQUEST message to the MME, start timer T3481 and enter the state PROCEDURE TRANSACTION PENDING (see example in figure 6.5.4.2.1).

The UE shall include the EPS bearer identity of the EPS bearer associated with the traffic flow aggregate in the EPS bearer identity for packet filter IE.

To request a change of the GBR without changing the packet filter(s), the UE shall set the TFT operation code in the Traffic flow aggregate IE to "no TFT operation" and include the packet filter identifier(s) to which the change of the GBR applies in the Packet filter identifier parameter in the parameters list. The UE shall indicate the new GBR requested for the EPS bearer context in the Required traffic flow QoS IE.

To request a modification of a traffic flow aggregate, the UE shall set the TFT operation code in the Traffic flow aggregate IE to "Replace packet filters in existing TFT" or "Add packet filters to existing TFT". If the TFT operation code is set to "Add packet filters to existing TFT", the UE shall include in the parameter list one existing packet filter identifier to which the newly added packet filter(s) is linked. If the EPS bearer is a GBR bearer and the UE also wishes to request a change of GBR, the UE shall indicate the new GBR requested for the EPS bearer context in the Required traffic flow QoS IE.

To request a release of bearer resources, the UE shall set the TFT operation code in the Traffic flow aggregate IE to "Delete packet filters from existing TFT". If the EPS bearer is a GBR bearer and the UE does not request the release of all bearer resources, the UE shall indicate the new GBR requested for the EPS bearer context in the Required traffic flow QoS IE.

To request re-negotiation of header compression configuration associated to an EPS bearer context, the UE shall include the Header compression configuration IE in the BEARER RESOURCE MODIFICATION REQUEST message if the network indicated "Control plane CIoT EPS optimization supported" and "Header compression for control plane CIoT EPS optimization supported" in the EPS network feature support IE.

After an inter-system change from N1 mode to S1 mode, if:

a) the UE is operating in single-registration mode and has received the interworking without N26 interface indicator set to "interworking without N26 interface not supported" from the network;

b) the PDN type value of the PDN type IE is set to "IPv4", "IPv6" or "IPv4v6";

c) the UE indicates "Control plane CIoT EPS optimization supported" and "Header compression for control plane CIoT EPS optimization supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message; and

d) the network indicates "Control plane CIoT EPS optimization supported" and "Header compression for control plane CIoT EPS optimization supported" in the EPS network feature support IE of the TRACKING AREA UPDATE ACCEPT message;

the UE shall send a BEARER RESOURCE MODIFICATION REQUEST message to the MME and include the Header compression configuration IE to negotiate the header compression configuration.

To indicate a change of 3GPP PS data off UE status associated to a PDN connection, the UE shall include the protocol configuration options IE in the BEARER RESOURCE MODIFICATION REQUEST message and set the 3GPP PS data off UE status only if:

- the network included the 3GPP PS data off support indication in the protocol configuration options IE in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message when the PDN connection was established; or

- the PDU session was established when in N1 mode.

The UE behaves as described in subclause 6.3.10.

If the UE requests the modification of a traffic flow aggregate, which is assigned to a dedicated EPS bearer context, it shall ensure that at least one packet filter applicable for the uplink direction remains among the packet filters created on request from the UE in that TFT, or no own packet filters.

NOTE: If the UE requests the release of all bearer resources of a GBR bearer and includes a Required traffic flow QoS IE in the BEARER RESOURCE MODIFICATION REQUEST message, the network ignores the Required traffic flow QoS IE.

If the UE includes the Required traffic flow QoS IE, the UE shall set the QCI to the current QCI value of the EPS bearer context.

If the UE requests the release of bearer resources, the ESM cause value typically indicates one of the following:

#36: regular deactivation.



Figure 6.5.4.2.1: UE requested bearer resource modification procedure

For the NBIFOM procedures as defined in 3GPP TS 24.161 [36], the UE may send a BEARER RESOURCE MODIFICATION REQUEST message to the MME.

It is possible that the traffic flow aggregate IE is not needed in the following procedures:

- re-negotiation of header compression configuration associated to an EPS bearer context;

- indicating a change of 3GPP PS data off UE status associated to a PDN connection; or

- NBIFOM procedures.

If the traffic flow aggregate IE is not needed, the UE shall set:

- the length indicator of the Traffic flow aggregate IE to the value 1;

- the TFT operation code to "000";

- the E bit to zero; and

- the number of packet filters to zero.

\*\*\*\*\* Next change \*\*\*\*\*

##### 6.6.1.2.2 ESM information request initiated by the network

The network initiates the ESM information request procedure by sending an ESM INFORMATION REQUEST message to the UE, starting timer T3489 and entering the state PROCEDURE TRANSACTION PENDING (see example in figure 6.6.1.2.2.1). This message shall be sent only after the security context has been setup, and if the ESM information transfer flag has been set in the PDN CONNECTIVITY REQUEST message. The MME shall set the EPS bearer identity of the ESM INFORMATION REQUEST message to the value "no EPS bearer identity assigned" and include the PTI from the associated PDN CONNECTIVITY REQUEST message.



Figure 6.6.1.2.2.1: ESM information request procedure

\*\*\*\*\* Next change \*\*\*\*\*

#### 6.6.3.3 Remote UE Report completion by the network

Upon receipt of the REMOTE UE REPORT message, the MME shall send a REMOTE UE REPORT RESPONSE message to the UE. The MME shall include the PTI from the REMOTE UE REPORT message.

\*\*\*\*\* Next change \*\*\*\*\*

#### 6.6.4.4 Abnormal cases in the UE

The following abnormal case can be identified:

a) T3396 is running

 The UE shall not send an ESM DATA TRANSPORT message unless

- the UE is a UE configured to use AC11 – 15 in selected PLMN; or

- the ESM DATA TRANSPORT message is used for an exception data reporting and the UE is allowed to use exception data reporting (see the ExceptionDataReportingAllowed leaf of the NAS configuration MO in 3GPP TS 24.368 [15A] or the USIM file EFNASCONFIG in 3GPP TS 31.102 [17]).

 The ESM DATA TRANSPORT message can be sent, if still necessary, when timer T3396 expires or is stopped.

b) Transmission failure of the ESM DATA TRANSPORT message indication from lower layers

 If lower layers indicate a TAI change and the current TAI is not in the TAI list, the transport of user data via the control plane procedure shall be aborted and re-initiated after successfully performing a tracking area updating procedure if the control plane CIoT EPS optimisation is still used and the user data exists. The "signalling active" flag shall be set in the TRACKING AREA UPDATE REQUEST message.

 If lower layers indicate a TAI change, but the current TAI is still part of the TAI list, or the TAI has not changed, the transport of user data via the control plane procedure shall be re-initiated immediately if the user data still exists by including the ESM DATA TRANSPORT message in a CONTROL PLANE SERVICE REQUEST message.

NOTE: How the ESM sublayer handles the retransmission of user data via the control plane is up to the UE implementation.

c) NAS MAC calculation indication from lower layers

 If lower layers indicate to calculate an NAS MAC, the UE shall calculate an NAS MAC as specified in 3GPP TS 33.401 [19] and then provide the calculated NAS MAC and 5 least significant bits of the uplink NAS COUNT used to calculate the NAS MAC to lower layers (see 3GPP TS 36.331 [22]). The UE shall increase the uplink NAS COUNT by one after the calculation of the NAS MAC.

\*\*\*\*\* Next change \*\*\*\*\*

#### 8.2.26.22 Network policy

This IE is included if the network needs to indicate network policy information to the UE. If this IE is not included, then the UE shall interpret this as a receipt of an information element with all bits of the value part coded as zero.

\*\*\*\*\* Next change \*\*\*\*\*

## 9.6 Sequence number

This IE includes the NAS message sequence number (SN) which consists of the eight least significant bits of the NAS COUNT for a security protected NAS message. The usage of SN is specified in subclause 4.4.3.

\*\*\*\*\* Next change \*\*\*\*\*

#### 9.9.3.12A EPS network feature support

The purpose of the EPS network feature support information element is to indicate whether certain features are supported by the network.

The EPS network feature support information element is coded as shown in figure 9.9.3.12A.1 and table 9.9.3.12A.1.

The EPS network feature support is a type 4 information element with a minimum length of 3 octets and a maximum length of 4 octets.

If the network does not include octet 4 as defined below in the present version of the protocol, then the UE shall interpret this as a receipt of an information element with all bits of octet 4 coded as zero.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| EPS network feature support IEI | octet 1 |
| Length of EPS network feature support contents | octet 2 |
| CP CIoT | ERw/oPDN | ESRPS | CS-LCS | EPC-LCS | EMC BS | IMS VoPS | octet 3 |
| 15 bearers | IWKN26 | RestrictDCNR | RestrictEC | ePCO | HC-CP CIoT | S1-U data | UP CIoT | octet 4\* |

Figure 9.9.3.12A.1: EPS network feature support information element

Table 9.9.3.12A.1: EPS network feature support information element

|  |
| --- |
| IMS voice over PS session indicator (IMS VoPS) (octet 3, bit 1) |
|  |
| Bit |
| 1 |  |  |  |  |
| 0 |  |  |  | IMS voice over PS session in S1 mode not supported |
| 1 |  |  |  | IMS voice over PS session in S1 mode supported |
|  |
| Emergency bearer services indicator (EMC BS) (octet 3, bit 2) |
|  |
| Bit |
| 2 |  |  |  |  |
| 0 |  |  |  | emergency bearer services in S1 mode not supported |
| 1 |  |  |  | emergency bearer services in S1 mode supported |
|  |
| Location services indicator in EPC (EPC-LCS) (octet 3, bit 3) |
|  |
| Bit |
| 3 |  |  |  |  |
| 0 |  |  |  | location services via EPC not supported |
| 1 |  |  |  | location services via EPC supported |
|  |
| Location services indicator in CS (CS-LCS) (octet 3, bit 4 to 5) |
|  |
| Bit |
| 5 | 4 |  |  |  |
| 0 | 0 |  |  | no information about support of location services via CS domain is available |
| 0 | 1 |  |  | location services via CS domain supported |
| 1 | 0 |  |  | location services via CS domain not supported |
| 1 | 1 |  |  | reserved |
|  |
| Support of EXTENDED SERVICE REQUEST for packet services (ESRPS)(octet 3, bit 6) |
|  |
| Bit |
| 6 |  |  |  |  |
| 0 |  |  |  | network does not support use of EXTENDED SERVICE REQUEST to request for packet services |
| 1 |  |  |  | network supports use of EXTENDED SERVICE REQUEST to request for packet services |
|  |
| EMM REGISTERED without PDN connectivity (ERw/oPDN)(octet 3, bit 7) |
| This bit indicates the capability for EMM-REGISTERED without PDN connection |
| Bit |
| 7 |  |  |  |  |
| 0 |  |  |  | EMM-REGISTERED without PDN connection not supported |
| 1 |  |  |  | EMM-REGISTERED without PDN connection supported |
|  |
| Control plane CIoT EPS optimization (CP CIoT)(octet 3, bit 8) |
| This bit indicates the capability for control plane CIoT EPS optimization |
| Bit |
| **8** |
| 0 |  |  |  | Control plane CIoT EPS optimization not supported |
| 1 |  |  |  | Control plane CIoT EPS optimization supported |
|  |
| User plane CIoT EPS optimization (UP CIoT)(octet 4, bit 1) |
| This bit indicates the capability for user plane CIoT EPS optimization |
| Bit |
| **1** |
| 0 |  |  |  | User plane CIoT EPS optimization not supported |
| 1 |  |  |  | User plane CIoT EPS optimization supported |
|  |
| S1-u data transfer (S1-U data)(octet 4, bit 2) |
| This bit indicates the capability for S1-u data transfer. This bit shall be considered only if the Control plane CIoT EPS optimization (CP CIoT) bit (octet 3, bit 8) is set to 1. If the Control plane CIoT EPS optimization (CP CIoT) bit (octet 3, bit 8) is set to 0, the UE shall assume S1-u data transfer is supported. |
| Bit |
| **2** |
| 0 |  |  |  | S1-u data transfer not supported |
| 1 |  |  |  | S1-u data transfer supported |
|  |
| Header compression for control plane CIoT EPS optimization (HC-CP CIoT)(octet 4, bit 3) |
| This bit indicates the capability for header compression for control plane CIoT EPS optimization |
| Bit |
| **3** |
| 0 |  |  |  | Header compression for control plane CIoT EPS optimization not supported |
| 1 |  |  |  | Header compression for control plane CIoT EPS optimization supported |
|  |
| Extended protocol configuration options (ePCO) (octet 4, bit 4)This bit indicates the support of the extended protocol configuration options IE. |
| Bit |
| **4** |
| 0 |  |  |  | Extended protocol configuration options IE not supported |
| 1 |  |  |  | Extended protocol configuration options IE supported |
|  |
| Restriction on enhanced coverage (RestrictEC) (octet 4, bit 5)This bit indicates if the use of enhanced coverage is restricted or not. |
| Bit |
| **5** |
| 0 |  |  |  | Use of enhanced coverage is not restricted |
| 1 |  |  |  | Use of enhanced coverage is restricted |
| Restriction on the use of dual connectivity with NR (RestrictDCNR) (octet 4, bit 6)This bit indicates if the use of dual connectivity with NR is restricted or not. |
| Bit |
| **6** |
| 0 |  |  |  | Use of dual connectivity with NR is not restricted |
| 1 |  |  |  | Use of dual connectivity with NR is restricted |
| Interworking without N26 interface indicator (IWK N26) (octet 4, bit 7)This bit indicates whether interworking without N26 interface is supported. |
| Bit |
| **7** |
| 0 |  |  |  | Interworking without N26 interface not supported |
| 1 |  |  |  | Interworking without N26 interface supported |
| Signalling for a maximum number of 15 EPS bearer contexts (15 bearers) (octet 4, bit 8)This bit indicates the support of signalling for a maximum number of 15 EPS bearer contexts. |
| Bit |
| **8** |
| 0 |  |  |  | Signalling for a maximum number of 15 EPS bearer contexts not supported |
| 1 |  |  |  | Signalling for a maximum number of 15 EPS bearer contexts supported |
|  |

\*\*\*\*\* Next change \*\*\*\*\*

#### 9.9.3.22 NAS message container

This information element is used to encapsulate the SMS messages transferred between the UE and the network. The NAS message container information element is coded as shown in figure 9.9.3.22.1 and table 9.9.3.22.1.

The NAS message container is a type 4 information element with a minimum length of 4 octets and a maximum length of 253 octets.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| NAS message container IEI | octet 1 |
| Length of NAS message container contents | octet 2 |
|  | octet 3 |
| NAS message container contents |  |
|  | octet n |

Figure 9.9.3.22.1: NAS message container information element

Table 9.9.3.22.1: NAS message container information element

|  |
| --- |
| NAS message container contents (octet 3 to octet n) |
|  |
| This IE can contain an SMS message (i.e. CP-DATA, CP-ACK or CP-ERROR) as defined in subclause 7.2 in 3GPP TS 24.011 [13A].  |
|  |

\*\*\*\*\* Next change \*\*\*\*\*

#### 9.9.3.34 UE network capability

The purpose of the UE network capability information element is to provide the network with information concerning aspects of the UE related to EPS or interworking with GPRS and 5GS. The contents might affect the manner in which the network handles the operation of the UE. The UE network capability information indicates general UE characteristics and it shall therefore, except for fields explicitly indicated, be independent of the frequency band of the channel it is sent on.

The UE network capability information element is coded as shown in figure 9.9.3.34.1 and table 9.9.3.34.1.

The UE network capability is a type 4 information element with a minimum length of 4 octets and a maximum length of 15 octets.

NOTE: The requirements for the support of UMTS security algorithms in the UE are specified in 3GPP TS 33.102 [18], and the requirements for the support of EPS security algorithms in 3GPP TS 33.401 [19].

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| UE network capability IEI | octet 1 |
| Length of UE network capability contents | octet 2 |
| EEA0 | 128-EEA1 | 128-EEA2 | 128-EEA3 | EEA4 | EEA5 | EEA6 | EEA7 | octet 3 |
| EIA0 | 128-EIA1 | 128-EIA2 | 128-EIA3 | EIA4 | EIA5 | EIA6 | EIA7 | octet 4 |
| UEA0 | UEA1 | UEA2 | UEA3 | UEA4 | UEA5 | UEA6 | UEA7 | octet 5\* |
| UCS2 | UIA1 | UIA2 | UIA3 | UIA4 | UIA5 | UIA6 | UIA7 | octet 6\* |
| ProSe-dd | ProSe | H.245-ASH | ACC-CSFB | LPP | LCS | 1xSRVCC | NF | octet 7\* |
| ePCO | HC-CP CIoT | ERw/oPDN | S1-U data | UP CIoT | CP CIoT | Prose-relay | ProSe-dc | octet 8\* |
| 15 bearers | SGC | N1mode | DCNR | CP backoff | RestrictEC | V2X PC5 | multipleDRB | octet 9\* |
| 0Spare | 0Spare | 0Spare | V2X NR-PC5 | UP-MT-EDT | CP-MT-EDT | WUSA | RACS | octet 10\* |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | octet 11\* -15\* |
| Spare |

Figure 9.9.3.34.1: UE network capability information element

Table 9.9.3.34.1: UE network capability information element

|  |
| --- |
| EPS encryption algorithms supported (octet 3) |
|  |
| EPS encryption algorithm EEA0 supported (octet 3, bit 8) |
| 0 |  |  |  | EPS encryption algorithm EEA0 not supported |
| 1 |  |  |  | EPS encryption algorithm EEA0 supported |
|  |
| EPS encryption algorithm 128-EEA1 supported (octet 3, bit 7) |
| 0 |  |  |  | EPS encryption algorithm 128-EEA1 not supported |
| 1 |  |  |  | EPS encryption algorithm 128-EEA1 supported |
|  |
| EPS encryption algorithm 128-EEA2 supported (octet 3, bit 6) |
| 0 |  |  |  | EPS encryption algorithm 128-EEA2 not supported |
| 1 |  |  |  | EPS encryption algorithm 128-EEA2 supported |
|  |
| EPS encryption algorithm 128-EEA3 supported (octet 3, bit 5) |
| 0 |  |  |  | EPS encryption algorithm 128-EEA3 not supported |
| 1 |  |  |  | EPS encryption algorithm 128-EEA3 supported |
|  |
| EPS encryption algorithm EEA4 supported (octet 3, bit 4) |
| 0 |  |  |  | EPS encryption algorithm EEA4 not supported |
| 1 |  |  |  | EPS encryption algorithm EEA4 supported |
|  |
| EPS encryption algorithm EEA5 supported (octet 3, bit 3) |
| 0 |  |  |  | EPS encryption algorithm EEA5 not supported |
| 1 |  |  |  | EPS encryption algorithm EEA5 supported |
|  |
| EPS encryption algorithm EEA6 supported (octet 3, bit 2) |
| 0 |  |  |  | EPS encryption algorithm EEA6 not supported |
| 1 |  |  |  | EPS encryption algorithm EEA6 supported |
|  |
| EPS encryption algorithm EEA7 supported (octet 3, bit 1) |
| 0 |  |  |  | EPS encryption algorithm EEA7 not supported |
| 1 |  |  |  | EPS encryption algorithm EEA7 supported |
|  |
| EPS integrity algorithms supported (octet 4) |
|  |
| EPS integrity algorithm EIA0 supported (octet 4, bit 8) |
| 0 |  |  |  | EPS integrity algorithm EIA0 not supported |
| 1 |  |  |  | EPS integrity algorithm EIA0 supported |
|  |
| EPS integrity algorithm 128-EIA1 supported (octet 4, bit 7) |
| 0 |  |  |  | EPS integrity algorithm 128-EIA1 not supported |
| 1 |  |  |  | EPS integrity algorithm 128-EIA1 supported |
|  |
| EPS integrity algorithm 128-EIA2 supported (octet 4, bit 6) |
| 0 |  |  |  | EPS integrity algorithm 128-EIA2 not supported |
| 1 |  |  |  | EPS integrity algorithm 128-EIA2 supported |
|  |
| EPS integrity algorithm 128-EIA3 supported (octet 4, bit 5) |
| 0 |  |  |  | EPS integrity algorithm 128-EIA3 not supported |
| 1 |  |  |  | EPS integrity algorithm 128-EIA3 supported |
|  |
| EPS integrity algorithm EIA4 supported (octet 4, bit 4) |
| 0 |  |  |  | EPS integrity algorithm EIA4 not supported |
| 1 |  |  |  | EPS integrity algorithm EIA4 supported |
|  |
| EPS integrity algorithm EIA5 supported (octet 4, bit 3) |
| 0 |  |  |  | EPS integrity algorithm EIA5 not supported |
| 1 |  |  |  | EPS integrity algorithm EIA5 supported |
|  |
| EPS integrity algorithm EIA6 supported (octet 4, bit 2) |
| 0 |  |  |  | EPS integrity algorithm EIA6 not supported |
| 1 |  |  |  | EPS integrity algorithm EIA6 supported |
|  |
| EPS integrity algorithm EIA7 supported (octet 4, bit 1) |
| 0 |  |  |  | EPS integrity algorithm EIA7 not supported |
| 1 |  |  |  | EPS integrity algorithm EIA7 supported |
|  |
| UMTS encryption algorithms supported (octet 5) |
|  |
| UMTS encryption algorithm UEA0 supported (octet 5, bit 8) |
| 0 |  |  |  | UMTS encryption algorithm UEA0 not supported |
| 1 |  |  |  | UMTS encryption algorithm UEA0 supported |
|  |
| UMTS encryption algorithm UEA1 supported (octet 5, bit 7) |
| 0 |  |  |  | UMTS encryption algorithm UEA1 not supported |
| 1 |  |  |  | UMTS encryption algorithm UEA1 supported |
|  |
| UMTS encryption algorithm UEA2 supported (octet 5, bit 6) |
| 0 |  |  |  | UMTS encryption algorithm UEA2 not supported |
| 1 |  |  |  | UMTS encryption algorithm UEA2 supported |
|  |
| UMTS encryption algorithm UEA3 supported (octet 5, bit 5) |
| 0 |  |  |  | UMTS encryption algorithm UEA3 not supported |
| 1 |  |  |  | UMTS encryption algorithm UEA3 supported |
|  |
| UMTS encryption algorithm UEA4 supported (octet 5, bit 4) |
| 0 |  |  |  | UMTS encryption algorithm UEA4 not supported |
| 1 |  |  |  | UMTS encryption algorithm UEA4 supported |
|  |
| UMTS encryption algorithm UEA5 supported (octet 5, bit 3) |
| 0 |  |  |  | UMTS encryption algorithm UEA5 not supported |
| 1 |  |  |  | UMTS encryption algorithm UEA5 supported |
|  |
| UMTS encryption algorithm UEA6 supported (octet 5, bit 2) |
| 0 |  |  |  | UMTS encryption algorithm UEA6 not supported |
| 1 |  |  |  | UMTS encryption algorithm UEA6 supported |
|  |
| UMTS encryption algorithm UEA7 supported (octet 5, bit 1) |
| 0 |  |  |  | UMTS encryption algorithm UEA7 not supported |
| 1 |  |  |  | UMTS encryption algorithm UEA7 supported |
|  |
| UCS2 support (UCS2) (octet 6, bit 8) |
| This information field indicates the likely treatment of UCS2 encoded character strings by the UE. |
|  |
| 0 |  |  |  | The UE has a preference for the default alphabet (defined in  |
|  |  |  |  | 3GPP TS 23.038 [3]) over UCS2 (see ISO/IEC 10646 [29]). |
| 1 |  |  |  | The UE has no preference between the use of the default alphabet and  |
|  |  |  |  | the use of UCS2. |
|  |
| UMTS integrity algorithms supported (octet 6) |
|  |
| UMTS integrity algorithm UIA1 supported (octet 6, bit 7) |
| 0 |  |  |  | UMTS integrity algorithm UIA1 not supported |
| 1 |  |  |  | UMTS integrity algorithm UIA1 supported |
|  |
| UMTS integrity algorithm UIA2 supported (octet 6, bit 6) |
| 0 |  |  |  | UMTS integrity algorithm UIA2 not supported |
| 1 |  |  |  | UMTS integrity algorithm UIA2 supported |
|  |
| UMTS integrity algorithm UIA3 supported (octet 6, bit 5) |
| 0 |  |  |  | UMTS integrity algorithm UIA3 not supported |
| 1 |  |  |  | UMTS integrity algorithm UIA3 supported |
|  |
| UMTS integrity algorithm UIA4 supported (octet 6, bit 4) |
| 0 |  |  |  | UMTS integrity algorithm UIA4 not supported |
| 1 |  |  |  | UMTS integrity algorithm UIA4 supported |
|  |
| UMTS integrity algorithm UIA5 supported (octet 6, bit 3) |
| 0 |  |  |  | UMTS integrity algorithm UIA5 not supported |
| 1 |  |  |  | UMTS integrity algorithm UIA5 supported |
|  |
| UMTS integrity algorithm UIA6 supported (octet 6, bit 2) |
| 0 |  |  |  | UMTS integrity algorithm UIA6 not supported |
| 1 |  |  |  | UMTS integrity algorithm UIA6 supported |
|  |
| UMTS integrity algorithm UIA7 supported (octet 6, bit 1) |
| 0 |  |  |  | UMTS integrity algorithm UIA7 not supported |
| 1 |  |  |  | UMTS integrity algorithm UIA7 supported |
|  |
| NF capability (octet 7, bit 1) |
| 0 |  |  |  | notification procedure not supported |
| 1 |  |  |  | notification procedure supported |
|  |
| 1xSRVCC capability (octet 7, bit 2) |
| 0 |  |  |  | SRVCC from E-UTRAN to cdma2000® 1x CS not supported |
| 1 |  |  |  | SRVCC from E-UTRAN to cdma2000® 1x CS supported |
|  |  |  |  | (see 3GPP TS 23.216 [8]) |
|  |
| Location services (LCS) notification mechanisms capability (octet 7, bit 3) |
| 0 |  |  |  | LCS notification mechanisms not supported  |
| 1 |  |  |  | LCS notification mechanisms supported (see 3GPP TS 24.171 [13C]) |
|  |
| LTE Positioning Protocol (LPP) capability (octet 7, bit 4) |
| 0 |  |  |  | LPP not supported |
| 1 |  |  |  | LPP supported (see 3GPP TS 36.355 [22A]) |
| Access class control for CSFB (ACC-CSFB) capability (octet 7, bit 5) |
| 0 |  |  |  | eNodeB-based access class control for CSFB not supported |
| 1 |  |  |  | eNodeB-based access class control for CSFB supported(see 3GPP TS 22.011 [1A])  |
| H.245 After SRVCC Handover capability (H.245-ASH) (octet 7, bit 6)This bit indicates the capability for H.245 with support and use of pre-defined codecs, and if needed, H.245 codec negotiation after SRVCC handover. |
| 0 |  |  |  | H.245 after SRVCC handover capability not supported |
| 1 |  |  |  | H.245 after SRVCC handover capability supported(see 3GPP TS 23.216 [8]) |
| ProSe (octet 7, bit 7)This bit indicates the capability for ProSe. |
| 0 |  |  |  | ProSe not supported |
| 1 |  |  |  | ProSe supported |
| ProSe direct discovery (ProSe-dd) (octet 7, bit 8)This bit indicates the capability for ProSe direct discovery. |
| 0 |  |  |  | ProSe direct discovery not supported |
| 1 |  |  |  | ProSe direct discovery supported |
| ProSe direct communication (ProSe-dc) (octet 8, bit 1)This bit indicates the capability for ProSe direct communication. |
| 0 |  |  |  | ProSe direct communication not supported |
| 1 |  |  |  | ProSe direct communication supported |
| ProSe UE-to-network-relay (ProSe-relay) (octet 8, bit 2)This bit indicates the capability to act as a ProSe UE-to-network relay |
| 0 |  |  |  | Acting as a ProSe UE-to-network relay not supported |
| 1 |  |  |  | Acting as a ProSe UE-to-network relay supported |
| Control plane CIoT EPS optimization (CP CIoT) (octet 8, bit 3)This bit indicates the capability for control plane CIoT EPS optimization. |
| 0 |  |  |  | Control plane CIoT EPS optimization not supported |
| 1 |  |  |  | Control plane CIoT EPS optimization supported |
| User plane CIoT EPS optimization (UP CIoT) (octet 8, bit 4)This bit indicates the capability for user plane CIoT EPS optimization. |
| 0 |  |  |  | User plane CIoT EPS optimization not supported |
| 1 |  |  |  | User plane CIoT EPS optimization supported |
| S1-u data transfer (S1-U data) (octet 8, bit 5)This bit indicates the capability for S1-u data transfer. This bit shall be considered only if the Control plane CIoT EPS optimization (CP CIoT) bit (octet 8, bit 3) is set to 1. If the Control plane CIoT EPS optimization (CP CIoT) bit (octet 8, bit 3) is set to 0, the MME shall assume S1-u data transfer is supported by the UE. |
| 0 |  |  |  | S1-U data transfer not supported |
| 1 |  |  |  | S1-U data transfer supported |
| EMM-REGISTERED without PDN connection (ERw/oPDN) (octet 8, bit 6)This bit indicates the capability for EMM REGISTERED without PDN connectivity. |
| 0 |  |  |  | EMM-REGISTERED without PDN connection not supported |
| 1 |  |  |  | EMM-REGISTERED without PDN connection supported |
| Header compression for control plane CIoT EPS optimization (HC-CP CIoT) (octet 8, bit 7)This bit indicates the capability for header compression for control plane CIoT EPS optimization. |
| 0 |  |  |  | Header compression for control plane CIoT EPS optimization not supported |
| 1 |  |  |  | Header compression for control plane CIoT EPS optimization supported |
| Extended protocol configuration options (ePCO) (octet 8, bit 8)This bit indicates the support of the extended protocol configuration options IE. |
| 0 |  |  |  | Extended protocol configuration options IE not supported |
| 1 |  |  |  | Extended protocol configuration options IE supported |
| Multiple DRB support (multipleDRB) (octet 9, bit 1)This bit indicates the capability to support multiple user plane radio bearers (see 3GPP TS 36.306 [44], 3GPP TS 36.331 [22]) in NB-S1 mode. |
| 0 |  |  |  | Multiple DRB not supported |
| 1 |  |  |  | Multiple DRB supported |
| V2X communication over PC5 (V2X PC5) (octet 9, bit 2)This bit indicates the capability for V2X communication over E-UTRA-PC5. |
| 0 |  |  |  | V2X communication over E-UTRA-PC5 not supported |
| 1 |  |  |  | V2X communication over E-UTRA-PC5 supported |
| Restriction on use of enhanced coverage support (RestrictEC) (octet 9, bit 3)This bit indicates the capability to support restriction on use of enhanced coverage. |
| 0 |  |  |  | Restriction on use of enhanced coverage not supported |
| 1 |  |  |  | Restriction on use of enhanced coverage supported |
| Control plane data backoff support (CP backoff) (octet 9, bit 4)This bit indicates the support of back-off timer for transport of user data via the control plane. |
| 0 |  |  |  | back-off timer for transport of user data via the control plane not supported |
| 1 |  |  |  | back-off timer for transport of user data via the control plane supported |
| Dual connectivity with NR (DCNR) (octet 9, bit 5)This bit indicates the capability for dual connectivity with NR. |
| 0 |  |  |  | dual connectivity with NR not supported |
| 1 |  |  |  | dual connectivity with NR supported |
| N1 mode supported (N1mode) (octet 9, bit 6)This bit indicates the capability for N1 mode. |
| 0 |  |  |  | N1 mode not supported |
| 1 |  |  |  | N1 mode supported |
| Service gap control (SGC) (octet 9, bit 7)This bit indicates the capability for service gap control |
| 0 |  |  |  | service gap control not supported |
| 1 |  |  |  | service gap control supported |
| Signalling for a maximum number of 15 EPS bearer contexts (15 bearers) (octet 9, bit 8)This bit indicates the support of signalling for a maximum number of 15 EPS bearer contexts |
| 0 |  |  |  | Signalling for a maximum number of 15 EPS bearer contexts not supported |
| 1 |  |  |  | Signalling for a maximum number of 15 EPS bearer contexts supported |
| Radio capability signalling optimisation (RACS) capability (octet 10, bit 1)This bit indicates the capability for RACS. |
| 0 |  |  |  | RACS not supported |
| 1 |  |  |  | RACS supported |
| Wake-up signal (WUS) assistance (octet 10, bit 2)This bit indicates the support of wake-up signal assistance |
| 0 |  |  |  | WUS assistance not supported |
| 1 |  |  |  | WUS assistance supported |
| Control plane Mobile Terminated-Early Data Transmission (CP-MT-EDT) (octet 10, bit 3)This bit indicates the support of control plane Mobile Terminated-Early Data Transmission |
| 0 |  |  |  | Control plane Mobile Terminated-Early Data Transmission not supported |
| 1 |  |  |  | Control plane Mobile Terminated-Early Data Transmission supported |
| User plane Mobile Terminated-Early Data Transmission (UP-MT-EDT) (octet 10, bit 4)This bit indicates the support of user plane Mobile Terminated-Early Data Transmission |
| 0 |  |  |  | User plane Mobile Terminated-Early Data Transmission not supported |
| 1 |  |  |  | User plane Mobile Terminated-Early Data Transmission supported |
| V2X communication over NR-PC5 (V2X NR-PC5) (octet 10, bit 5)This bit indicates the capability for V2X communication over NR-PC5. |
| 0 |  |  |  | V2X communication over NR-PC5 not supported |
| 1 |  |  |  | V2X communication over NR-PC5 supported |
| All other bits in octet 10 to 15 are spare and shall be coded as zero, if the respective octet is included in the information element. |
|  |
| NOTE 1: For a UE supporting dual connectivity with NR, if the UE supports one of the encryption algorithms for E-UTRAN (bits 8 to 5 of octet 3), it shall support the same algorithm for NR-PDCP as specified in 3GPP TS 33.401 [19]. The NR-PDCP is specified in 3GPP TS 38.323 [53].NOTE 2: For a UE supporting dual connectivity with NR, if the UE supports one of the integrity algorithms for E-UTRAN (bits 8 to 5 of octet 4), it shall support the same algorithm for NR-PDCP as specified in 3GPP TS 33.401 [19]. |

\*\*\*\*\* Next change \*\*\*\*\*

#### 9.9.3.42 Generic message container type

The purpose of the generic message container type information element is to specify the type of message contained in the generic message container IE.

The generic message container type information element is coded as shown in table 9.9.3.42.1.

Table 9.9.3.42.1: Generic message container type information element

|  |  |  |
| --- | --- | --- |
| Bits |  |  |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |  |
|  |  |  |  |  |  |  |  |  |  |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  | Reserved |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |  | LTE Positioning Protocol (LPP) message container (see 3GPP TS 36.355 [22A]) |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |  | Location services message container (see 3GPP TS 24.171 [13C]) |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |  |  |
| to |  | Unused |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |  |  |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |  |
| to |  | Reserved |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |

\*\*\*\*\* Next change \*\*\*\*\*

#### 9.9.3.43 Generic message container

This information element is used to encapsulate the application message transferred between the UE and the network. The generic message container information element is coded as shown in figure 9.9.3.43.1 and table 9.9.3.43.1.

The generic message container is a type 6 information element.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| Generic message container IEI | octet 1 |
| Length of generic message container contents | octet 2 |
|  | octet 3 |
|  | octet 4 |
| Generic message container contents |  |
|  | octet n |

Figure 9.9.3.43.1: Generic message container information element

Table 9.9.3.43.1: Generic message container information element

|  |
| --- |
| Generic message container contents (octet 4 to octet n); Max value of 65535 octets |
|  |
| The coding of the contents of the generic message container is dependent on the particular application. |
|  |

\*\*\*\*\* Next change \*\*\*\*\*

#### 9.9.3.51 Replayed NAS message container

The purpose of the Replayed NAS message container IE is to, during an ongoing attach or tracking area updating procedure, re-send the ATTACH REQUEST or TRACKING AREA UPDATE REQUEST message with which the UE had initiated the procedure, if the MME has included a HASHMME in the SECURITY MODE COMMAND message and the HASHMME is different from the hash value locally calculated at the UE as described in 3GPP TS 33.401 [19]. If an ATTACH REQUEST message is included in this IE, the ATTACH REQUEST message shall be coded as specified in subclause 8.2.4, i.e. without NAS security header. If a TRACKING AREA UPDATE REQUEST message is included in this IE, the TRACKING AREA UPDATE REQUEST message shall be coded as specified in subclause 8.2.29, i.e. without NAS security header

The Replayed NAS message container information element is coded as shown in figure 9.9.3.51.1 and table 9.9.3.51.1.

The Replayed NAS message container is a type 6 information element.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| Replayed NAS message container IEI | octet 1 |
| Length of Replayed NAS message container contents | octet 2 |
|  | octet 3 |
|  | octet 4 |
| Replayed NAS message container contents |  |
|  | octet n |

Figure 9.9.3.51.1: Replayed NAS message container information element

Table 9.9.3.51.1: Replayed NAS message container information element

|  |
| --- |
| Replayed NAS message container contents (octet 4 to octet n); Max value of 65535 octets |
|  |
| This IE can contain an ATTACH REQUEST message as defined in subclause 8.2.4, or a TRACKING AREA UPDATE REQUEST message as defined in subclause 8.2.29. |
|  |

\*\*\*\*\* Next change \*\*\*\*\*

#### 9.9.3.56 Ciphering key data

The purpose of the Ciphering key data information element is to transfer a list of ciphering data sets from the network to the UE for deciphering of ciphered assistance data.

The Ciphering key data information element is coded as shown in figure 9.9.3.56.1, figure 9.9.3.56.2 and table 9.9.3.56.1.

The Ciphering key data is a type 6 information element, with a minimum length of 35 octets and a maximum length of 2291 octets. The list can contain a maximum of 16 ciphering data sets.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| Ciphering key data IEI | octet 1 |
| Length of ciphering key data contents | octet 2octet 3 |
| Ciphering data set 1 | octet 4octet i |
| Ciphering data set 2 | octet i+1\*octet l\* |
| … | octet l+1\*octet m\* |
| Ciphering data set p | octet m+1\*octet n\* |

Figure 9.9.3.56.1: Ciphering key data information element

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| Ciphering set ID | octet 1octet 2 |
| Ciphering key | octet 3octet 18 |
| 0 | 0 | 0 | c0 length | octet 19 |
| Spare |
| c0 | octet 20octet k |
| PosSIBType1-1 | PosSIBType1-2 | PosSIBType1-3 | PosSIBType1-4 | PosSIBType1-5 | PosSIBType1-6 | PosSIBType1-7 | PosSIBType2-1 | octet k+1octet k+4 |
| PosSIBType2-2 | PosSIBType2-3 | PosSIBType2-4 | PosSIBType2-5 | PosSIBType2-6 | PosSIBType2-7 | PosSIBType2-8 | PosSIBType2-9 |
| PosSIBType2-10 | PosSIBType2-11 | PosSIBType2-12 | PosSIBType2-13 | PosSIBType2-14 | PosSIBType2-15 | PosSIBType2-16 | PosSIBType2-17 |
| PosSIBType2-18 | PosSIBType2-19 | PosSIBType3-1 | 0Spare | 0Spare | 0Spare | 0Spare | 0Spare |
| Validity start time | octet k+5octet k+9 |
| Validity duration | octet k+10octet k+11 |
| TAIs list | octet k+12octet n |

Figure 9.9.3.56.2: Ciphering data set

Table 9.9.3.56.1: Ciphering key data information element

|  |
| --- |
| Value part of the Ciphering key data information element (octets 4 to n) |
|  |
| The value part of the Ciphering key data information element consists of one or several ciphering data sets. |
| The UE shall store the complete list received. If more than 16 ciphering data sets are included in this information element, the UE shall store the first 16 ciphering data sets and ignore the remaining octets of the information element. |
|  |
|  |
| Ciphering data set: |
|  |
| Ciphering set ID (octets 1 to 2) |
|  |
| This field contains the binary encoding of the ID identifying the ciphering set. |
|  |
| Ciphering key (octets 3 to octet 18) |
|  |
| This field contains the 128 bit ciphering key. |
|  |
| c0 length (octet 19, bits 5 to 1)This field contains the binary encoding of the length, in octets, of the c0 counter. The maximum value for the length of the c0 counter is 16 octets. |
|  |
| Bits 8 to 6 of octet 19 are spare and shall be coded as zero. |
|  |
|  |
| c0 (octets 20 to k) |
|  |
| This field contains the binary encoding of the c0 counter. |
|  |
|  |
| Positioning SIB types for which the ciphering data set is applicable (octets k+1 to k+4) |
|  |
| Ciphering data set applicable for positioning SIB type 1-1 (octet k+1, bit 8) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 1-1 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 1-1 |
|  |
| Ciphering data set applicable for positioning SIB type 1-2 (octet k+1, bit 7) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 1-2 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 1-2 |
|  |
| Ciphering data set applicable for positioning SIB type 1-3 (octet k+1, bit 6) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 1-3 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 1-3 |
|  |
| Ciphering data set applicable for positioning SIB type 1-4 (octet k+1, bit 5) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 1-4 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 1-4 |
|  |
| Ciphering data set applicable for positioning SIB type 1-5 (octet k+1, bit 4) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 1-5 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 1-5 |
|  |
| Ciphering data set applicable for positioning SIB type 1-6 (octet k+1, bit 3) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 1-6 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 1-6 |
|  |
| Ciphering data set applicable for positioning SIB type 1-7 (octet k+1, bit 2) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 1-7 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 1-7 |
|  |
| Ciphering data set applicable for positioning SIB type 2-1 (octet k+1, bit 1) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-1 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-1 |
|  |
|  |
| Ciphering data set applicable for positioning SIB type 2-2 (octet k+2, bit 8) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-2 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-2 |
|  |
| Ciphering data set applicable for positioning SIB type 2-3 (octet k+2, bit 7) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-3 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-3 |
|  |
| Ciphering data set applicable for positioning SIB type 2-4 (octet k+2, bit 6) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-4 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-4 |
|  |
| Ciphering data set applicable for positioning SIB type 2-5 (octet k+2, bit 5) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-5 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-5 |
|  |
| Ciphering data set applicable for positioning SIB type 2-6 (octet k+2, bit 4) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-6 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-6 |
|  |
| Ciphering data set applicable for positioning SIB type 2-7 (octet k+2, bit 3) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-7 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-7 |
|  |
| Ciphering data set applicable for positioning SIB type 2-8 (octet k+2, bit 2) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-8 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-8 |
|  |
| Ciphering data set applicable for positioning SIB type 2-9 (octet k+2, bit 1) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-9 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-9 |
|  |
| Ciphering data set applicable for positioning SIB type 2-10 (octet k+3, bit 8) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-10 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-10 |
|  |
| Ciphering data set applicable for positioning SIB type 2-11 (octet k+3, bit 7) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-11 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-11 |
|  |
| Ciphering data set applicable for positioning SIB type 2-12 (octet k+3, bit 6) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-12 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-12 |
|  |
| Ciphering data set applicable for positioning SIB type 2-13 (octet k+3, bit 5) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-13 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-13 |
|  |
| Ciphering data set applicable for positioning SIB type 2-14 (octet k+3, bit 4) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-14 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-14 |
|  |
| Ciphering data set applicable for positioning SIB type 2-15 (octet k+3, bit 3) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-15 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-15 |
|  |
| Ciphering data set applicable for positioning SIB type 2-16 (octet k+3, bit 2) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-16 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-16 |
|  |
| Ciphering data set applicable for positioning SIB type 2-17 (octet k+3, bit 1) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-17 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-17 |
|  |
| Ciphering data set applicable for positioning SIB type 2-18 (octet k+4, bit 8) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-18 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-18 |
|  |
| Ciphering data set applicable for positioning SIB type 2-19 (octet k+4, bit 7) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 2-19 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 2-19 |
|  |
| Ciphering data set applicable for positioning SIB type 3-1 (octet k+4, bit 6) |
| 0 |  |  |  | Ciphering data set not applicable to positioning SIB type 3-1 |
| 1 |  |  |  | Ciphering data set applicable to positioning SIB type 3-1 |
|  |
| Bits 5 to 1 of octet k+4 are spare and shall be coded as zero. |
|  |
|  |
| Validity start time (octets k+5 to k+9) |
|  |
| This field contains the UTC time when the ciphering data set becomes valid, encoded as octets 2 to 6 of the Time zone and time IE specified in 3GPP TS 24.008 [13]. |
|  |
|  |
| Validity duration (octets k+10 to k+11) |
|  |
| This field contains the duration for which the ciphering data set is valid after the validity start time, in units of minutes. |
|  |
|  |
| TAIs list (octets k+12 to n) |
|  |
| This field contains the list of tracking areas for which the ciphering data set is applicable, encoded as octets 2 to n of the Tracking area identity list IE as specified in subclause 9.9.3.33. If the TAIs list is empty (as indicated by a zero length), the ciphering data set is applicable to the entire serving PLMN. |
|  |

\*\*\*\*\* Next change \*\*\*\*\*

#### 9.9.3.57 N1 UE network capability

The purpose of the N1 UE network capability IE is to allow the UE that supports N1 mode, to provide the network with information related to the UE’s capabilities for 5GS.

The N1 UE network capability information element is coded as shown in figure 9.9.3.57.1 and table 9.9.3.57.1.

The N1 UE network capability is a type 4 information element.

|  |  |
| --- | --- |
| N1 UE network capability IEI | octet 1 |
| Length of N1 UE network capability contents | octet 2 |
| 0Spare | 0Spare | 5GS-PNB-CIoT | 5G-UP CIoT | 5G-HC-CP CIoT | N3 data | 5G-CP CIoT | octet 3 |

Figure 9.9.3.57.1: N1 UE network capability information element

Table 9.9.3.57.1: N1 UE network capability information element

|  |
| --- |
| Control plane CIoT 5GS optimization (5G-CP CIoT) (octet 3, bit 1) |
| This bit indicates the capability for control plane CIoT 5GS optimization |
| Bit |
| 1 |  |  |
| 0 |  | Control plane CIoT 5GS optimization not supported |
| 1 |  | Control plane CIoT 5GS optimization supported |
|  |
| N3 data transfer (N3 data) (octet 3, bits 2)This bit indicates the capability for N3 data transfer. |
| Bit  |
| 2 |  |  |
| 0 |  | N3 data transfer supported |
| 1 |  | N3 data transfer not supported |
|  |
| Header compression for control plane CIoT 5GS optimization (5G-HC-CP CIoT) (octet 3, bit 3)This bit indicates the capability for header compression for control plane CIoT 5GS optimization. |
| Bit  |
| 3 |  |  |
| 0 |  | Header compression for control plane CIoT 5GS optimization not supported |
| 1 |  | Header compression for control plane CIoT 5GS optimization supported |
|  |
| User plane CIoT 5GS optimization (5G-UP CIoT) (octet 3, bit 4) |
| This bit indicates the capability for user plane CIoT 5GS optimization |
| Bit  |
| 4 |  |  |
| 0 |  | User plane CIoT 5GS optimization not supported |
| 1 |  | User plane CIoT 5GS optimization supported |
|  |
| 5GS Preferred CIoT network behaviour (5GS-PNB-CIoT) (octet 3, bits 5 and 6) |
| These bits indicate the 5GS CIoT network behaviour the UE prefers to use |
| Bits  |
| 6 | 5 |  |
| 0 | 0 | no additional information |
| 0 | 1 | control plane CIoT 5GS optimization |
| 1 | 0 | user plane CIoT 5GS optimization |
| 1 | 1 | reserved |
|  |
| All other bits in octet 3 are spare and shall be coded as zero, if the respective octet is included in the information element. |

\*\*\*\*\* Next change \*\*\*\*\*

#### 9.9.3.61 UE radio capability ID deletion indication

See subclause 9.11.3.69 in 3GPP TS 24.501 [54].

\*\*\*\*\* Next change \*\*\*\*\*

#### 9.9.3.62 WUS assistance information

The purpose of the WUS assistance information information element is to transfer the required assistance information to determine the WUS group used when paging the UE.

The coding of the information element allows combining different types of WUS assistance information.

The WUS assistance information information element is coded as shown in figure 9.9.3.62.1, figure 9.9.3.62.2 and table 9.9.3.62.1.

The WUS assistance information is a type 4 information element, with a minimum length of 3 octets.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| WUS assistance information IEI | octet 1 |
| Length of WUS assistance information contents | octet 2 |
| WUS assistance information type 1 | octet 3octet i |
| WUS assistance information type 2 | octet i+1\*octet l\* |
| … | octet l+1\*octet m\* |
| WUS assistance information type p | octet m+1\*octet n\* |

Figure 9.9.3.62.1: WUS assistance information information element

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| Type of information | UE paging probability information value | octet 1 |

Figure 9.9.3.62.2: WUS assistance information type –type of information= "000"

Table 9.9.3.62.1: WUS assistance information information element

|  |
| --- |
| Value part of the WUS assistance information information element (octets 3 to n) |
|  |
| The value part of the WUS assistance information information element consists of one or several types of WUS assistance information. |
|  |
| WUS assistance information type: |
|  |
| Type of information (octet 1) |
| Bits |
| 8 | 7 | 6 |  |
| 0 | 0 | 0 | UE paging probability information |
|  |
| All other values are reserved. |
|  |
| UE paging probability information value: |
|  |
| This field contains the value of UE paging probability information requested by the UE or negotiated by the network. It represents the probability of the UE receiving the paging.bit |
| 5 | 4 | 3 | 2 | 1 | UE paging probability information value |
| 0 | 0 | 0 | 0 | 0 | p00 |
| 0 | 0 | 0 | 0 | 1 | p05 |
| 0 | 0 | 0 | 1 | 0 | p10 |
| 0 | 0 | 0 | 1 | 1 | p15  |
| 0 | 0 | 1 | 0 | 0 | p20 |
| 0 | 0 | 1 | 0 | 1 | p25 |
| 0 | 0 | 1 | 1 | 0 | p30 |
| 0 | 0 | 1 | 1 | 1 | p35 |
| 0 | 1 | 0 | 0 | 0 | p40 |
| 0 | 1 | 0 | 0 | 1 | p45 |
| 0 | 1 | 0 | 1 | 0 | p50 |
| 0 | 1 | 0 | 1 | 1 | p55 |
| 0 | 1 | 1 | 0 | 0 | p60 |
| 0 | 1 | 1 | 0 | 1 | p65 |
| 0 | 1 | 1 | 1 | 0 | p70 |
| 0 | 1 | 1 | 1 | 1 | p75 |
| 1 | 0 | 0 | 0 | 0 | p80 |
| 1 | 0 | 0 | 0 | 1 | p85 |
| 1 | 0 | 0 | 1 | 0 | p90 |
| 1 | 0 | 0 | 1 | 1 | p95 |
| 1 | 0 | 1 | 0 | 0 | p100 |
|  |
| All other values shall be interpreted as 10100 by this version of the protocol. |

\*\*\*\*\* Next change \*\*\*\*\*

#### 9.9.4.3 EPS quality of service

The purpose of the EPS quality of service information element is to specify the QoS parameters for an EPS bearer context.

The EPS quality of service information element is coded as shown in figure 9.9.4.3.1 and table 9.9.4.3.1.

The EPS quality of service is a type 4 information element with a minimum length of 3 octets and a maximum length of 15 octets. Octets 4-15 are optional. If octet 4 is included, then octets 5-7 shall also be included, and octets 8-15 may be included. If octet 8 is included, then octets 4-11 shall also be included, and octets 12-15 may be included. If octet 12 is included, then octets 4-15 shall also be included. The length of the EPS QoS IE can be either 3 octets, 7 octets, 11 octets or 15 octets.

Refer to 3GPP TS 23.203 [7] for a detailed description of the QoS Class Identifier (QCI).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| EPS quality of service IEI | octet 1 |
| Length of EPS quality of service contents | octet 2 |
| QCI | octet 3 |
| Maximum bit rate for uplink | octet 4\* |
| Maximum bit rate for downlink | octet 5\* |
| Guaranteed bit rate for uplink | octet 6\* |
| Guaranteed bit rate for downlink | octet 7\* |
| Maximum bit rate for uplink (extended) | octet 8\* |
| Maximum bit rate for downlink (extended) | octet 9\* |
| Guaranteed bit rate for uplink (extended) | octet 10\* |
| Guaranteed bit rate for downlink (extended) | octet 11\* |
| Maximum bit rate for uplink (extended-2) | octet 12\* |
| Maximum bit rate for downlink (extended-2) | octet 13\* |
| Guaranteed bit rate for uplink (extended-2) | octet 14\* |
| Guaranteed bit rate for downlink (extended-2) | octet 15\* |

Figure 9.9.4.3.1: EPS quality of service information element

Table 9.9.4.3.1: EPS quality of service information element

|  |
| --- |
| Quality of Service Class Identifier (QCI), octet 3 (see 3GPP TS 23.203 [7] and 3GPP TS 29.212 [16B])Bits8 7 6 5 4 3 2 1In UE to network direction:0 0 0 0 0 0 0 0 no QCI requested (NOTE)In network to UE direction:0 0 0 0 0 0 0 0 ReservedIn UE to network direction and in network to UE direction:0 0 0 0 0 0 0 1 QCI 10 0 0 0 0 0 1 0 QCI 20 0 0 0 0 0 1 1 QCI 30 0 0 0 0 1 0 0 QCI 40 0 0 0 0 1 0 1 QCI 50 0 0 0 0 1 1 0 QCI 60 0 0 0 0 1 1 1 QCI 70 0 0 0 1 0 0 0 QCI 80 0 0 0 1 0 0 1 QCI 90 0 0 0 1 0 1 0 to Spare0 1 0 0 0 0 0 00 1 0 0 0 0 0 1 QCI 650 1 0 0 0 0 1 0 QCI 660 1 0 0 0 0 1 1 QCI 670 1 0 0 0 1 0 0 to Spare0 1 0 0 0 1 0 00 1 0 0 0 1 0 1 QCI 690 1 0 0 0 1 1 0 QCI 700 1 0 0 0 1 1 1 QCI 710 1 0 0 1 0 0 0 QCI 720 1 0 0 1 0 0 1 QCI 730 1 0 0 1 0 1 0 QCI 740 1 0 0 1 0 1 1 QCI 750 1 0 0 1 1 0 0 QCI 760 1 0 0 1 1 0 0 to Spare0 1 0 0 1 1 1 00 1 0 0 1 1 1 1 QCI 790 1 0 1 0 0 0 0 QCI 800 1 0 1 0 0 0 1 Spare0 1 0 1 0 0 1 0 QCI 820 1 0 1 0 0 1 1 QCI 830 1 0 1 0 1 0 0 QCI 840 1 0 1 0 1 0 1 QCI 850 1 0 1 0 1 1 0 to Spare0 1 1 1 1 1 1 11 0 0 0 0 0 0 0 to Operator-specific QCIs1 1 1 1 1 1 1 0 1 1 1 1 1 1 1 1 ReservedThe network shall consider all other values not explicitly defined in this version of the protocol as unsupported.NOTE: The UE shall use this value, if the information element has presence requirement "M" in a message, but the information element does not serve any useful purpose in the specific procedure for which the message is sent (see subclause 6.5.3.2).QCI values 10-127 were reserved in earlier versions of the protocol.If the UE receives a QCI value (excluding the reserved QCI values) that it does not understand, the UE shall choose a QCI value from the set of QCI values defined in this version of the protocol (see 3GPP TS 23.203 [7] and 3GPP TS 29.212 [16B]) and associated with: - GBR bearers if the IE includes a guaranteed bit rate value; and - non-GBR bearers if the IE does not include a guaranteed bit rate value.The UE shall use this chosen QCI value for internal operations only. The UE shall use the received QCI value in subsequent NAS signalling procedures.For all non-GBR QCIs, the maximum and guaranteed bit rates shall be ignored.Maximum bit rate for uplink, octet 4 (see 3GPP TS 23.107 [5])Bits8 7 6 5 4 3 2 1In UE to network direction:0 0 0 0 0 0 0 0 Subscribed maximum bit rate for uplinkIn network to UE direction:0 0 0 0 0 0 0 0 ReservedIn UE to network direction and in network to UE direction:0 0 0 0 0 0 0 1 The maximum bit rate is binary coded in 8 bits, using a granularity of 1 kbps to giving a range of values from 1 kbps to 63 kbps in 1 kbps increments.0 0 1 1 1 1 1 10 1 0 0 0 0 0 0 The maximum bit rate is 64 kbps + ((the binary coded value in 8 bits – 01000000) \* 8 kbps) to giving a range of values from 64 kbps to 568 kbps in 8 kbps increments.0 1 1 1 1 1 1 11 0 0 0 0 0 0 0 The maximum bit rate is 576 kbps + ((the binary coded value in 8 bits – 10000000) \* 64 kbps) to giving a range of values from 576 kbps to 8640 kbps in 64 kbps increments.1 1 1 1 1 1 1 01 1 1 1 1 1 1 1 0kbpsIf the sending entity wants to indicate a maximum bit rate for uplink higher than 8640 kbps, it shall set octet 4 to "11111110", i.e. 8640 kbps, and shall encode the value for the maximum bit rate in octet 8.The network shall map all other values not explicitly defined onto one of the values defined in this version of the protocol. The network shall return a negotiated value which is explicitly defined in this version of the protocol.Maximum bit rate for downlink, octet 5 (see 3GPP TS 23.107 [5])Coding is identical to that of maximum bit rate for uplink.If the sending entity wants to indicate a maximum bit rate for downlink higher than 8640 kbps, it shall set octet 5 to "11111110", i.e. 8640 kbps, and shall encode the value for the maximum bit rate in octet 9.The network shall map all other values not explicitly defined onto one of the values defined in this version of the protocol. The network shall return a negotiated value which is explicitly defined in this version of the protocol.In this version of the protocol, for messages specified in the present document, the sending entity shall not request 0 kbps for both the maximum bit rate for downlink and the maximum bit rate for uplink at the same time. Any entity receiving a request for 0 kbps in both the maximum bit rate for downlink and the maximum bit rate for uplink shall consider that as a syntactical error (see clause 8 of 3GPP TS 24.008 [13]).Guaranteed bit rate for uplink, octet 6 (see 3GPP TS 23.107 [5])Coding is identical to that of maximum bit rate for uplink.If the sending entity wants to indicate a guaranteed bit rate for uplink higher than 8640 kbps, it shall set octet 6 to "11111110", i.e. 8640 kbps, and shall encode the value for the guaranteed bit rate in octet 10.The network shall map all other values not explicitly defined onto one of the values defined in this version of the protocol. The network shall return a negotiated value which is explicitly defined in this version of the protocol.Guaranteed bit rate for downlink, octet 7 (see 3GPP TS 23.107 [5])Coding is identical to that of maximum bit rate for uplink.If the sending entity wants to indicate a guaranteed bit rate for downlink higher than 8640 kbps, it shall set octet 7 to "11111110", i.e. 8640 kbps, and shall encode the value for the guaranteed bit rate in octet 11.The network shall map all other values not explicitly defined onto one of the values defined in this version of the protocol. The network shall return a negotiated value which is explicitly defined in this version of the protocol.Maximum bit rate for uplink (extended), octet 8Bits8 7 6 5 4 3 2 1In UE to network direction and in network to UE direction:0 0 0 0 0 0 0 0 Use the value indicated by the maximum bit rate for uplink in octet 4. For all other values: ignore the value indicated by the maximum bit rate for uplink in octet 4 and use the following value:0 0 0 0 0 0 0 1 The maximum bit rate is 8600 kbps + ((the binary coded value in 8 bits) \* 100 kbps), to giving a range of values from 8700 kbps to 16000 kbps in 100 kbps increments.0 1 0 0 1 0 1 00 1 0 0 1 0 1 1 The maximum bit rate is 16 Mbps + ((the binary coded value in 8 bits - 01001010) \* 1 Mbps), to giving a range of values from 17 Mbps to 128 Mbps in 1 Mbps increments.1 0 1 1 1 0 1 01 0 1 1 1 0 1 1 The maximum bit rate is 128 Mbps + ((the binary coded value in 8 bits - 10111010) \* 2 Mbps), to giving a range of values from 130 Mbps to 256 Mbps in 2 Mbps increments.1 1 1 1 1 0 1 0If the sending entity wants to indicate a Maximum bit rate for uplink higher than 256 Mbps, it shall set octet 8 to "11111010", i.e. 256 Mbps, and shall encode the value for the Maximum bit rate in octet 12.The network shall map all other values not explicitly defined onto one of the values defined in this version of the protocol. The network shall return a negotiated value which is explicitly defined in this version of the protocol.Maximum bit rate for downlink (extended), octet 9This field is an extension of the maximum bit rate for downlink in octet 5. The coding is identical to that of the maximum bit rate for uplink (extended).If the sending entity wants to indicate a Maximum bit rate for downlink higher than 256 Mbps, it shall set octet 9 to "11111010", i.e. 256 Mbps, and shall encode the value for the Maximum bit rate in octet 13.The network shall map all other values not explicitly defined onto one of the values defined in this version of the protocol. The network shall return a negotiated value which is explicitly defined in this version of the protocol.Guaranteed bit rate for uplink (extended), octet 10Bits8 7 6 5 4 3 2 1In UE to network direction and in network to UE direction:0 0 0 0 0 0 0 0 Use the value indicated by the guaranteed bit rate for uplink in octet 6. For all other values: ignore the value indicated by the guaranteed bit rate for uplink in octet 6 and use the following value:0 0 0 0 0 0 0 1 The guaranteed bit rate is 8600 kbps + ((the binary coded value in 8 bits) \* 100 kbps), to giving a range of values from 8700 kbps to 16000 kbps in 100 kbps increments.0 1 0 0 1 0 1 00 1 0 0 1 0 1 1 The guaranteed bit rate is 16 Mbps + ((the binary coded value in 8 bits - 01001010) \* 1 Mbps), to giving a range of values from 17 Mbps to 128 Mbps in 1 Mbps increments.1 0 1 1 1 0 1 01 0 1 1 1 0 1 1 The guaranteed bit rate is 128 Mbps + ((the binary coded value in 8 bits - 10111010) \* 2 Mbps), to giving a range of values from 130 Mbps to 256 Mbps in 2 Mbps increments.1 1 1 1 1 0 1 0If the sending entity wants to indicate a Guaranteed bit rate for uplink higher than 256 Mbps, it shall set octet 10 to "11111010", i.e. 256 Mbps, and shall encode the value for the Maximum bit rate in octet 14.The network shall map all other values not explicitly defined onto one of the values defined in this version of the protocol. The network shall return a negotiated value which is explicitly defined in this version of the protocol.Guaranteed bit rate for downlink (extended), octet 11This field is an extension of the guaranteed bit rate for downlink in octet 7. The coding is identical to that of guaranteed bit rate for uplink (extended).If the sending entity wants to indicate a Guaranteed bit rate for downlink higher than 256 Mbps, it shall set octet 11 to "11111010", i.e. 256 Mbps, and shall encode the value for the Maximum bit rate in octet 15.The network shall map all other values not explicitly defined onto one of the values defined in this version of the protocol. The network shall return a negotiated value which is explicitly defined in this version of the protocol.Maximum bit rate for uplink (extended-2), octet 12Bits8 7 6 5 4 3 2 1In UE to network direction and in network to UE direction:0 0 0 0 0 0 0 0 Use the value indicated by the Maximum bit rate for uplink in octet 4 and octet 8. For all other values: Ignore the value indicated by the Maximum bit rate for uplink in octet 4 and octet 8 and use the following value:0 0 0 0 0 0 0 1 The maximum bit rate is 256 Mbps + ((the binary coded value in 8 bits) \* 4 Mbps),0 0 1 1 1 1 0 1 giving a range of values from 260 Mbps to 500 Mbps in 4 Mbps increments.0 0 1 1 1 1 1 0 The maximum bit rate is 500 Mbps + ((the binary coded value in 8 bits - 00111101) \* 10 Mbps),1 0 1 0 0 0 0 1 giving a range of values from 510 Mbps to 1500 Mbps in 10 Mbps increments.1 0 1 0 0 0 1 0 The maximum bit rate is 1500 Mbps + ((the binary coded value in 8 bits - 10100001) \* 100 Mbps),1 1 1 1 0 1 1 0 giving a range of values from 1600 Mbps to 10 Gbps in 100 Mbps increments.If the sending entity wants to indicate a Maximum bit rate for uplink higher than 10 Gbps, it shall set octet 12 to "11110110", i.e. 10 Gbps, and shall encode the value for the maximum bit rate in the Extended quality of service information element specified in subclause 9.9.4.30.The network shall map all other values not explicitly defined onto one of the values defined in this version of the protocol. The network shall return a negotiated value which is explicitly defined in this version of the protocol.The UE shall map all other values not explicitly defined onto the maximum value defined in this version of the protocol.Maximum bit rate for downlink (extended-2), octet 13This field is an extension of the Maximum bit rate for downlink in octet 9. The coding is identical to that of the Maximum bit rate for uplink (extended-2).If the sending entity wants to indicate a Maximum bit rate for downlink higher than 10 Gbps, it shall set octet 13 to "11110110", i.e. 10 Gbps, and shall encode the value for the maximum bit rate in the Extended quality of service information element specified in subclause 9.9.4.30.The network shall map all other values not explicitly defined onto one of the values defined in this version of the protocol. The network shall return a negotiated value which is explicitly defined in this version of the protocol.The UE shall map all other values not explicitly defined onto the maximum value defined in this version of the protocol.Guaranteed bit rate for uplink (extended-2), octet 14 Bits8 7 6 5 4 3 2 1In UE to network direction and in network to UE direction:0 0 0 0 0 0 0 0 Use the value indicated by the Guaranteed bit rate for uplink in octet 6 and octet 10. For all other values: Ignore the value indicated by the Guaranteed bit rate for uplink in octet 6 and octet 10 and use the following value:0 0 0 0 0 0 0 1 The guaranteed bit rate is 256 Mbps + ((the binary coded value in 8 bits) \* 4 Mbps),0 0 1 1 1 1 0 1 giving a range of values from 260 Mbps to 500 Mbps in 4 Mbps increments.0 0 1 1 1 1 1 0 The guaranteed bit rate is 500 Mbps + ((the binary coded value in 8 bits - 00111101) \* 10 Mbps),1 0 1 0 0 0 0 1 giving a range of values from 510 Mbps to 1500 Mbps in 10 Mbps increments.1 0 1 0 0 0 1 0 The guaranteed bit rate is 1500 Mbps + ((the binary coded value in 8 bits - 10100001) \* 100 Mbps),1 1 1 1 0 1 1 0 giving a range of values from 1600 Mbps to 10 Gbps in 100 Mbps increments.If the sending entity wants to indicate a Guaranteed bit rate for uplink higher than 10 Gbps, it shall set octet 14 to "11110110", i.e. 10 Gbps, and shall encode the value for the guaranteed bit rate in the Extended quality of service information element specified in subclause 9.9.4.30.The network shall map all other values not explicitly defined onto one of the values defined in this version of the protocol. The network shall return a negotiated value which is explicitly defined in this version of the protocol.The UE shall map all other values not explicitly defined onto the maximum value defined in this version of the protocol.Guaranteed bit rate for downlink (extended-2), octet 15 This field is an extension of the Guaranteed bit rate for downlink in octet 11. The coding is identical to that of the Guaranteed bit rate for uplink (extended-2).If the sending entity wants to indicate a Guaranteed bit rate for downlink higher than 10 Gbps, it shall set octet 15 to "11110110", i.e. 10 Gbps, and shall encode the value for the guaranteed bit rate in the Extended quality of service information element specified in subclause 9.9.4.30.The network shall map all other values not explicitly defined onto one of the values defined in this version of the protocol. The network shall return a negotiated value which is explicitly defined in this version of the protocol.The UE shall map all other values not explicitly defined onto the maximum value defined in this version of the protocol. |

\*\*\*\*\* Next change \*\*\*\*\*

#### 9.9.4.22 Header compression configuration

The purpose of the Header compression configuration information element is to negotiate ROHC channel setup parameters specified in IETF RFC 5795 [37] and, optionally, provide additional header compression context setup parameters.

The Header compression configuration information element is coded as shown in figure 9.9.4.22.1 and table 9.9.4.22.1.

The Header compression configuration is a type 4 information element with a minimum length of 5 octets and a maximum length of 257 octets.

The optional Additional header compression parameters container field conveys the additional header compression context setup parameters as specified in 3GPP TS 23.401 [10] in a generic container. This field corresponds to the profile-specific information in the header of the ROHC IR packet type in IETF RFC 5795 [37].

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| Header compression configuration IEI | octet 1 |
| Length of Header compression configuration contents | octet 2 |
| Spare | P0x0104 | P0x0103 | P0x0102 | P0x0006 | P0x0004 | P0x0003 | P0x0002 | octet 3 |
| MAX\_CID | octet 4 |
| octet 5 |
| Additional header compression context setup parameters type | octet 6\* |
| Additional header compression context setup parameters container | octet 7\* |
|  |
| octet n\* |

Figure 9.9.4.22.1: Header compression configuration information element

Table 9.9.4.22.1: Header compression configuration information element

|  |
| --- |
| ROHC Profiles (octet 3)The ROHC Profiles shall indicate which of the ROHC profiles is supported. When a particular bit is set to 1, this indicates that the corresponding profile is supported. The No Compression profile 0x0000 (see IETF RFC 5795 [37]) shall always be supported. When all the bits are set to 0, this indicates that only the No Compression profile 0x0000 is supported. Profile 0x0002 support indicator (see IETF RFC 3095 [40] and IETF RFC 4815 [42]) (octet 3 bit 1) 0 RoHC profile 0x0002 (UDP/IP) is not supported1 RoHC profile 0x0002 (UDP/IP) is supported Profile 0x0003 support indicator (see IETF RFC 3095 [40] and IETF RFC 4815 [42]) (octet 3 bit 2)0 RoHC profile 0x0003 (ESP/IP) is not supported1 RoHC profile 0x0003 (ESP/IP) is supported Profile 0x0004 support indicator (see IETF RFC 3843 [41] and IETF RFC 4815 [42]) (octet 3 bit 3)0 RoHC profile 0x0004 (IP) is not supported1 RoHC profile 0x0004 (IP) is supported Profile 0x0006 support indicator (see IETF RFC 6846 [39]) (octet 3 bit 4)0 RoHC profile 0x0006 (TCP/IP) is not supported1 RoHC profile 0x0006 (TCP/IP) is supported Profile 0x0102 support indicator (see IETF RFC 5225 [43]) (octet 3 bit 5)0 RoHC profile 0x0102 (UDP/IP) is not supported1 RoHC profile 0x0102 (UDP/IP) is supported Profile 0x0103 support indicator (see IETF RFC 5225 [43]) (octet 3 bit 6)0 RoHC profile 0x0103 (ESP/IP) is not supported1 RoHC profile 0x0103 (ESP/IP) is supported Profile 0x0104 support indicator (see IETF RFC 5225 [43]) (octet 3 bit 7)0 RoHC profile 0x0104 (IP) is not supported1 RoHC profile 0x0104 (IP) is supported Bits 8 is spare and shall be set to 0.MAX\_CID (octet 4 and octet 5)This is the MAX\_CID value as specified in 3GPP TS 36.323 [38]. It is encoded in binary coding with a value in the range from 1 to 16383.Additional header compression context parameters type (octet 6).The Additional header compression context parameters type octet indicates the profile associated with the profile-specific information in the Additional header compression context parameters container.Bits**8 7 6 5 4 3 2 1** Type  0 0 0 0 0 0 0 0 0x0000 (No Compression) 0 0 0 0 0 0 0 1 0x0002 (UDP/IP) 0 0 0 0 0 0 1 0 0x0003 (ESP/IP) 0 0 0 0 0 0 1 1 0x0004 (IP)0 0 0 0 0 1 0 0 0x0006 (TCP/IP) 0 0 0 0 0 1 0 1 0x0102 (UDP/IP) 0 0 0 0 0 1 1 0 0x0103 (ESP/IP)0 0 0 0 0 1 1 1 0x0104 (IP)0 0 0 0 1 0 0 0 Other0 0 0 0 1 0 0 1 to1 1 1 1 1 1 1 1 SpareAdditional header compression context parameters container (octets 7 to n).Additional header compression context parameters container carries the profile-specific information (see IETF RFC 5795 [37]). The maximum size is 251 octets. |

\*\*\*\*\* Next change \*\*\*\*\*

#### 9.9.4.27 Header compression configuration status

The purpose of the Header compression configuration status information element is to indicate the status of the Header compression configuration for each EPS bearer using Control plane CIoT EPS optimisation that can be identified by an EPS bearer identity.

The Header compression configuration status information element is a type 4 information element with 4 the length of 4 octets.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| Header compression configuration status IEI | octet 1 |
| Length of Header compression configuration status contents | octet 2 |
| EBI(7) | EBI(6) | EBI(5) | EBI(4) | EBI(3) | EBI(2) | EBI(1) | EBI(0) | octet 3 |
| EBI(15) | EBI(14) | EBI(13) | EBI(12) | EBI(11) | EBI(10) | EBI(9) | EBI(8) | octet 4 |

Figure 9.9.4.27.1: Header compression configuration status information element

Table 9.9.4.27.1: Header compression configuration status information element

|  |
| --- |
| EBI(x) shall be coded as follows:EBI(0):Bit 0 of octet 3 is spare and shall be coded as zero.EBI(1) – EBI(15):0 indicates that the header compression configuration for the corresponding EPS bearer is used.1 indicates that the header compression configuration for the corresponding EPS bearer is not used.  |

\*\*\*\*\* Next change \*\*\*\*\*

#### 9.9.4.29 Extended APN aggregate maximum bit rate

The purpose of the extended APN aggregate maximum bit rate information element is to indicate the initial subscribed APN-AMBR with a value higher than 65280 Mbps when the UE establishes a PDN connection or to indicate the new APN-AMBR with a value higher than 65280 Mbps if it is changed by the network.

The receiving entity shall ignore the bit rate values which are included in the extended APN aggregate maximum bit rate information element and not higher than 65280 Mbps.

The extended APN aggregate maximum bit rate information element is coded as shown in figure 9.9.4.29.1 and table 9.9.4.29.1.

The extended APN aggregate maximum bit rate is a type 4 information element with a length of 8 octets.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| Extended APN aggregate maximum bit rate IEI | octet 1 |
| Length of extended APN aggregate maximum bit rate contents | octet 2 |
| Unit for extended APN-AMBR for downlink | octet 3 |
| Extended APN-AMBR for downlink | octet 4 |
| Extended APN-AMBR for downlink (continued) | octet 5 |
| Unit for extended APN-AMBR for uplink | octet 6 |
| Extended APN-AMBR for uplink | octet 7 |
| Extended APN-AMBR for uplink (continued) | octet 8 |

Figure 9.9.4.29.1: Extended APN aggregate maximum bit rate information element

Table 9.9.4.29.1: Extended APN aggregate maximum bit rate information element

|  |
| --- |
| Unit for extended APN-AMBR for downlink (octet 3)0 0 0 0 0 0 0 0 value is not used (see NOTE) 0 0 0 0 0 0 0 1 value is not used (see NOTE) 0 0 0 0 0 0 1 0 value is not used (see NOTE) 0 0 0 0 0 0 1 1 value is incremented in multiples of 4 Mbps 0 0 0 0 0 1 0 0 value is incremented in multiples of 16 Mbps 0 0 0 0 0 1 0 1 value is incremented in multiples of 64 Mbps 0 0 0 0 0 1 1 0 value is incremented in multiples of 256 Mbps 0 0 0 0 0 1 1 1 value is incremented in multiples of 1 Gbps 0 0 0 0 1 0 0 0 value is incremented in multiples of 4 Gbps 0 0 0 0 1 0 0 1 value is incremented in multiples of 16 Gbps 0 0 0 0 1 0 1 0 value is incremented in multiples of 64 Gbps 0 0 0 0 1 0 1 1 value is incremented in multiples of 256 Gbps 0 0 0 0 1 1 0 0 value is incremented in multiples of 1 Tbps 0 0 0 0 1 1 0 1 value is incremented in multiples of 4 Tbps 0 0 0 0 1 1 1 0 value is incremented in multiples of 16 Tbps 0 0 0 0 1 1 1 1 value is incremented in multiples of 64 Tbps 0 0 0 1 0 0 0 0 value is incremented in multiples of 256 Tbps 0 0 0 1 0 0 0 1 value is incremented in multiples of 1 Pbps 0 0 0 1 0 0 1 0 value is incremented in multiples of 4 Pbps 0 0 0 1 0 0 1 1 value is incremented in multiples of 16 Pbps 0 0 0 1 0 1 0 0 value is incremented in multiples of 64 Pbps 0 0 0 1 0 1 0 1 value is incremented in multiples of 256 PbpsOther values shall be interpreted as multiples of 256 Pbps in this version of the protocol.Extended APN-AMBR for downlink (octets 4 and 5)Octets 4 and 5 represent the binary coded value of extended APN-AMBR for downlink in units defined by octet 3Unit for extended APN-AMBR for uplink (octet 6)The coding is identical to that of the unit for extended APN-AMBR for downlink (octet 3)Extended APN-AMBR for uplink (octets 7 and 8)Octets 7 and 8 represent the binary coded value of extended APN-AMBR for uplink in units defined by octet 6.NOTE: In this release of the specifications if received it shall be interpreted as value is incremented in multiples of 4 Mbps. In earlier releases of specifications, the interpretation of this value is up to implementation. |

\*\*\*\*\* Next change \*\*\*\*\*

#### 9.9.4.30 Extended quality of service

The purpose of the Extended quality of service information element is to indicate for an EPS bearer context the maximum bit rates for uplink and downlink and the guaranteed bit rates for uplink and downlink, if at least one of the bit rates has a value higher than 10 Gbps.

The Extended quality of service information element is coded as shown in figure 9.9.4.30.1 and table 9.9.4.30.1. For uplink and downlink, if the sending entity only has to indicate one bit rate (i.e., with a value higher than 10 Gbps), it shall encode the other bit rate (i.e., with a value smaller or equal to 10 Gbps) as "00000000". The receiving entity shall ignore a bit rate which is included in the extended quality of service information element and has a value smaller or equal to 10 Gbps.

The Extended quality of service is a type 4 information element with a length of 12 octets.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |  |
| Extended quality of service IEI | octet 1 |
| Length of Extended quality of service contents | octet 2 |
| Unit for maximum bit rate | octet 3 |
| Maximum bit rate for uplink | octet 4 |
| Maximum bit rate for uplink (continued) | octet 5 |
| Maximum bit rate for downlink | octet 6 |
| Maximum bit rate for downlink (continued) | octet 7 |
| Unit for guaranteed bit rate | octet 8 |
| Guaranteed bit rate for uplink | octet 9 |
| Guaranteed bit rate for uplink (continued) | octet 10 |
| Guaranteed bit rate for downlink | octet 11 |
| Guaranteed bit rate for downlink (continued) | octet 12 |

Figure 9.9.4.30.1: Extended quality of service information element

Table 9.9.4.30.1: Extended quality of service information element

|  |
| --- |
| Unit for maximum bit rate (octet 3) 0 0 0 0 0 0 0 0 value is not used (see NOTE) 0 0 0 0 0 0 0 1 value is incremented in multiples of 200 kbps 0 0 0 0 0 0 1 0 value is incremented in multiples of 1 Mbps 0 0 0 0 0 0 1 1 value is incremented in multiples of 4 Mbps 0 0 0 0 0 1 0 0 value is incremented in multiples of 16 Mbps 0 0 0 0 0 1 0 1 value is incremented in multiples of 64 Mbps 0 0 0 0 0 1 1 0 value is incremented in multiples of 256 Mbps 0 0 0 0 0 1 1 1 value is incremented in multiples of 1 Gbps 0 0 0 0 1 0 0 0 value is incremented in multiples of 4 Gbps 0 0 0 0 1 0 0 1 value is incremented in multiples of 16 Gbps 0 0 0 0 1 0 1 0 value is incremented in multiples of 64 Gbps 0 0 0 0 1 0 1 1 value is incremented in multiples of 256 Gbps 0 0 0 0 1 1 0 0 value is incremented in multiples of 1 Tbps 0 0 0 0 1 1 0 1 value is incremented in multiples of 4 Tbps 0 0 0 0 1 1 1 0 value is incremented in multiples of 16 Tbps 0 0 0 0 1 1 1 1 value is incremented in multiples of 64 Tbps 0 0 0 1 0 0 0 0 value is incremented in multiples of 256 Tbps 0 0 0 1 0 0 0 1 value is incremented in multiples of 1 Pbps 0 0 0 1 0 0 1 0 value is incremented in multiples of 4 Pbps 0 0 0 1 0 0 1 1 value is incremented in multiples of 16 Pbps 0 0 0 1 0 1 0 0 value is incremented in multiples of 64 Pbps 0 0 0 1 0 1 0 1 value is incremented in multiples of 256 PbpsOther values shall be interpreted as multiples of 256 Pbps in this version of the protocol.Maximum bit rate for uplink (octets 4 and 5)Octets 4 and 5 represent the binary coded value of maximum bit rate for uplink in units defined by octet 3.Maximum bit rate for downlink (octets 6 and 7)Octets 6 and 7 represent the binary coded value of maximum bit rate for downlink in units defined by octet 3.Unit for guaranteed bit rate (octet 8)The coding is identical to that of the unit for maximum bit rate (octet 3).Guaranteed bit rate for uplink (octets 9 and 10)Octets 9 and 10 represent the binary coded value of guaranteed bit rate for uplink in units defined by octet 8.Guaranteed bit rate for downlink (octets 11 and 12)Octets 11 and 12 represent the binary coded value of guaranteed bit rate for downlink in units defined by octet 8.NOTE: In this release of the specifications if received it shall be interpreted as value is incremented in multiples of 200 Kbps. In earlier releases of specifications, the interpretation of this value is up to implementation. |

\*\*\*\*\* Next change \*\*\*\*\*

## 10.2 Timers of EPS mobility management

Table 10.2.1: EPS mobility management timers – UE side

| TIMER NUM. | TIMER VALUE | STATE | CAUSE OF START | NORMAL STOP | ON EXPIRY |
| --- | --- | --- | --- | --- | --- |
| T3402 | Default 12 min.NOTE 1 | EMM-DEREGISTEREDEMM-REGISTERED | At attach failure and the attempt counter is equal to 5.At tracking area updating failure and the attempt counter is equal to 5.ATTACH ACCEPT with EMM cause #16 or #17 and the attempt counter is equal to 5 for CS/PS mode 2 UE, or ATTACH ACCEPT with EMM cause #22, as described in subclause 5.5.1.3.4.3.TRACKING AREA UPDATE ACCEPT with EMM cause #16 or #17 and the attempt counter is equal to 5 for CS/PS mode 2 UE, TRACKING AREA UPDATE ACCEPT with EMM cause #16 or #17 and the attempt counter is equal to 5 for CS/PS mode 1 UE with "IMS voice not available" and with a persistent EPS bearer context, or TRACKING AREA UPDATE ACCEPT with EMM cause #22, as described in subclause 5.5.3.3.4.3.ATTACH ACCEPT and the attempt counter is equal to 5 as described in subclause 5.5.1.2.4A and 5.5.1.2.6A.TRACKING AREA UPDATE ACCEPT and the attempt counter is equal to 5 as described in subclause 5.5.3.2.4A and 5.5.3.2.6A.DETACH REQUEST with other EMM cause values than those treated in subclause 5.5.2.3.2 or no EMM cause IE and Detach type IE indicates "re-attach not required" as described in subclause 5.5.2.3.4.  | ATTACH REQUEST sentTRACKING AREA UPDATE REQUEST sentNAS signalling connection released | Initiation of the attach procedure, if still required or TAU procedure |
| T3410 | 15sNOTE 7NOTE 8In WB-S1/CE mode, 85s | EMM-REGISTERED-INITIATED | ATTACH REQUEST sent | ATTACH ACCEPT receivedATTACH REJECT received | Start T3411 or T3402 as described in subclause 5.5.1.2.6 |
| T3411 | 10s | EMM-DEREGISTERED. ATTEMPTING-TO-ATTACHEMM-REGISTERED. ATTEMPTING-TO-UPDATEEMM-REGISTERED. NORMAL-SERVICE | At attach failure due to lower layer failure, T3410 timeout or attach rejected with other EMM cause values than those treated in subclause 5.5.1.2.5.At tracking area updating failure due to lower layer failure, T3430 timeout or TAU rejected with other EMM cause values than those treated in subclause 5.5.3.2.5.ATTACH ACCEPT and the attempt counter is less than 5 as described in subclause 5.5.1.2.4A and 5.5.1.2.6A.TRACKING AREA UPDATE ACCEPT and the attempt counter is less than 5 as described in subclause 5.5.3.2.4A and 5.5.3.2.6A. | ATTACH REQUEST sentTRACKING AREA UPDATE REQUEST sentEMM-CONNECTED mode entered (NOTE 6) | Retransmission of the ATTACH REQUEST, if still required as described in subclause 5.5.1.2.6 or retransmission of TRACKING AREA UPDATE REQUEST |
| T3412 | Default 54 min.NOTE 2NOTE 5 | EMM-REGISTERED | In EMM-REGISTERED, when EMM-CONNECTED mode is left. | When entering state EMM-DEREGISTERED or when entering EMM-CONNECTED mode.  | Initiation of the periodic TAU procedure if the UE is not attached for emergency bearer services or T3423 started under the conditions as specified in subclause 5.3.5.Implicit detach from network if the UE is attached for emergency bearer services. |
| T3416 | 30sNOTE 7NOTE 8In WB-S1/CE mode, 48s | EMM-REGISTERED-INITIATEDEMM-REGISTEREDEMM-DEREGISTERED-INITIATEDEMM-TRACKING-AREA-UPDATING-INITIATEDEMM-SERVICE-REQUEST-INITIATED | RAND and RES stored as a result of an EPS authentication challenge | SECURITY MODE COMMAND receivedSERVICE REJECT receivedSERVICE ACCEPT receivedTRACKING AREA UPDATE ACCEPT receivedAUTHENTICATION REJECT receivedAUTHENTICATION FAILURE sentEMM-DEREGISTERED, EMM-NULL orEMM-IDLE mode entered | Delete the stored RAND and RES |
| T3417 | 5s NOTE 7NOTE 8 In WB-S1/CE mode, 51s | EMM-SERVICE-REQUEST-INITIATED | SERVICE REQUEST sentEXTENDED SERVICE REQUEST sent in case f, g, i and j in subclause 5.6.1.1EXTENDED SERVICE REQUEST sent with service type set to "packet services via S1" in case a, b, c, h and k in subclause 5.6.1.1CONTROL PLANE SERVICE REQUEST sent as specified in subclause 5.6.1.2.2 | Bearers have been set upSERVICE REJECT receivedSERVICE ACCEPT receivedIndication of system change from lower layer receivedcdma2000® 1xCS fallback rejection receivedsee subclause 5.6.1.4.2 | Abort the procedure |
| T3417ext | 10s | EMM-SERVICE-REQUEST-INITIATED | EXTENDED SERVICE REQUEST sent in case d in subclause 5.6.1.1 | Inter-system change from S1 mode to A/Gb mode or Iu mode is completedInter-system change from S1 mode to A/Gb mode or Iu mode is failedSERVICE REJECT received | Select GERAN or UTRAN |
| T3417ext-mt | 4s | EMM-SERVICE-REQUEST-INITIATED | EXTENDED SERVICE REQUEST sent in case e in subclause 5.6.1.1 and the CSFB response was set to "CS fallback accepted by the UE" | Inter-system change from S1 mode to A/Gb mode or Iu mode is completedInter-system change from S1 mode to A/Gb mode or Iu mode is failedSERVICE REJECT received | Select GERAN or UTRAN |
| T3418 | 20sNOTE 7NOTE 8In WB-S1/CE mode, 38s | EMM-REGISTERED-INITIATEDEMM-REGISTEREDEMM-TRACKING-AREA-UPDATING-INITIATEDEMM-DEREGISTERED-INITIATEDEMM-SERVICE-REQUEST-INITIATED | AUTHENTICATION FAILURE (EMM cause = #20 "MAC failure" or #26 "non-EPS authentication unacceptable") sent | AUTHENTICATION REQUEST received or AUTHENTICATION REJECT receivedorSECURITY MODE COMMAND receivedwhen entering EMM-IDLE modeindication of transmission failure of AUTHENTICATION FAILURE message from lower layers | On first expiry, the UE should consider the network as false and follow item f of subclause 5.4.2.7, if the UE is not attached for emergency bearer services or access to RLOS.On first expiry, the UE will follow subclause 5.4.2.7 under "For items c, d, and e:", if the UE is attached for emergency bearer services or if the UE is attached for access to RLOS. |
| T3420 | 15sNOTE 7NOTE 8In WB-S1/CE mode, 33s | EMM-REGISTERED-INITIATEDEMM-REGISTEREDEMM-DEREGISTERED-INITIATEDEMM-TRACKING-AREA-UPDATING-INITIATEDEMM-SERVICE-REQUEST-INITIATED | AUTHENTICATION FAILURE (cause = #21 "synch failure") sent | AUTHENTICATION REQUEST received or AUTHENTICATION REJECT receivedorSECURITY MODE COMMAND receivedwhen entering EMM-IDLE modeindication of transmission failure of AUTHENTICATION FAILURE message from lower layers | On first expiry, the UE should consider the network as false and follow item f of subclause 5.4.2.7, if the UE is not attached for emergency bearer services or access to RLOS.On first expiry, the UE will follow subclause 5.4.2.7 under "For items c, d, and e:", if the UE is attached for emergency bearer services or if the UE is attached for access to RLOS. |
| T3421 | 15sNOTE 7NOTE 8In WB-S1/CE mode, 45s | EMM-DEREGISTERED-INITIATEDEMM-REGISTERED.IMSI-DETACH-INITIATED | DETACH REQUEST sent with the Detach type IE not indicating "switch off" | DETACH ACCEPT received | Retransmission of DETACH REQUEST |
| T3423 | NOTE 3 | EMM-REGISTERED | T3412 expires while ISR is activated and either T3346 is running or the UE is in one of the following states:- EMM-REGISTERED.NO-CELL-AVAILABLE;- EMM-REGISTERED.PLMN-SEARCH; -EMM-REGISTERED.UPDATE-NEEDED; or-EMM-REGISTERED.LIMITED-SERVICE. | When entering state EMM-DEREGISTERED or when entering EMM-CONNECTED mode. | Set TIN to "P‑TMSI".For A/Gb mode or Iu mode, see 3GPP TS 24.008 [13] |
| T3430 | 15sNOTE 7NOTE 8 In WB-S1/CE mode, 77s | EMM-TRACKING-AREA-UPDATING-INITIATED | TRACKING AREA UPDATE REQUEST sent | TRACKING AREA UPDATE ACCEPT receivedTRACKING AREA UPDATE REJECT received | Start T3411 or T3402 as described in subclause 5.5.3.2.6 |
| T3440 | 10s | EMM-DEREGISTERED EMM-REGISTERED | ATTACH REJECT, DETACH REQUEST, TRACKING AREA UPDATE REJECT with any of the EMM cause #3, #6, #7, #8, #11, #12, #13, #14, #15, #25, #31 or #35SERVICE REJECT received with any of the EMM cause #3, #6, #7, #8, #11, #12, #13, #15, #25, #31, #35 or #39TRACKING AREA UPDATE ACCEPT received after the UE sent TRACKING AREA UPDATE REQUEST in EMM-IDLE mode without the "active" flag set and without the "signalling active" flag set, and the user-plane radio bearers have not been setupDETACH ACCEPT received after the UE sent DETACH REQUEST with detach type to "IMSI detach"Upon receipt of ESM DATA TRANSPORT message as described in subclause 5.3.1.2.1 (NOTE 9)AUTHENTICATION REJECT received | NAS signalling connection releasedBearers have been set up or a request for PDN connection for emergency bearer services or a CS emergency call is startedUpon receipt of ESM DATA TRANSPORT message as described in subclause 5.3.1.2.1 (NOTE 9) | Release the NAS signalling connection for the cases a), b) and c) as described in subclause 5.3.1.2 |
| EMM-DEREGISTEREDEMM-DEREGISTERED.NORMAL-SERVICE | TRACKING AREA UPDATE REJECT, SERVICE REJECT with any of the EMM cause #9, #10 or #40 | NAS signalling connection released | Release the NAS signalling connection for the cases d) and e) as described in subclause 5.3.1.2 and initiation of the attach procedure as specified in subclause 5.5.3.2.5, 5.5.3.3.5 or 5.6.1.5  |
| T3442 | NOTE 4 | EMM-REGISTERED | SERVICE REJECT received with EMM cause #39 "CS service temporarily not available" with a non-zero T3442 value | TRACKING AREA UPDATE REQUEST sent | None |
| T3444 | NOTE 11 | All except EMM-NULL and 5GMM-NULL (defined in 3GPP TS 24.501 [54]) | - UE configured for eCall only mode enters EMM-IDLE mode after an eCall over IMS- UE configured for eCall only mode moves from GERAN/UTRAN to E-UTRAN with timer T3242 (see 3GPP TS 24.008 [13]) running- UE configured for eCall only mode enters 5GMM-IDLE mode (defined in 3GPP TS 24.501 [54]) after an eCall over IMS | - Removal of eCall only restriction- Intersystem change from S1 mode to A/Gb or Iu mode | Perform eCall inactivity procedure in EPS as described in subclause 5.5.4.Perform eCall inactivity procedure in 5GS as described in 3GPP TS 24.501 [54]. |
| T3445 | NOTE 12 | All except EMM-NULL and 5GMM-NULL (defined in 3GPP TS 24.501 [54]) | - UE configured for eCall only mode enters EMM-IDLE mode after a call to a non-emergency MSISDN or URI for test or terminal reconfiguration service- UE configured for eCall only mode moves from GERAN/UTRAN to E-UTRAN with timer T3243 (see 3GPP TS 24.008 [13]) running- UE configured for eCall only mode enters 5GMM-IDLE mode (defined in 3GPP TS 24.501 [54]) after a call to a non-emergency MSISDN or URI for test or terminal reconfiguration service | Removal of eCall only restriction- Intersystem change from S1 mode to A/Gb or Iu mode | Perform eCall inactivity procedure in EPS as described in subclause 5.5.4.Perform eCall inactivity procedure in 5GS as described in 3GPP TS 24.501 [54]. |
| T3447 | NOTE 2 | All except EMM-NULL | NAS signalling connection release that was not established for paging, attach without PDN connection or tracking area update request without "active" or "signalling active" flag set.N1 NAS signalling connection release that was not established due to paging, or REGISTRATION REQUEST for initial registration with Follow-on request indicator set to "No follow-on request pending", or REGISTRATION REQUEST for mobility and periodic registration update with Follow-on request indicator set to "No follow-on request pending" and without Uplink data status IE included (defined in 3GPP TS 24.501 [54]). | ATTACH ACCEPT or TRACKING AREA UPDATE ACCEPT without the T3447 value IE.Inter-system change from S1 mode to A/Gb mode or Iu mode is completedREGISTRATION ACCEPT without the T3447 value IE (defined in 3GPP TS 24.501 [54]). CONFIGURATION UPDATE COMMAND with the T3447 value IE set to zero or deactivated (defined in 3GPP TS 24.501 [54]). | Allowed to initiate transfer of uplink user data |
| T3448 | NOTE 10 | All except EMM-NULL and 5GMM-NULL (defined in 3GPP TS 24.501 [54]) | ATTACH ACCEPT message or TRACKING AREA UPDATE ACCEPT message or SERVICE ACCEPT message received with a non-zero T3448 value.SERVICE REJECT message received with EMM cause #22 "Congestion" and a non-zero T3448 value.REGISTRATION ACCEPT message or SERVICE ACCEPT message received with a non-zero T3448 value (defined in 3GPP TS 24.501 [54])SERVICE REJECT message received with 5GMM cause #22 "Congestion" and a non-zero T3448 value (defined in 3GPP TS 24.501 [54]) | SERVICE ACCEPT message or TRACKING AREA UPDATE ACCEPT message received without T3448 valueSERVICE ACCEPT message or REGISTRATION ACCEPT message received without T3448 value (defined in 3GPP TS 24.501 [54]) | Allowed to initiate transfer of user data via the control plane |
| T3449 | 5sNOTE 7NOTE 8 In WB-S1/CE mode, 51s | EMM-REGISTERED | Bearers have been set upSECURITY MODE COMMAND message received | SERVICE ACCEPT message receivedSecurity protected ESM message or a security protected EMM message not related to an EMM common procedure received | SERVICE ACCEPT message considered as a protocol error and EMM STATUS returned |
| NOTE 1: The cases in which the default value of this timer is used are described in subclause 5.3.6.NOTE 2: The value of this timer is provided by the network operator during the attach and tracking area updating procedures.NOTE 3: The value of this timer may be provided by the network in the ATTACH ACCEPT message and TRACKING AREA UPDATE ACCEPT message. The default value of this timer is identical to the value of T3412.NOTE 4: The value of this timer is provided by the network operator when a service request for CS fallback is rejected by the network with EMM cause #39 "CS service temporarily not available".NOTE 5: The default value of this timer is used if the network does not indicate a value in the TRACKING AREA UPDATE ACCEPT message and the UE does not have a stored value for this timer.NOTE 6: The conditions for which this applies are described in subclause 5.5.3.2.6.NOTE 7: In NB-S1 mode, the timer value shall be calculated as described in subclause 4.7.NOTE 8: In WB-S1 mode, if the UE supports CE mode B and operates in either CE mode A or CE mode B, then the timer value is as described in this table for the case of WB-S1/CE mode (see subclause 4.8).NOTE 9: It is possible that the UE does not stop or start timer T3440 upon receipt of ESM DATA TRANSPORT message as described in subclause 5.3.1.2.1.NOTE 10: The timer value is provided by the network in the ATTACH ACCEPT, TRACKING AREA UPDATE ACCEPT, SERVICE ACCEPT, SERVICE REJECT or REGISTRATION ACCEPT message, or chosen randomly from a default value range of 15 – 30 minutes.NOTE 11: If the timer is started due to a UE configured for eCall only mode moving from GERAN/UTRAN to E-UTRAN with timer T3242 (see 3GPP TS 24.008 [13]) running, the UE starts the timer with a value set to the time left on timer T3242. Otherwise the UE starts the timer with a value set to 12 hours.NOTE 12: If the timer is started due to a UE configured for eCall only mode moving from GERAN/UTRAN to E-UTRAN with timer T3243 (see 3GPP TS 24.008 [13]) running, the UE starts the timer with a value set to the time left on timer T3243. Otherwise the UE starts the timer with a value set to 12 hours. |

Table 10.2.2: EPS mobility management timers – network side

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| TIMER NUM. | TIMER VALUE | STATE  | CAUSE OF START | NORMAL STOP | ON THE1st, 2nd, 3rd, 4th EXPIRY (NOTE 1) |
| T3413NOTE 8 NOTE 10 | NOTE 2 | EMM-REGISTERED | Paging procedure for EPS services initiated | Paging procedure for EPS services completedPaging procedure is aborted | Network dependent |
| T3415 NOTE 8NOTE 10 | NOTE 6 | EMM-REGISTERED | Paging procedure for EPS services initiated for a UE which the network accepted the request to use eDRX and the UE does not have a PDN connection for emergency bearer services | Paging procedure for EPS services completedPaging procedure is aborted | Paging procedure is aborted and the network proceeds as specified in 3GPP TS 23.401 [10] |
| T3422NOTE 7NOTE 9 | 6sIn WB-S1/CE mode, 24s | EMM-DEREGISTERED-INITIATED | DETACH REQUEST sent | DETACH ACCEPT received | Retransmission of DETACH REQUEST |
| T3447 | NOTE 2 | All | UE transitions from EMM-CONNECTED mode to EMM-IDLE mode except when UE was in EMM-CONNECTED mode due to paging, attach without PDN connection or tracking area update request without "active" or "signalling active" flag setUE transitions from 5GMM-CONNECTED mode to 5GMM-IDLE mode except when UE was in 5GMM-CONNECTED mode due to paging, REGISTRATION REQUEST for initial registration with Follow-on request indicator set to "No follow-on request pending", or REGISTRATION REQUEST for mobility and periodic registration update with Follow-on request indicator set to "No follow-on request pending" and without Uplink data status IE included. | ATTACH ACCEPT or TRACKING AREA UPDATE ACCEPT without the T3447 value IE. At MME during inter-system change from S1 mode to N1 mode.REGISTRATION ACCEPT without the T3447 value IE (defined in 3GPP TS 24.501 [54]). CONFIGURATION UPDATE COMMAND with the T3447 value IE set to zero or deactivated (defined in 3GPP TS 24.501 [54]). At AMF during inter-system change from N1 mode to S1 mode defined in 3GPP TS 24.501 [54]). | Allow the UE to initiate a connection for transfer of uplink user data. |
| T3450NOTE 7NOTE 9 | 6sIn WB-S1/CE mode, 18s | EMM-COMMON-PROC-INIT | ATTACH ACCEPT sentTRACKING AREA UPDATE ACCEPT sent with GUTITRACKING AREA UPDATE ACCEPT sent with TMSIGUTI REALLOCATION COMMAND sent | ATTACH COMPLETE receivedTRACKING AREA UPDATE COMPLETE receivedGUTI REALLOCATION COMPLETE received | Retransmission of the same message type, i.e. ATTACH ACCEPT, TRACKING AREA UPDATE ACCEPT or GUTI REALLOCATION COMMAND |
| T3460NOTE 7NOTE 9 | 6sIn WB-S1/CE mode, 24s | EMM-COMMON-PROC-INIT | AUTHENTICATION REQUEST sentSECURITY MODE COMMAND sent | AUTHENTICATION RESPONSE receivedAUTHENTICATION FAILURE receivedSECURITY MODE COMPLETE receivedSECURITY MODE REJECT received | Retransmission of the same message type, i.e. AUTHENTICATION REQUESTor SECURITY MODE COMMAND |
| T3470NOTE 7NOTE 9 | 6sIn WB-S1 mode, 24s | EMM-COMMON-PROC-INIT | IDENTITY REQUEST sent | IDENTITY RESPONSE received | Retransmission of IDENTITY REQUEST |
| Mobile reachable | NOTE 4 | All except EMM-DEREGISTERED | Entering EMM-IDLE mode | NAS signalling connection established | Network dependent, but typically paging is halted on 1st expiry if the UE is not attached for emergency bearer services.Implicitly detach the UE which is attached for emergency bearer services. |
| Implicit detach timer | NOTE 3 | All except EMM-DEREGISTERED | The mobile reachable timer expires while the network is in EMM-IDLE mode  | NAS signalling connection established | Implicitly detach the UE on 1st expiry |
| active timer | NOTE 5 | All except EMM-DEREGISTERED | Entering EMM-IDLE mode | NAS signalling connection established | Network dependent, but typically paging is halted on 1st expiry  |
| NOTE 1: Typically, the procedures are aborted on the fifth expiry of the relevant timer. Exceptions are described in the corresponding procedure description.NOTE 2: The value of this timer is network dependent.NOTE 3: The value of this timer is network dependent. If ISR is activated, the default value of this timer is 4 minutes greater than T3423.NOTE 4: The default value of this timer is 4 minutes greater than T3412. If T3346 is larger than T3412 and the MME includes timer T3346 in the TRACKING AREA UPDATE REJECT message or SERVICE REJECT message, the value of the mobile reachable timer and implicit detach timer is set such that the sum of the timer values is greater than T3346. If the UE is attached for emergency bearer services, the value of this timer is set equal to T3412.NOTE 5: If the MME includes timer T3324 in the ATTACH ACCEPT message or TRACKING AREA UPDATE ACCEPT message and if the UE is not attached for emergency bearer services and has no PDN connection for emergency bearer services, the value of this timer is equal to the value of timer T3324.NOTE 6: The value of this timer is smaller than the value of timer T3-RESPONSE (see 3GPP TS 29.274 [16D]).NOTE 7: In NB-S1 mode, then the timer value shall be calculated as described in subclause 4.7.NOTE 8: In NB-S1 mode, then the timer value shall be calculated by using an NAS timer value which is network dependent.NOTE 9: In WB-S1 mode, if the UE supports CE mode B and operates in either CE mode A or CE mode B, then the timer value is as described in this table for the case of WB-S1/CE mode (see subclause 4.8).NOTE 10: In WB-S1 mode, if the UE supports CE mode B, then the timer value shall be calculated by using an NAS timer value which value is network dependent. |

\*\*\*\*\* Next change \*\*\*\*\*

# A.1 Causes related to UE identification

Cause #2 – IMSI unknown in HSS

 This EMM cause is sent to the UE if the UE is not known (registered) in the HSS or if the UE has packet only subscription. This EMM cause does not affect operation of the EPS service, although it may be used by an EMM procedure.

Cause #3 – Illegal UE

 This EMM cause is sent to the UE when the network refuses service to the UE either because an identity of the UE is not acceptable to the network or because the UE does not pass the authentication check, i.e. the RES received from the UE is different from that generated by the network.

Cause #6 – Illegal ME

 This EMM cause is sent to the UE if the ME used is not acceptable to the network, e.g. blacklisted.

Cause #9 – UE identity cannot be derived by the network.

 This EMM cause is sent to the UE when the network cannot derive the UE's identity from the GUTI/S-TMSI/P-TMSI and RAI e.g. no matching identity/context in the network or failure to validate the UE's identity due to integrity check failure of the received message.

Cause #10 – Implicitly detached

 This EMM cause is sent to the UE either if the network has implicitly detached the UE, e.g. after the implicit detach timer has expired, or if the EMM context data related to the subscription does not exist in the MME e.g. because of a MME restart, or because of a periodic tracking area update request routed to a new MME.

\*\*\*\*\* Next change \*\*\*\*\*

# D.1 Mapping of NAS procedure to RRC establishment cause (S1 mode only)

When EMM requests the establishment of a NAS-signalling connection, or when EMM requests the lower layers to resume a NAS signalling connection, the RRC establishment cause used by the UE shall be selected according to the NAS procedure as specified in table D.1.1. The EMM shall also indicate to the lower layer for the purpose of access control, the call type associated with the RRC establishment cause as specified in table D.1.1. If the UE is configured for EAB (see the "ExtendedAccessBarring" leaf of NAS configuration MO in 3GPP TS 24.368 [15A] or 3GPP TS 31.102 [17]), the EMM shall indicate to the lower layer for the purpose of access control that EAB applies for this request except for the following cases:

- the UE is a UE configured to use AC11 – 15 in selected PLMN;

- the UE is answering to paging;

- the RRC Establishment cause is set to "Emergency call";

- the UE is configured to allow overriding EAB (see the "Override\_ExtendedAccessBarring" leaf of the NAS configuration MO as specified in 3GPP TS 24.368 [15A] or 3GPP TS 31.102 [17]) and receives an indication from the upper layers to override EAB; or

- the UE is configured to allow overriding EAB (see the "Override\_ExtendedAccessBarring" leaf of the NAS configuration MO as specified in 3GPP TS 24.368 [15A] or 3GPP TS 31.102 [17]) and already has a PDN connection that was established with EAB override.

Table D.1.1: Mapping of NAS procedure to establishment cause and call type

|  |  |  |
| --- | --- | --- |
| **NAS procedure** | **RRC establishment cause (according 3GPP TS 36.331 [22])** | **Call type** |
| Attach | If an ATTACH REQUEST has EPS attach type not set to "EPS emergency attach", the RRC establishment cause shall be set to MO signalling except when the UE initiates attach procedure to establish emergency bearer services.(See Note 1) | "originating signalling" |
| If an ATTACH REQUEST contains the Device properties IE with low priority indicator set to "MS is configured for NAS signalling low priority", the RRC establishment cause shall be set to Delay tolerant.(See Note 1) | "originating signalling" |
| If an ATTACH REQUEST has EPS attach type set to "EPS emergency attach", or if the ATTACH REQUEST has EPS attach type not set to "EPS emergency attach" but the UE initiates the attach procedure either on receiving request from upper layer to establish emergency bearer services or with a PDN CONNECTIVITY REQUEST that has request type set to "handover of emergency bearer services", the RRC establishment cause shall be set to Emergency call.(See Note 1, Note 4) | "emergency calls" |
| If the UE is allowed to use exception data reporting (see the ExceptionDataReportingAllowed leaf of the NAS configuration MO in 3GPP TS 24.368 [15A] or the USIM file EFNASCONFIG in 3GPP TS 31.102 [17]) and the attach procedure has been initiated upon receiving a request from upper layers to transmit user data related to an exceptional event, the RRC establishment cause shall be set to MO exception data.(See Note 1)  | "originating signalling" |
| Tracking Area Update | If the UE does not have a PDN connection established for emergency bearer services and is not initiating a PDN CONNECTIVITY REQUEST that has request type set to "emergency" or "handover of emergency bearer services", and MO MMTEL voice call is not started, MO MMTEL video call is not started, MO SMSoIP is not started, MO SMS over NAS or MO SMS over S102 is not requested, the RRC establishment cause shall be set to MO signalling.(See Note 1, Note 5) | "originating signalling" |
| If the UE does not have a PDN connection established for emergency bearer services and is not initiating a PDN CONNECTIVITY REQUEST that has request type set to "emergency" or "handover of emergency bearer services", and an MO MMTEL voice call is started, the RRC establishment cause shall be set to MO signalling.(See Note 1, Note 3, Note 5) | "originating MMTEL voice"  |
| If the UE does not have a PDN connection established for emergency bearer services and is not initiating a PDN CONNECTIVITY REQUEST that has request type set to "emergency" or "handover of emergency bearer services", and an MO MMTEL video call is started, the RRC establishment cause shall be set to MO signalling.(See Note 1, Note 3, Note 5) | "originating MMTEL video" |
| If the UE does not have a PDN connection established for emergency bearer services and is not initiating a PDN CONNECTIVITY REQUEST that has request type set to "emergency" or "handover of emergency bearer services", and an MO SMSoIP is started, the RRC establishment cause shall be set to MO signalling.(See Note 1, Note 5) | "originating SMSoIP" |
| If the UE does not have a PDN connection established for emergency bearer services and is not initiating a PDN CONNECTIVITY REQUEST that has request type set to "emergency" or "handover of emergency bearer services", and an MO SMS over NAS or MO SMS over S102 is requested, the RRC establishment cause shall be set to MO signalling.(See Note 1, Note 5) | "originating SMS" |
| If the UE does not have a PDN connection established for emergency bearer services and is not initiating a PDN CONNECTIVITY REQUEST that has request type set to "emergency" or "handover of emergency bearer services", the tracking area updating procedure is not triggered due to paging, a TRACKING AREA UPDATE REQUEST contains the Device properties IE with low priority indicator set to "MS is configured for NAS signalling low priority", and MO MMTEL voice call is not started, MO MMTEL video call is not started, MO SMSoIP is not started, MO SMS over NAS or MO SMS over S102 is not requested, the RRC establishment cause shall be set to Delay tolerant.(See Note 1) | "originating signalling" |
| If the UE does not have a PDN connection established for emergency bearer services and is not initiating a PDN CONNECTIVITY REQUEST that has request type set to "emergency" or "handover of emergency bearer services", an MO MMTEL voice call is started, and a TRACKING AREA UPDATE REQUEST contains the Device properties IE with low priority indicator set to "MS is configured for NAS signalling low priority", the RRC establishment cause shall be set to MO signalling.(See Note 1, Note 3, Note 5) | "originating MMTEL voice"  |
| If the UE does not have a PDN connection established for emergency bearer services and is not initiating a PDN CONNECTIVITY REQUEST that has request type set to "emergency" or "handover of emergency bearer services", an MO MMTEL video call is started, and a TRACKING AREA UPDATE REQUEST contains the Device properties IE with low priority indicator set to "MS is configured for NAS signalling low priority", the RRC establishment cause shall be set to MO signalling.(See Note 1, Note 3, Note 5) | "originating MMTEL video" |
| If the UE does not have a PDN connection established for emergency bearer services and is not initiating a PDN CONNECTIVITY REQUEST that has request type set to "emergency" or "handover of emergency bearer services", an MO SMSoIP is started, and a TRACKING AREA UPDATE REQUEST contains the Device properties IE with low priority indicator set to "MS is configured for NAS signalling low priority", the RRC establishment cause shall be set to MO signalling.(See Note 1, Note 5) | "originating SMSoIP" |
| If the UE does not have a PDN connection established for emergency bearer services and is not initiating a PDN CONNECTIVITY REQUEST that has request type set to "emergency" or "handover of emergency bearer services", an MO SMS over NAS or MO SMS over S102 is requested, and a TRACKING AREA UPDATE REQUEST contains the Device properties IE with low priority indicator set to "MS is configured for NAS signalling low priority", the RRC establishment cause shall be set to MO signalling.(See Note 1, Note 5) | "originating SMS" |
| If the UE does not have a PDN connection established for emergency bearer services and is not initiating a PDN CONNECTIVITY REQUEST that has request type set to "emergency" or "handover of emergency bearer services", and a TRACKING AREA UPDATE REQUEST is a response to paging where the CN domain indicator is set to "PS" or "CS", the RRC establishment cause shall be set to MT access.(See Note 1) | "terminating calls" |
| If the UE has CS fallback emergency call or 1xCS fallback emergency call pending, the RRC establishment cause shall be set to Emergency call.(See Note 1) | "emergency calls" |
| If the UE has a PDN connection established for emergency bearer services or is initiating a PDN CONNECTIVITY REQUEST that has request type set to "emergency" or "handover of emergency bearer services", the RRC establishment cause shall be set to Emergency call.(See Note 1) | "emergency calls" |
| If the UE is allowed to use exception data reporting (see the ExceptionDataReportingAllowed leaf of the NAS configuration MO in 3GPP TS 24.368 [15A] or the USIM file EFNASCONFIG in 3GPP TS 31.102 [17]) and there is a pending request from upper layers to transmit user data related to an exceptional event, the RRC establishment cause shall be set to MO exception data.  | "originating signalling" |
| If the UE is requesting resources for V2X communication over PC5, the RRC establishment cause shall be set to MO signalling. (See Note 1) | "originating signalling" |
| If the UE is requesting resources for V2X communication over PC5 and a TRACKING AREA UPDATE REQUEST contains the Device properties IE with low priority indicator set to "MS is configured for NAS signalling low priority", the RRC establishment cause shall be set to Delay tolerant. (See Note 1) | "originating signalling" |
| If the UE is requesting resources for ProSe direct discovery or ProSe direct communication as specified in 3GPP TS 36.331 [22], the RRC establishment cause shall be set to MO signalling.(See Note 1) | "originating signalling" |
| If the UE is requesting resources for ProSe direct discovery or ProSe direct communication as specified in 3GPP TS 36.331 [22] and a TRACKING AREA UPDATE REQUEST contains the Device properties IE with low priority indicator set to "MS is configured for NAS signalling low priority", the RRC establishment cause shall be set to Delay tolerant.(See Note 1) | "originating signalling" |
| Detach | MO signalling(See Note 1) | "originating signalling" |
|  | If a SERVICE REQUEST is to request user plane radio resources and MO MMTEL voice call is not started, MO MMTEL video call is not started and MO SMSoIP is not started, the RRC establishment cause shall be set to MO data.(See Note 1) | "originating calls" |
| If a SERVICE REQUEST is to request user plane radio resources and an MO MMTEL voice call is started, the RRC establishment cause shall be set to MO data.(See Note 1, Note 3) | "originating MMTEL voice"  |
| If a SERVICE REQUEST is to request user plane radio resources and an MO MMTEL video call is started, the RRC establishment cause shall be set to MO data.(See Note 1, Note 3) | "originating MMTEL video" |
| If a SERVICE REQUEST is to request user plane radio resources and an MO SMSoIP is started, the RRC establishment cause shall be set to MO data.(See Note 1)  | "originating SMSoIP" |
| If a SERVICE REQUEST is to request user plane radio resources for emergency bearer services, the RRC establishment cause shall be set to Emergency call.(See Note 1) | "emergency calls" |
| If a SERVICE REQUEST is to request resources for UL signalling and not for MO SMS over NAS or MO SMS over S102, the RRC establishment cause shall be set to MO data.(See Note 1) | "originating calls" |
| If a SERVICE REQUEST is to request resources for UL signalling for MO SMS over NAS or MO SMS over S102, the RRC establishment cause shall be set to MO data.(See Note 1) | "originating SMS" |
| If a SERVICE REQUEST is to request user plane radio resources or to request resources for UL signalling and the UE is configured for dual priority and the NAS signalling low priority indicator is overridden, the RRC establishment cause shall be set to MO data.(See Note 1) | "originating calls" |
| If a SERVICE REQUEST is triggered by a PDN CONNECTIVITY REQUEST that has request type set to "emergency" or "handover of emergency bearer services", the RRC establishment cause shall be set to Emergency call.(See Note 1) | "emergency calls" |
| If a SERVICE REQUEST is to request user plane radio resources or to request resources for UL signalling, the UE is configured for NAS signalling low priority, and MO MMTEL voice call is not started, MO MMTEL video call is not started and MO SMSoIP is not started, MO SMS over NAS or MO SMS over S102 is not requested, the RRC establishment cause shall be set to Delay tolerant.(See Note 1) | "originating calls" |
| If a SERVICE REQUEST is to request user plane radio resources, an MO MMTEL voice call is started, and the UE is configured for NAS signalling low priority, the RRC establishment cause shall be set to MO data.(See Note 1, Note 3) | "originating MMTEL voice"  |
| If a SERVICE REQUEST is to request user plane radio resources, an MO MMTEL video call is started, and the UE is configured for NAS signalling low priority, the RRC establishment cause shall be set to MO data.(See Note 1, Note 3) | "originating MMTEL video" |
| If a SERVICE REQUEST is to request user plane radio resources, an MO SMSoIP is started, and the UE is configured for NAS signalling low priority, the RRC establishment cause shall be set to MO data.(See Note 1) | "originating SMSoIP" |
| If a SERVICE REQUEST is to request resources for UL signalling for MO SMS over NAS or MO SMS over S102 and the UE is configured for NAS signalling low priority, the RRC establishment cause shall be set to MO data.(See Note 1) | "originating SMS" |
| If a SERVICE REQUEST is a response to paging where the CN domain indicator is set to "PS", the RRC establishment cause shall be set to MT access.(See Note 1) | "terminating calls" |
| If a SERVICE REQUEST is triggered to request resources for ProSe direct discovery or ProSe direct communication as specified in 3GPP TS 36.331 [22], the RRC establishment cause shall be set to MO data.(See Note 1) | "originating calls" |
| If a SERVICE REQUEST is triggered to request resources for ProSe direct discovery or ProSe direct communication as specified in 3GPP TS 36.331 [22] and the UE is configured for NAS signalling low priority, the RRC establishment cause shall be set to Delay tolerant.(See Note 1) | "originating calls" |
| If a SERVICE REQUEST is triggered to request resources for V2X communication over PC5, the RRC establishment cause shall be set to MO data.(See Note 1) | "originating calls" |
| If a SERVICE REQUEST is triggered to request resources for V2X communication over PC5 and the UE is configured for NAS signalling low priority, the RRC establishment cause shall be set to Delay tolerant.(See Note 1) | "originating calls" |
| If an EXTENDED SERVICE REQUEST has service type set to "packet services via S1" and is to request user plane radio resources for emergency bearer services, the RRC establishment cause shall be set to Emergency call.(See Note 1) | "emergency calls" |
| If an EXTENDED SERVICE REQUEST has service type set to "packet services via S1" and is triggered by a PDN CONNECTIVITY REQUEST that has request type set to "emergency" or "handover of emergency bearer services", the RRC establishment cause shall be set to Emergency call.(See Note 1) | "emergency calls" |
| If an EXTENDED SERVICE REQUEST has service type set to "packet services via S1" and is a response to paging where the CN domain indicator is set to "PS", the RRC establishment cause shall be set to MT access.(See Note 1) | "terminating calls" |
| If an EXTENDED SERVICE REQUEST has service type set to "mobile originating CS fallback or 1xCS fallback" and is to request mobile originating 1xCS fallback, or if an EXTENDED SERVICE REQUEST is a response to paging for 1xCS fallback received over cdma2000® 1xRTT and has service type set to "mobile terminating CS fallback or 1xCS fallback", the RRC establishment cause shall be set to MO data.(See Note 1). | "originating calls" |
| If an EXTENDED SERVICE REQUEST has service type set to "mobile originating CS fallback or 1xCS fallback" and is to request mobile originating CS fallback, the RRC establishment cause shall be set to MO data.(See Note 1). | "mobile originating CS fallback" |
| If an EXTENDED SERVICE REQUEST is a response to paging for CS fallback, service type set to "mobile terminating CS fallback or 1xCS fallback", the RRC establishment cause shall be set to MT access.(See Note1, Note 2). | "terminating calls" |
| If an EXTENDED SERVICE REQUEST has service type set to "mobile originating CS fallback emergency call or 1xCS fallback emergency call", the RRC establishment cause shall be set to Emergency call. (See Note 1). | "emergency calls" |
| If an EXTENDED SERVICE REQUEST contains the Device properties IE with low priority indicator set to "MS is not configured for NAS signalling low priority", and MO MMTEL voice call is not started, MO MMTEL video call is not started and MO SMSoIP is not started, MO SMS over NAS or MO SMS over S102 is not requested, the RRC establishment cause shall be set to MO data.(See Note 1) | "originating calls" |
| If an EXTENDED SERVICE REQUEST contains the Device properties IE with low priority indicator set to "MS is not configured for NAS signalling low priority" and an MO MMTEL voice call is started, the RRC establishment cause shall be set to MO data.(See Note 1, Note 3) | "originating MMTEL voice"  |
| If an EXTENDED SERVICE REQUEST contains the Device properties IE with low priority indicator set to "MS is not configured for NAS signalling low priority" and an MO MMTEL video call is started, the RRC establishment cause shall be set to MO data.(See Note 1, Note 3) | "originating MMTEL video" |
| If an EXTENDED SERVICE REQUEST contains the Device properties IE with low priority indicator set to "MS is not configured for NAS signalling low priority" and an MO SMSoIP is started, the RRC establishment cause shall be set to MO data.(See Note 1) | "originating SMSoIP" |
| If an EXTENDED SERVICE REQUEST contains the Device properties IE with low priority indicator set to "MS is not configured for NAS signalling low priority" and an MO SMS over NAS or MO SMS over S102 is requested, the RRC establishment cause shall be set to MO data.(See Note 1) | "originating SMS" |
| If an EXTENDED SERVICE REQUEST contains the Device properties IE with low priority indicator set to "MS is configured for NAS signalling low priority", and MO MMTEL voice call is not started, MO MMTEL video call is not started and MO SMSoIP is not started, MO SMS over NAS or MO SMS over S102 is not requested, the RRC establishment cause shall be set to Delay tolerant.(See Note 1). | "originating calls" |
| If an EXTENDED SERVICE REQUEST contains the Device properties IE with low priority indicator set to "MS is configured for NAS signalling low priority" and an MO MMTEL voice call is started, the RRC establishment cause shall be set to MO data.(See Note 1, Note 3) | "originating MMTEL voice"  |
| If an EXTENDED SERVICE REQUEST contains the Device properties IE with low priority indicator set to "MS is configured for NAS signalling low priority" and an MO MMTEL video call is started, the RRC establishment cause shall be set to MO data.(See Note 1, Note 3) | "originating MMTEL video" |
| If an EXTENDED SERVICE REQUEST contains the Device properties IE with low priority indicator set to "MS is configured for NAS signalling low priority" and an MO SMSoIP is started, the RRC establishment cause shall be set to MO data.(See Note 1) | "originating SMSoIP" |
| If an EXTENDED SERVICE REQUEST contains the Device properties IE with low priority indicator set to "MS is configured for NAS signalling low priority" and an MO SMS over NAS or MO SMS over S102 is requested, the RRC establishment cause shall be set to MO data.(See Note 1) | "originating SMS" |
| If an EXTENDED SERVICE REQUEST contains the Device properties IE with low priority indicator set to "MS is not configured for NAS signalling low priority" and is triggered to request resources for ProSe direct discovery or ProSe direct communication, the RRC establishment cause shall be set to MO data.(See Note 1) | "originating calls" |
| If an EXTENDED SERVICE REQUEST contains the Device properties IE with low priority indicator set to "MS is configured for NAS signalling low priority" and is triggered to request resources for ProSe direct discovery or ProSe direct communication, the RRC establishment cause shall be set to Delay tolerant.(See Note 1) | "originating calls" |
| If an EXTENDED SERVICE REQUEST contains the Device properties IE with low priority indicator set to "MS is not configured for NAS signalling low priority" and is triggered to request resources for V2X communication over PC5, the RRC establishment cause shall be set to MO data.(See Note 1) | "originating calls" |
| If an EXTENDED SERVICE REQUEST contains the Device properties IE with low priority indicator set to "MS is configured for NAS signalling low priority" and is triggered to request resources for V2X communication over PC5, the RRC establishment cause shall be set to Delay tolerant.(See Note 1) | "originating calls" |
| If a CONTROL PLANE SERVICE REQUEST is a response to paging where the Control plane service type is set to "mobile terminating request", the RRC establishment cause shall be set to MT access. (see Note 1) | "terminating calls" |
| If a CONTROL PLANE SERVICE REQUEST is to transfer user data or to request resources for UL signalling, the RRC establishment cause shall be set to MO data.(see Note 1) | "originating calls" |
| If a CONTROL PLANE SERVICE REQUEST is to transfer user data or to request resources for UL signalling and contains the Device properties IE with low priority indicator set to "MS is configured for NAS signalling low priority", the RRC establishment cause shall be set to Delay tolerant.(see Note 1) | "originating calls" |
| In WB-S1 Mode, if a CONTROL PLANE SERVICE REQUEST is to transfer MO SMS, the RRC establishment cause shall be set to MO data.(see Note 1) | "originating SMS" |
| In NB-S1 Mode, if a CONTROL PLANE SERVICE REQUEST is to transfer MO SMS, the RRC establishment cause shall be set to MO data. | "originating calls" |
| In NB-S1 Mode, if a CONTROL PLANE SERVICE REQUEST is to transfer MO SMS and contains the Device properties IE with low priority indicator set to "MS is configured for NAS signalling low priority", the RRC establishment cause shall be set to Delay tolerant. | "originating calls" |
| If the UE is allowed to use exception data reporting (see the ExceptionDataReportingAllowed leaf of the NAS configuration MO in 3GPP TS 24.368 [15A] or the USIM file EFNASCONFIG in 3GPP TS 31.102 [17]) and a CONTROL PLANE SERVICE REQUEST is to perform initial data transfer related to an exceptional event, the RRC establishment cause shall be set to MO exception data. | "originating calls" |
| Note 1: For these NAS procedures in WB-S1 mode initiated by UEs of access class 12, 13 or 14 in their home country, the RRC establishment cause will be set to "High priority access AC 11 – 15". For this purpose, the home country is defined as the country to which the MCC part of the IMSI is associated, see 3GPP TS 23.122 [6] for the definition of country. For these NAS procedures in WB-S1 mode initiated by UE of access class 11 or 15 in their HPLMN (if the EHPLMN list is not present or is empty) or EHPLMN (if the EHPLMN list is present), the RRC establishment cause will be set to "High priority access AC 11 – 15".Note 2: This row is not applicable for mobile terminating 1xCS fallback with 1xCS paging request received over E-UTRAN.Note 3: For these NAS procedures, the lower layers can change the RRC establishment cause from "MO data" or from "MO Signalling" to "MO Voice Call", if the serving cell requests the UE to use the RRC establishment cause "MO voice call" (see 3GPP TS 36.331 [22]).Note 4: It is an implementation option to initiate attach request carrying a PDN CONNECTIVITY REQUEST with request type "handover of emergency bearer services" to support access transfer of an ongoing emergency session from non-3GPP access to 3GPP access when the UE is not already in EMM-REGISTERED state.Note 5: For these NAS procedures, the lower layers can change the RRC establishment cause from "MO Signalling" to "MO Voice Call" during EPS fallback for IMS voice (see 3GPP TS 36.331 [22]). |

NOTE: The RRC establishment cause can be used by the network to prioritise the connection establishment request from the UE at high load situations in the network.