**3GPP TSG-CT WG1 Meeting #133-bis-eC1-220348**

**E-meeting, 17-21 January 2022**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **24.501** | **CR** | **3910** | **rev** | **-** | **Current version:** | **17.5.0** |  |
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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 | **X** | Radio Access Network |  | Core Network | **X** |

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| ***Title:***  | Clarification on the paging information for Multi-USIM UE in 5GS |
|  |  |
| ***Source to WG:*** | vivo  |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | MUSIM |  | ***Date:*** | 2022-1-4 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***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)* |
|  |  |
| ***Reason for change:*** | LS from RAN2 (R2-2111330) specifies that the information available in the paging message includes voice service and non-voice service. Current specification in TS 24.501 only supports the voice service indication as the information available in the paging message. To align with the RAN2 specification, "voice service indication" shall be populated with “voice service indication or non-voice service indication”. |
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| ***Summary of change:*** | Add the non-voice service indication as the information available in the paging message. |
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| ***Consequences if not approved:*** | The UE may miss non-voice service. |
|  |  |
| ***Clauses affected:*** | 5.2.3.2.1, 5.2.3.2.3, 5.3.9, 5.5.1.3.2, 5.6.1.1, 5.6.2.1, 5.6.2.2.1 |
|  |  |
|  | **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:*** |  |

\* \* \* First Change \* \* \*

##### 5.2.3.2.1 NORMAL-SERVICE

The UE:

a) shall initiate the mobility or the periodic registration update procedure (according to conditions given in subclause 5.5.1.3.2), except that the periodic registration update procedure shall not be initiated over non-3GPP access;

b) shall initiate the service request procedure (according to conditions given in subclause 5.6.1);

c) shall respond to paging;

d) if configured for eCall only mode as specified in 3GPP TS 31.102 [22], shall perform the eCall inactivity procedure at expiry of timer T3444 or timer T3445 (see subclause 5.5.3); and

e) shall initiate a registration procedure for mobility and periodic registration update on the expiry of timer T3511.

NOTE 1: Paging is not supported over non-3GPP access.

NOTE 2: As an implementation option, the MUSIM capable UE is allowed to not respond to paging based on the paging cause indication.

\* \* \* Next Change \* \* \*

##### 5.2.3.2.3 ATTEMPTING-REGISTRATION-UPDATE

The UE in 3GPP access:

a) shall not send any user data;

b) shall initiate a registration procedure for mobility and periodic registration update on the expiry of timers T3502, T3511 or T3346;

c) shall initiate a registration procedure for mobility and periodic registration update 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 the forbidden PLMN lists, and the tracking area is not in one of the lists of 5GS forbidden tracking areas;

d) shall initiate a registration procedure for mobility and periodic registration update 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 or the SNPN identity of the new cell is in neither the "permanently forbidden SNPNs" list nor the "temporarily forbidden SNPNs" list which are, if the MS supports access to an SNPN using credentials from a credentials holder, associated with the selected entry of the "list of subscriber data" or the selected PLMN subscription, and the tracking area is not in one of the lists of 5GS forbidden tracking areas;

e) may initiate a registration procedure for mobility and periodic registration update upon request of the upper layers to establish an emergency PDU session;

e1) may initiate a registration procedure for mobility and periodic registration update upon request of the upper layers to establish a PDU session, if the UE is a UE configured for high priority access in selected PLMN;

f) may perform de-registration locally and initiate a registration procedure for initial registration for emergency services even if timer T3346 is running;

g) shall initiate registration procedure for mobility and periodic registration update upon reception of paging, or upon reception of NOTIFICATION message with access type indicating 3GPP access;

NOTE: As an implementation option, the MUSIM capable UE is allowed to not respond to paging based on the paging cause indication.

h) may initiate a registration procedure for mobility and periodic registration update upon request for an MMTEL voice call, MMTEL video call, or an MO IMS registration related signalling from the upper layers, and none of the following conditions is met:

- timer T3346 is running;

- the UE has stored a list of "non-allowed tracking areas" and the UE is camped on a cell which is in the registered PLMN or a PLMN from the list of equivalent PLMNs whose TAI is in the list of "non-allowed tracking areas"; or

- the UE has stored a list of "allowed tracking areas" and the UE is not camped on a cell which is in the registered PLMN or a PLMN from the list of equivalent PLMNs whose TAI is in the list of "allowed tracking areas";

i) shall initiate a registration procedure for mobility and periodic registration update if the 5GS update status is set to 5U2 NOT UPDATED, and timers T3511, T3502 and T3346 are not running;

j) if configured for eCall only mode as specified in 3GPP TS 31.102 [22], shall perform the eCall inactivity procedure at expiry of timer T3444 or timer T3445 (see subclause 5.5.3);

k) may initiate a registration procedure for mobility and periodic registration update for UE in NB-N1 mode 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 [17]) if timer T3346 is not already running for "MO exception data" and even if timer T3502 or timer T3511 is running; and

l) shall not initiate the de-registration signalling procedure unless the current TAI is part of the TAI list.

The UE in non-3GPP access:

a) shall not send any user data;

b) shall initiate the registration procedure for mobility and periodic registration update on the expiry of timers T3502, T3511 or T3346;

c) may initiate a registration procedure for mobility registration update upon request of the upper layers to establish an emergency PDU session;

c1) may initiate a registration procedure for mobility and periodic registration update upon request of the upper layers to establish a PDU session, if the UE is a UE configured for high priority access in selected PLMN;

d) may perform de-registration locally and initiate a registration procedure for initial registration for emergency services even if timer T3346 is running;

e) may initiate a registration procedure for mobility and periodic registration update upon request for an MMTEL voice call, MMTEL video call, or an MO IMS registration related signalling from the upper layers, if timer T3346 is not running;

f) shall initiate a registration procedure for mobility and periodic registration update if the 5GS update status is set to 5U2 NOT UPDATED, and timers T3511, T3502 and T3346 are not running; and

g) shall not initiate the de-registration signalling procedure unless timer T3346 is running.

\* \* \* Next Change \* \* \*

### 5.3.9 Handling of NAS level mobility management congestion control

The AMF may detect 5GMM signalling congestion and perform general NAS level congestion control. Under the 5GMM signalling congestion conditions the AMF may reject 5GMM signalling requests from UEs as specified in 3GPP TS 23.501 [8]. The AMF should not reject the following:

a) requests for emergency services;

b) requests for emergency services fallback;

c) requests from UEs configured for high priority access in selected PLMN;

d) DEREGISTRATION REQUEST message;

e) requests for mobile terminated services, triggered by paging or a notification procedure; and

f) requests for initial registration or mobility and periodic registration update, when emergency is indicated by lower layers.

When general NAS level congestion control is active, the AMF may include a value for the mobility management back-off timer T3346 in the reject messages. The UE starts the timer T3346 with the value received in the 5GMM reject messages. To avoid that large numbers of UEs simultaneously initiate deferred requests, the AMF should select the value for the timer T3346 for the rejected UEs so that timeouts are not synchronised.

If the UE is registered in the same PLMN over the 3GPP access and non-3GPP access, and the UE receives the timer T3346 from the AMF, the timer T3346 shall apply to both 3GPP access and non-3GPP access.

If the UE receives the paging message or NOTIFICATION message when timer T3346 is running and the UE is registered to the same PLMN over 3GPP access and non-3GPP access, the UE shall stop the timer T3346 for both accesses and respond to the paging message or NOTIFICATION message as specified in subclause 5.6.2 and subclause 5.6.3.

NOTE 1: As an implementation option, MUSIM-capable UE is allowed to not respond to paging based on the paging cause indication.

If the timer T3346 is running when the UE enters state 5GMM-DEREGISTERED, the UE remains switched on, and the USIM in the UE remains the same, then the timer T3346 is kept running until it expires or it is stopped.

If the UE is switched off when the timer T3346 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 T3346 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.

If the UE enters a new PLMN while timer T3346 is running, and the new PLMN is not equivalent to the PLMN where the UE started timer T3346, the UE shall stop timer T3346 when initiating 5GMM procedures in the new PLMN.

After a change in registration area, if the timer T3346 is running and 5GS update status is 5U1 UPDATED then the UE shall set the 5GS update status to 5U2 NOT UPDATED and enter state 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE.

If timer T3346 is running or is deactivated, and the UE is a UE configured for high priority access in selected PLMN, or the UE needs to initiate signalling for emergency services or emergency services fallback, then the UE is allowed to initiate 5GMM procedures.

NOTE 2: UE can, based on implementation, restrict lower layers of non-3GPP access from establishing access stratum connection on a registered PLMN when timer T3346 is running for the same PLMN.

\* \* \* Next Change \* \* \*

##### 5.5.1.3.2 Mobility and periodic registration update initiation

The UE in state 5GMM-REGISTERED shall initiate the registration procedure for mobility and periodic registration update by sending a REGISTRATION REQUEST message to the AMF,

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 AMF;

b) when the periodic registration updating timer T3512 expires in 5GMM-IDLE mode;

c) when the UE receives a CONFIGURATION UPDATE COMMAND message indicating "registration requested" in the Registration requested bit of the Configuration update indication IE as specified in subclauses 5.4.4.3;

d) when the UE in state 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE either receives a paging or the UE receives a NOTIFICATION message with access type indicating 3GPP access over the non-3GPP access for PDU sessions associated with 3GPP access;

NOTE 1: As an implementation option, MUSIM-capable UE is allowed to not respond to paging based on the paging cause indication.

e) upon inter-system change from S1 mode to N1 mode and if the UE previously had initiated an attach procedure or a tracking area updating procedure when in S1 mode;

f) when the UE receives an indication of "RRC Connection failure" from the lower layers and does not have signalling pending (i.e. when the lower layer requests NAS signalling connection recovery) except for the case specified in subclause 5.3.1.4;

g) when the UE changes the 5GMM capability or the S1 UE network capability or both;

h) when the UE's usage setting changes;

i) when the UE needs to change the slice(s) it is currently registered to;

j) when the UE changes the UE specific DRX parameters;

k) when the UE in state 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE receives a request from the upper layers to establish an emergency PDU session or perform emergency services fallback;

l) when the UE needs to register for SMS over NAS, indicate a change in the requirements to use SMS over NAS, or de-register from SMS over NAS;

m) when the UE needs to indicate PDU session status to the network after performing a local release of PDU session(s) as specified in subclauses 6.4.1.5 and 6.4.3.5;

n) when the UE in 5GMM-IDLE mode changes the radio capability for NG-RAN or E-UTRAN;

o) when the UE receives a fallback indication from the lower layers and does not have signalling pending (i.e. when the lower layer requests NAS signalling connection recovery, see subclauses 5.3.1.4 and 5.3.1.2);

p) void;

q) when the UE needs to request new LADN information;

r) when the UE needs to request the use of MICO mode or needs to stop the use of MICO mode or to request the use of new T3324 value;

s) when the UE in 5GMM-CONNECTED mode with RRC inactive indication enters a cell in the current registration area belonging to an equivalent PLMN of the registered PLMN and not belonging to the registered PLMN;

t) when the UE receives over 3GPP access a SERVICE REJECT message or a DL NAS TRANSPORT message, with the 5GMM cause value set to #28 "Restricted service area";

u) when the UE needs to request the use of eDRX, when a change in the eDRX usage conditions at the UE requires different extended DRX parameters, or needs to stop the use of eDRX;

NOTE 2: A change in the 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.

v) when the UE supporting 5G-SRVCC from NG-RAN to UTRAN changes the mobile station classmark 2 or the supported codecs;

w) when the UE in state 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE decides to request new network slices after being rejected due to no allowed network slices requested, or request S-NSSAI(s) which have been removed from the rejected NSSAI for the maximum number of UEs reached;

x) when the UE is not in NB-N1 mode and 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 SNPN;

y) when the UE receives a REGISTRATION REJECT message with 5GMM cause values #3, #6 or #7 without integrity protection over another access;

z) when the UE needs to request new ciphering keys for ciphered broadcast assistance data;

za) when due to manual CAG selection the UE has selected a CAG-ID which is not included in the "allowed CAG list" for the selected PLMN or a CAG-ID in a PLMN for which the entry in the "CAG information list" does not exist or when the UE has selected, without selecting a CAG-ID, a PLMN for which the entry in the "CAG information list" includes an "indication that the UE is only allowed to access 5GS via CAG cells";

zb) when the UE needs to start, stop or change the conditions for using the WUS assistance information or PEIPS assistance information;

zc) when the UE changes the UE specific DRX parameters in NB-N1 mode;

zd) when the UE in 5GMM-CONNECTED mode with RRC inactive indication enters a new cell with different RAT in current TAI list or not in current TAI list;

ze) when the UE enters state 5GMM-REGISTERED.NORMAL-SERVICE or 5GMM-REGISTERED.NON-ALLOWED-SERVICE (as described in subclause 5.3.5.2) over 3GPP access after the UE has sent a NOTIFICATION RESPONSE message over non-3GPP access in response to reception of a NOTIFICATION message over non-3GPP access as specified in subclause 5.6.3.1;

zf) when the UE supporting UAS services is not registered for UAS services and needs to register to the 5GS for UAS services;

zg) when the UE supporting MINT needs to perform the registration procedure for mobility and periodic registration update to register to the PLMN offering disaster roaming;

zh) when the MUSIM capable UE needs to request a new 5G-GUTI assignment; or

NOTE 3: Based on implementation, the MUSIM capable UE can request a new 5G-GUTI assignment (e.g. when the lower layers request to modify the timing of the paging occasions).

zi) when the MUSIM capable UE in state 5GMM-REGISTERED.NON-ALLOWED-SERVICE needs to requests the network to remove the paging restrictions.

If case b) is the only reason for initiating the registration procedure for mobility and periodic registration update, the UE shall indicate "periodic registration updating" in the 5GS registration type IE; otherwise, if the UE initiates the registration procedure for mobility and periodic registration update due to case Zg), the UE shall indicate "disaster roaming mobility registration updating" in the 5GS registration type IE; otherwise the UE shall indicate "mobility registration updating".

Editor's note: It is FFS how the new registration type is used in AMF.

Editor's note: It is FFS if changes are needed to align the usage for "disaster roaming mobility registration updating" and "mobility registration updating" wherever "mobility registration updating" is used in this specification.

If the UE indicates "mobility registration updating" in the 5GS registration type IE and the UE supports S1 mode, the UE shall:

- set the S1 mode bit to "S1 mode supported" in the 5GMM capability IE of the REGISTRATION REQUEST message;

- include the S1 UE network capability IE in the REGISTRATION REQUEST message; and

- if the UE supports sending an ATTACH REQUEST message containing a PDN CONNECTIVITY REQUEST message with request type set to "handover" to transfer a PDU session from N1 mode to S1 mode, set the HO attach bit to "attach request message containing PDN connectivity request with request type set to handover to transfer PDU session from N1 mode to S1 mode supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

If the UE supports the LTE positioning protocol (LPP) in N1 mode as specified in 3GPP TS 36.355 [26], the UE shall set the LPP bit to "LPP in N1 mode supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

If the UE supports the Location Services (LCS) notification mechanisms in N1 mode as specified in 3GPP TS 23.273 [6B], the UE shall set the 5G-LCS bit to " LCS notification mechanisms supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

For all cases except case b), when the UE is not in NB-N1 mode and the UE supports RACS, the UE shall set the RACS bit to "RACS supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

If the UE supports 5G-SRVCC from NG-RAN to UTRAN as specified in 3GPP TS 23.216 [6A], the UE shall set:

- the 5G-SRVCC from NG-RAN to UTRAN capability bit to "5G-SRVCC from NG-RAN to UTRAN supported" in the 5GMM capability IE of the REGISTRATION REQUEST message for all cases except case b; and

- include the Mobile station classmark 2 IE and the Supported codecs IE in the REGISTRATION REQUEST message for all cases except case b.

If the UE supports the restriction on use of enhanced coverage, the UE shall set the RestrictEC bit to "Restriction on use of enhanced coverage supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

If the UE supports network slice-specific authentication and authorization, the UE shall set the NSSAA bit to "network slice-specific authentication and authorization supported" in the 5GMM capability IE of the REGISTRATION REQUEST message for all cases except case b.

If the UE supports CAG feature, the UE shall set the CAG bit to "CAG Supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

If the UE operating in the single-registration mode performs inter-system change from S1 mode to N1 mode and has one or more stored UE policy sections identified by a UPSI with the PLMN ID part indicating the HPLMN or the selected PLMN, the UE shall set the Payload container type IE to "UE policy container" and include the UE STATE INDICATION message (see annex D) in the Payload container IE of the REGISTRATION REQUEST message.

NOTE 4: In this version of the protocol, the UE can only include the Payload container IE in the REGISTRATION REQUEST message to carry a payload of type "UE policy container".

The UE in state 5GMM-REGISTERED shall initiate the registration procedure for mobility and periodic update by sending a REGISTRATION REQUEST message to the AMF when the UE needs to request the use of SMS over NAS transport or the current requirements to use SMS over NAS transport change in the UE. The UE shall set the SMS requested bit of the 5GS update type IE in the REGISTRATION REQUEST message as specified in subclause 5.5.1.2.2.

When initiating a registration procedure for mobility and periodic registration update and the UE needs to send the 5GS update type IE for a reason different than indicating a change in requirement to use SMS over NAS, the UE shall set the SMS requested bit of the 5GS update type IE in the REGISTRATION REQUEST message to the same value as indicated by the UE in the last REGISTRATION REQUEST message.

If the UE no longer requires the use of SMS over NAS, then the UE shall include the 5GS update type IE in the REGISTRATION REQUEST message with the SMS requested bit set to "SMS over NAS not supported".

After sending the REGISTRATION REQUEST message to the AMF the UE shall start timer T3510. If timer T3502 is currently running, the UE shall stop timer T3502. If timer T3511 is currently running, the UE shall stop timer T3511.

If the last visited registered TAI is available, the UE shall include the last visited registered TAI in the REGISTRATION REQUEST message.

The UE shall handle the 5GS mobile identity IE in the REGISTRATION REQUEST message as follows:

a) if the UE is operating in the single-registration mode, performs inter-system change from S1 mode to N1 mode, and the UE holds a valid 4G-GUTI, the UE shall include the 5G-GUTI mapped from the 4G-GUTI as specified in 3GPP TS 23.003 [4] in the 5GS mobile identity IE. Additionally, if the UE holds a valid 5G‑GUTI, the UE shall include the 5G-GUTI in the Additional GUTI IE in the REGISTRATION REQUEST message in the following order:

1) a valid 5G-GUTI that was previously assigned by the same PLMN with which the UE is performing the registration, if available;

2) a valid 5G-GUTI that was previously assigned by an equivalent PLMN, if available; and

3) a valid 5G-GUTI that was previously assigned by any other PLMN, if available; and

NOTE 5: The 5G-GUTI included in the Additional GUTI IE is a native 5G-GUTI.

b) for all other cases, if the UE holds a valid 5G-GUTI, the UE shall indicate the 5G-GUTI in the 5GS mobile identity IE. If the UE is registering with an SNPN and the valid 5G-GUTI was previously assigned by another SNPN, the UE shall additionally include the NID of the other SNPN in the NID IE.

 If the UE holds two valid native 5G-GUTIs and:

1) one of the valid native 5G-GUTI was assigned by the PLMN with which the UE is performing the registration, then the UE shall indicate the valid native 5G-GUTI assigned by the PLMN with which the UE is performing the registration. In addition, the UE shall include the other valid native 5G-GUTI in the Additional GUTI IE; or

2) none of the valid native 5G-GUTI was assigned by the PLMN with which the UE is performing the registration, then the UE shall indicate the valid native 5G-GUTI assigned over the same access via which the UE is performing the registration.

If the UE supports MICO mode and requests the use of MICO mode, then the UE shall include the MICO indication IE in the REGISTRATION REQUEST message. If the UE requests to use an active time value, it shall include the active time value in the T3324 IE in the REGISTRATION REQUEST message. Additionally, if the UE supports strictly periodic registration timer, the UE shall set the Strictly Periodic Registration Timer Indication bit of the MICO indication IE in the REGISTRATION REQUEST message to "strictly periodic registration timer supported". If the UE needs to stop the use of MICO mode, then the UE shall not include the MICO indication IE in the REGISTRATION REQUEST message.

If the UE needs to use or change the UE specific DRX parameters, the UE shall include the Requested DRX parameters IE in the REGISTRATION REQUEST message.

If the UE is in NB-N1 mode and if the UE needs to use or change the UE specific DRX parameters for NB-N1 mode, the UE shall include the Requested NB-N1 mode DRX parameters IE in the REGISTRATION REQUEST message.

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

If the UE needs to request LADN information for specific LADN DNN(s) or indicates a request for LADN information as specified in 3GPP TS 23.501 [8], the UE shall include the LADN indication IE in the REGISTRATION REQUEST message and:

- request specific LADN DNNs by including a LADN DNN value in the LADN indication IE for each LADN DNN for which the UE requests LADN information; or

- to indicate a request for LADN information by not including any LADN DNN value in the LADN indication IE.

If the UE is initiating the registration procedure for mobility and periodic registration update, the UE may include the Uplink data status IE to indicate which PDU session(s) that is:

- not associated with control plane only indication;

- associated with the access type the REGISTRATION REQUEST message is sent over; and

- have pending user data to be sent over user plane.

If the UE has one or more active always-on PDU sessions associated with the access type over which the REGISTRATION REQUEST message is sent and the user-plane resources for these PDU sessions are not established, the UE shall include the Uplink data status IE and indicate that the UE has pending user data to be sent for those PDU sessions. If the UE is located outside the LADN service area, the UE shall not include the PDU session for LADN in the Uplink data status IE. If the UE is in a non-allowed area or is not in an allowed area as specified in subclause 5.3.5, the UE shall not include the Uplink data status IE except for emergency services or for high priority access. If the UE supports MUSIM and requests the network to release the NAS signalling connection, the UE shall not include the Uplink data status IE in the REGISTRATION REQUEST message.

If the UE has one or more active PDU sessions which are not accepted by the network as always-on PDU sessions and no uplink user data pending to be sent for those PDU sessions, the UE shall not include those PDU sessions in the Uplink data status IE in the REGISTRATION REQUEST message.

When the registration procedure for mobility and periodic registration update is initiated in 5GMM-IDLE mode, the UE may include a PDU session status IE in the REGISTRATION REQUEST message, indicating:

- which single access PDU sessions associated with the access type the REGISTRATION REQUEST message is sent over are active in the UE; and

- which MA PDU sessions are active and having user plane resources established in the UE on the access the REGISTRATION REQUEST message is sent over.

If the UE received a paging message with the access type indicating non-3GPP access, the UE shall include the Allowed PDU session status IE in the REGISTRATION REQUEST message indicating the PDU session(s) for which the UE allows to re-establish the user-plane resources over 3GPP access.

When the Allowed PDU session status IE is included in the REGISTRATION REQUEST message, the UE shall indicate that a PDU session is not allowed to be transferred to the 3GPP access if the 3GPP PS data off UE status is "activated" for the corresponding PDU session and the UE is not using the PDU session to send uplink IP packets for any of the 3GPP PS data off exempt services (see subclause 6.2.10).

If the UE operating in the single-registration mode performs inter-system change from S1 mode to N1 mode, the UE:

a) shall include the UE status IE with the EMM registration status set to "UE is in EMM-REGISTERED state" in the REGISTRATION REQUEST message;

NOTE 6: Inclusion of the UE status IE with this setting corresponds to the indication that the UE is "moving from EPC" as specified in 3GPP TS 23.502 [9], subclause 4.11.1.3.3 and 4.11.2.3.

NOTE 7: The value of the 5GMM registration status included by the UE in the UE status IE is not used by the AMF.

b) may include the PDU session status IE in the REGISTRATION REQUEST message indicating the status of the PDU session(s) mapped during the inter-system change from S1 mode to N1 mode from the PDN connection(s) for which the EPS indicated that interworking to 5GS is supported, if any (see subclause 6.1.4.1);

c) shall include a TRACKING AREA UPDATE REQUEST message as specified in 3GPP TS 24.301 [15] in the EPS NAS message container IE in the REGISTRATION REQUEST message if the registration procedure is initiated in 5GMM-IDLE mode and the UE has received an "interworking without N26 interface not supported" indication from the network;

c1) may include a TRACKING AREA UPDATE REQUEST message as specified in 3GPP TS 24.301 [15] in the EPS NAS message container IE in the REGISTRATION REQUEST message if the registration procedure is initiated in 5GMM-IDLE mode and the UE has received an "interworking without N26 interface supported" indication from the network; and

d) shall include an EPS bearer context status IE in the REGISTRATION REQUEST message indicating which EPS bearer contexts are active in the UE, if the UE has locally deactivated EPS bearer context(s) for which interworking to 5GS is supported while the UE was in S1 mode without notifying the network.

For a REGISTRATION REQUEST message with a 5GS registration type IE indicating "mobility registration updating", if the UE:

a) is in NB-N1 mode and:

1) the UE needs to change the slice(s) it is currently registered to within the same registration area; or

2) the UE has entered a new registration area; or

b) the UE is not in NB-N1 mode and is not registered for onboarding services in SNPN;

the UE shall include the Requested NSSAI IE containing the S-NSSAI(s) corresponding to the network slices to which the UE intends to register and associated mapped S-NSSAI(s), if available, in the REGISTRATION REQUEST message as described in this subclause. When the UE is entering a visited PLMN and intends to register to the slices for which the UE has only HPLMN S-NSSAI(s) available, the UE shall include these HPLMN S-NSSAI(s) in the Requested mapped NSSAI IE.

NOTE 8: The REGISTRATION REQUEST message can include both the Requested NSSAI IE and the Requested mapped NSSAI IE as described below.

If the UE is registered for onboarding services in SNPN, the UE shall not include the Requested NSSAI IE in the REGISTRATION REQUEST message.

If the UE has allowed NSSAI or configured NSSAI or both for the current PLMN, the Requested NSSAI IE shall include either:

a) the configured NSSAI for the current PLMN, or a subset thereof as described below;

b) the allowed NSSAI for the current PLMN, or a subset thereof as described below; or

c) the allowed NSSAI for the current PLMN, or a subset thereof as described below, plus one or more S-NSSAIs from the configured NSSAI for which no corresponding S-NSSAI is present in the allowed NSSAI and those are neither in the rejected NSSAI nor in the pending NSSAI.

and in addition the Requested NSSAI IE shall include S-NSSAI(s) applicable in the current PLMN, and if available the associated mapped S-NSSAI(s) for:

a) each PDN connection that is established in S1 mode when the UE is operating in the single-registration mode and the UE is performing an inter-system change from S1 mode to N1 mode; or

b) each active PDU session.

If the UE does not have S-NSSAI(s) applicable in the current PLMN, then the Requested mapped NSSAI IE shall include HPLMN S-NSSAI(s) (e.g. mapped S-NSSAI(s), if available) for:

a) each PDN connection established in S1 mode when the UE is operating in the single-registration mode and the UE is performing an inter-system change from S1 mode to N1 mode to a visited PLMN; or

b) each active PDU session when the UE is performing mobility from N1 mode to N1 mode to a visited PLMN.

NOTE 9: The Requested NSSAI IE is used instead of Requested mapped NSSAI IE in REGISTRATION REQUEST message when the UE enters HPLMN.

For a REGISTRATION REQUEST message with a 5GS registration type IE indicating "mobility registration updating", if the UE is in NB-N1 mode and the procedure is initiated for all cases except case a), c), e), i), s), t), w), and x), the REGISTRATION REQUEST message shall not include the Requested NSSAI IE.

If the UE has:

- no allowed NSSAI for the current PLMN;

- no configured NSSAI for the current PLMN;

- neither active PDU session(s) nor PDN connection(s) to transfer associated with an S-NSSAI applicable in the current PLMN; and

- neither active PDU session(s) nor PDN connection(s) to transfer associated with mapped S-NSSAI(s);

and has a default configured NSSAI, then the UE shall:

a) include the S-NSSAI(s) in the Requested NSSAI IE of the REGISTRATION REQUEST message using the default configured NSSAI; and

b) include the Network slicing indication IE with the Default configured NSSAI indication bit set to "Requested NSSAI created from default configured NSSAI" in the REGISTRATION REQUEST message.

If the UE has:

- no allowed NSSAI for the current PLMN;

- no configured NSSAI for the current PLMN;

- neither active PDU session(s) nor PDN connection(s) to transfer associated with an S-NSSAI applicable in the current PLMN

- neither active PDU session(s) nor PDN connection(s) to transfer associated with mapped S-NSSAI(s); and

- no default configured NSSAI

the UE shall include neither Requested NSSAI IE nor Requested mapped NSSAI IE in the REGISTRATION REQUEST message.

If all the S-NSSAI(s) corresponding to the slice(s) to which the UE intends to register are included in the pending NSSAI, the UE shall not include a requested NSSAI in the REGISTRATION REQUEST message.

When the UE storing a pending NSSAI intends to register to additional S-NSSAI(s) over the same access type, the UE shall send the requested NSSAI containing the additional S-NSSAI(s) that the UE intends to register to in the REGISTRATION REQUEST message. The requested NSSAI shall not include any S-NSSAI from the pending NSSAI.

The subset of configured NSSAI provided in the requested NSSAI consists of one or more S-NSSAIs in the configured NSSAI applicable to this PLMN, if the S-NSSAI is neither in the rejected NSSAI nor associated to the S-NSSAI(s) in the rejected NSSAI. In addition, if the NSSRG information is available, the subset of configured NSSAI provided in the requested NSSAI shall be associated with at least one common NSSRG value. If the UE has already an allowed NSSAI for the other access, all the S-NSSAI(s) in the requested NSSAI for the current access shall share at least an NSSRG value common to all the S-NSSAI(s) of the allowed NSSAI for the other access. If the UE is simultaneously performing the registration procedure on the other access, the UE shall include S-NSSAIs that share at least a common NSSRG value across all access types.

NOTE 10: If the UE has stored mapped S-NSSAI(s) for the rejected NSSAI, and one or more S-NSSAIs in the stored mapped S-NSSAI(s) for the configured NSSAI are not included in the stored mapped S-NSSAI(s) for the rejected NSSAI, then a S-NSSAI in the configured NSSAI associated to one or more of these mapped S-NSSAI(s) for the configured NSSAI are available to be included in the requested NSSAI together with their mapped S-NSSAI.

NOTE 11: If one or more mapped S-NSSAIs in the stored mapped S-NSSAI(s) for the configured NSSAI are not included in the stored rejected NSSAI for the failed or revoked NSSAA, a S-NSSAI in the configured NSSAI associated to one or more of these mapped S-NSSAI(s) for the configured NSSAI are available to be included in the registration request together with their mapped S-NSSAI.

The subset of allowed NSSAI provided in the requested NSSAI consists of one or more S-NSSAIs in the allowed NSSAI for this PLMN.

NOTE 12: How the UE selects the subset of configured NSSAI or allowed NSSAI to be provided in the requested NSSAI is implementation specific. The UE can take preferences indicated by the upper layers (e.g. policies, applications) into account.

NOTE 13: The number of S-NSSAI(s) included in the requested NSSAI cannot exceed eight.

The UE shall set the Follow-on request indicator to "Follow-on request pending", if the UE:

a) initiates the mobility and periodic registration updating procedure upon request of the upper layers to establish an emergency PDU session;

b) initiates the mobility and periodic registration updating procedure upon receiving a request from the upper layers to perform emergency services fallback; or

c) needs to prolong the established NAS signalling connection after the completion of the registration procedure for mobility and periodic registration update (e.g. due to uplink signalling pending but no user data pending).

NOTE 14: The UE does not have to set the Follow-on request indicator to 1 even if the UE has to request resources for V2X communication over PC5 reference point, ProSe direct discovery over PC5 or ProSe direct communication over PC5.

For case n), the UE shall include the 5GS update type IE in the REGISTRATION REQUEST message with the NG-RAN-RCU bit set to " UE radio capability update needed". Additionally, if the UE is not in NB-N1 mode, the UE supports RACS and the UE has an applicable UE radio capability ID for the new UE radio configuration in the serving PLMN or SNPN, the UE shall include the applicable UE radio capability ID in the UE radio capability ID of the REGISTRATION REQUEST message.

If the UE is in the 5GMM-CONNECTED mode and the UE changes the radio capability for NG-RAN or E‑UTRAN, the UE may locally release the established N1 NAS signalling connection and enter the 5GMM-IDLE mode. Then, the UE shall initiate the registration procedure for mobility and periodic updating including the 5GS update type IE in the REGISTRATION REQUEST message with the NG-RAN-RCU bit set to " UE radio capability update needed".

For case o), the UE shall include the Uplink data status IE in the REGISTRATION REQUEST message indicating the PDU session(s) without active user-plane resources for which the UE has pending user data to be sent, if any, and the PDU session(s) for which user-plane resources were active prior to receiving the fallback indication, if any. If the UE is in a non-allowed area or if the UE is not in allowed area, the UE shall not include the Uplink data status IE in REGISTRATION REQUEST message, except if the PDU session for which user-plane resources were active prior to receiving the fallback indication is an emergency PDU session, or if the UE is configured for high priority access in the selected PLMN as specified in subclause 5.3.5.

For case f), the UE shall include the Uplink data status IE in the REGISTRATION REQUEST message indicating the PDU session(s) for which user-plane resources were active prior to receiving "RRC Connection failure" indication from the lower layers, if any. If the UE is in non-allowed area or not in allowed area, the UE shall not include the Uplink data status IE in REGISTRATION REQUEST message, except that the PDU session(s) for which user-plane resources were active prior to receiving the "RRC Connection failure"indication is emergency PDU session(s), or that the UE is configured for high priority access in selected PLMN, as specified in subclause 5.3.5.

If the UE supports service gap control, then the UE shall set the SGC bit to "service gap control supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

For case a), x) or if the UE operating in the single-registration mode performs inter-system change from S1 mode to N1 mode, the UE shall:

a) if the UE has an applicable network-assigned UE radio capability ID for the current UE radio configuration in the selected PLMN or SNPN, include the applicable network-assigned UE radio capability ID in the UE radio capability ID IE of the REGISTRATION REQUEST message; and

b) if the UE:

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

2) 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 REGISTRATION REQUEST message.

For all cases except cases b and z, 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 REGISTRATION REQUEST message.

For case z, 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 REGISTRATION 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 REGISTRATION 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 T3512, 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 REGISTRATION REQUEST message.

The UE shall set the WUSA bit to "WUS assistance information reception supported" in the 5GMM capability IE if the UE supports WUS assistance information. The UE may include its UE paging probability information in the Requested WUS assistance information IE if the UE has set the WUSA bit to "WUS assistance information reception supported" in the 5GMM capability IE.

The UE shall set the NR-PSSI bit to "NR paging subgrouping supported" in the 5GMM capability IE if the UE supports PEIPS assistance information and the UE:

- is not registered for emergency services; and

- does not have an active emergency PDU session.

If the network supports the N1 NAS signalling connection release, the UE supports MUSIM and requests the network to release the NAS signalling connection, the UE shall set Request type to "NAS signalling connection release" in the UE request type IE, set the Follow-on request indicator to "No follow-on request pending" and, if the network supports the paging restriction, may set the paging restriction preference in the Paging restriction IE in the REGISTRATION REQUEST message. In addition, the UE shall not include the Uplink data status IE or the Allowed PDU session status IE in the REGISTRATION REQUEST message even if the UE has one or more active always-on PDU sessions associated with the 3GPP access.

NOTE 15: If the network has already indicated support for N1 NAS signalling connection release in the current stored registration area, the MUSIM UE is allowed to request the network to release the NAS signalling connection during mobility registration update procedure that is due to mobility outside the registration area even before detecting whether the network supports the N1 NAS signalling connection release in the new tracking area.

NOTE 16: If the network has already indicated support for paging restriction in the current stored registration area, the MUSIM UE is allowed to include paging restriction together with the request to the network to release the NAS signalling connection during mobility registration update procedure that is due to mobility outside the registration area even before detecting whether the network supports the paging restriction in the new tracking area.

For case zi the UE shall not include the Uplink data status IE in the REGISTRATION REQUEST message.

If the UE does not have a valid 5G NAS security context and the UE is sending the REGISTRATION REQUEST message after an inter-system change from S1 mode to N1 mode in 5GMM-IDLE mode, the UE shall send the REGISTRATION REQUEST message without including the NAS message container IE. The UE shall include the entire REGISTRATION REQUEST message (i.e. containing cleartext IEs and non-cleartext IEs, if any) in the NAS message container IE that is sent as part of the SECURITY MODE COMPLETE message as described in subclauses 4.4.6 and 5.4.2.3.

If the UE indicates "mobility registration updating" in the 5GS registration type IE and supports V2X as specified in 3GPP TS 24.587 [19B], the UE shall set the V2X bit to "V2X supported" in the 5GMM capability IE of the REGISTRATION REQUEST message. If the UE indicates "mobility registration updating" in the 5GS registration type IE and supports V2X communication over E-UTRA-PC5 as specified in 3GPP TS 24.587 [19B], the UE shall set the V2XCEPC5 bit to "V2X communication over E-UTRA-PC5 supported" in the 5GMM capability IE of the REGISTRATION REQUEST message. If the UE indicates "mobility registration updating" in the 5GS registration type IE and supports V2X communication over NR-PC5 as specified in 3GPP TS 24.587 [19B], the UE shall set the V2XCNPC5 bit to "V2X communication over NR-PC5 supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

The UE shall send the REGISTRATION REQUEST message including the NAS message container IE as described in subclause 4.4.6:

a) when the UE is sending the message from 5GMM-IDLE mode, the UE has a valid 5G NAS security context, and needs to send non-cleartext IEs; or

b) when the UE is sending the message after an inter-system change from S1 mode to N1 mode in 5GMM-IDLE mode and the UE has a valid 5G NAS security context and needs to send non-cleartext IEs.

The UE with a valid 5G NAS security context shall send the REGISTRATION REQUEST message without including the NAS message container IE when the UE does not need to send non-cleartext IEs and the UE is sending the message:

a) from 5GMM-IDLE mode; or

b) after an inter-system change from S1 mode to N1 mode in 5GMM-IDLE mode.

If the UE is sending the REGISTRATION REQUEST message after an inter-system change from S1 mode to N1 mode in 5GMM-CONNECTED mode and the UE needs to send non-cleartext IEs, the UE shall cipher the NAS message container IE using the mapped 5G NAS security context and send the REGISTRATION REQUEST message including the NAS message container IE as described in subclause 4.4.6. If the UE does not need to send non-cleartext IEs, the UE shall send the REGISTRATION REQUEST message without including the NAS message container IE.

If the REGISTRATION REQUEST message includes a NAS message container IE, the AMF shall process the REGISTRATION REQUEST message that is obtained from the NAS message container IE as described in subclause 4.4.6.

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

If the registration procedure for mobility and periodic registration update is initiated and there is request from the upper layers to perform "emergency services fallback" pending, the UE shall send a REGISTRATION REQUEST message without an Uplink data status IE.

If the UE supports N3 data transfer and multiple user-plane resources in NB-N1 mode (see 3GPP TS 36.306 [25D], 3GPP TS 36.331 [25A]), then the UE shall set the Multiple user-plane resources support bit to "Multiple user-plane resources supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

The UE shall set the ER-NSSAI bit to "Extended rejected NSSAI supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

If the UE supports the NSSRG, then the UE shall set the NSSRG bit to "NSSRG supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

If the UE enters 5GMM-REGISTERED.NO-CELL-AVAILABLE and it has one or more S-NSSAI(s) in pending NSSAI, the UE shall initiate registration procedure for mobility and periodic registration update upon finding a suitable cell according to 3GPP TS 38.304 [28].

For case zf), the UE shall include the Service-level device ID in the Service-level-AA container IE of the REGISTRATION REQUEST message and set the value to the CAA-level UAV ID. The UE may include the Service-level-AA server address in the Service-level-AA container IE of the REGISTRATION REQUEST message and set the value to the USS address, if it is configured in the UE.

If the UE supports ProSe direct discovery as specified in 3GPP TS 24.554 [19E], the UE shall set the ProSe-dd bit to "ProSe direct discovery supported" in the 5GMM capability IE of the REGISTRATION REQUEST message. If the UE supports ProSe direct communication as specified in 3GPP TS 24.554 [19E], the UE shall set the ProSe-dc bit to "ProSe discovery communication supported" in the 5GMM capability IE of the REGISTRATION REQUEST message. If the UE supports acting as ProSe layer-2 UE-to-network relay UE as specified in 3GPP TS 24.554 [19E], the UE shall set the ProSe-l2relay bit to "Acting as a ProSe layer-2 UE-to-network relay UE supported" in the 5GMM capability IE of the REGISTRATION REQUEST message. If the UE supports acting as ProSe layer-3 UE-to-network relay UE as specified in 3GPP TS 24.554 [19E], the UE shall set the ProSe-l3relay bit to "Acting as a ProSe layer-3 UE-to-network relay UE supported" in the 5GMM capability IE of the REGISTRATION REQUEST message. If the UE supports acting as ProSe layer-2 UE-to-network remote UE as specified in 3GPP TS 24.554 [19E], the UE shall set the ProSe-l2rmt bit to "Acting as a ProSe layer-2 UE-to-network remote UE supported" in the 5GMM capability IE of the REGISTRATION REQUEST message. If the UE supports acting as ProSe layer-3 UE-to-network remote UE as specified in 3GPP TS 24.554 [19E], the UE shall set the ProSe-l3rmt bit to "Acting as a ProSe layer-3 UE-to-network remote UE supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

For all cases except case b, if the Multi-USIM UE supports the N1 NAS signalling connection release, then the UE shall set the N1 NAS signalling connection release bit to "N1 NAS signalling connection release supported" in the 5GMM capability IE of the REGISTRATION REQUEST message otherwise the UE shall not set the N1 NAS signalling connection release bit to "N1 NAS signalling connection release supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

For all cases except case b, if the Multi-USIM UE supports the paging indication for voice services, then the UE shall set the paging indication for voice services bit to "paging indication for voice services supported" in the 5GMM capability IE of the REGISTRATION REQUEST message otherwise the UE shall not set the paging indication for voice services bit to "paging indication for voice services supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

For all cases except case b, if the Multi-USIM UE supports the reject paging request, then the UE shall set the reject paging request bit to "reject paging request supported" in the 5GMM capability IE of the REGISTRATION REQUEST message otherwise the UE shall not set the reject paging request bit to "reject paging request supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

For all cases except case b, if the Multi-USIM UE sets:

- the reject paging request bit to "reject paging request supported";

- the N1 NAS signalling connection release bit to "N1 NAS signalling connection release supported"; or

- both of them;

and supports the paging restriction, then the UE shall set the paging restriction bit to "paging restriction supported" in the 5GMM capability IE of the REGISTRATION REQUEST message otherwise the UE shall not set the paging restriction bit to "paging restriction supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

If the UE supports MINT, the UE shall set the MINT bit to "MINT supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

For case zg), if:

a) the PLMN with disaster condition is the HPLMN and:

1) the Additional GUTI IE is included in the REGISTRATION REQUEST message and does not contain a valid 5G-GUTI that was previously assigned by the HPLMN; or

2) the Additional GUTI IE is not included in the REGISTRATION REQUEST message and the 5GS mobile identity IE contains neither the SUCI nor a valid 5G-GUTI that was previously assigned by the HPLMN; or

b) the PLMN with disaster condition is not the HPLMN and:

1) the Additional GUTI IE is included in the REGISTRATION REQUEST message and does not contain a valid 5G-GUTI that was previously assigned by the PLMN with disaster condition; or

2) the Additional GUTI IE is not included in the REGISTRATION REQUEST message and the 5GS mobile identity IE does not contain a valid 5G-GUTI that was previously assigned by the PLMN with disaster condition;

then the UE shall include in the REGISTRATION REQUEST message the PLMN with disaster condition IE indicating the PLMN with disaster condition.



Figure 5.5.1.3.2.1: Registration procedure for mobility and periodic registration update

\* \* \* Next Change \* \* \*

#### 5.6.1.1 General

The purpose of the service request procedure is to change the 5GMM mode from 5GMM-IDLE to 5GMM-CONNECTED mode. If the UE is not using 5GS services with control plane CIoT 5GS optimization, this procedure is used to request the establishment of user-plane resources for PDU sessions which are established without user-plane resources. In latter case, the 5GMM mode can be the 5GMM-IDLE mode or the 5GMM-CONNECTED mode if the UE requires to establish user-plane resources for PDU sessions. If the UE is using 5GS services with control plane CIoT 5GS optimization, this procedure can be used for UE initiated transfer of user data via the control plane from 5GMM-IDLE mode.

NOTE 1: The lower layer indicates when the user-plane resources for PDU sessions are successfully established or released.

This procedure is used when:

- the network has downlink signalling pending over 3GPP access and the UE is in 5GMM-IDLE mode over 3GPP access;

- the network has downlink signalling pending over non-3GPP access, the UE is in 5GMM-IDLE mode over non-3GPP access and in 5GMM-IDLE or 5GMM-CONNECTED mode over 3GPP access;

- the UE has uplink signalling pending over 3GPP access and the UE is in 5GMM-IDLE mode over 3GPP access;

- the network has downlink user data pending over 3GPP access and the UE is in 5GMM-IDLE mode over 3GPP access;

- the network has downlink user data pending over non-3GPP access, the UE is in 5GMM-IDLE mode over non-3GPP access and in 5GMM-IDLE or 5GMM-CONNECTED mode over 3GPP access;

- the UE has user data pending over 3GPP access and the UE is in 5GMM-IDLE or 5GMM-CONNECTED mode over 3GPP access;

- the UE has user data pending over non-3GPP access and the UE is in 5GMM-CONNECTED mode over non-3GPP access;

- the UE in 5GMM-IDLE mode over non-3GPP access, receives an indication from the lower layers of non-3GPP access, that the access stratum connection is established between UE and network, if T3346 is not running;

- the UE in 5GMM-IDLE or 5GMM-CONNECTED mode over 3GPP access receives a request from the upper layers to perform emergency services fallback and performs emergency services fallback as specified in subclause 4.13.4.2 of 3GPP TS 23.502 [9];

- the UE has to request resources for V2X communication over PC5;

- the UE has to request resources for 5G ProSe direct discovery over PC5 or 5G ProSe direct communication over PC5;

- the UE that is MUSIM capable and in 5GMM-IDLE mode requests the network to remove the paging restriction; or

- the UE supporting MUSIM requests the release of the NAS signalling connection or rejects the paging request from the network.

This procedure shall not be used for initiating user data transfer or PDU session management related signalling other than for performing UE-requested PDU session release procedure related to a PDU session for LADN when the UE is located outside the LADN service area.

In NB-N1 mode, this procedure shall not be used to request the establishment of user-plane resources:

a) for a number of PDU sessions that exceeds the UE' s maximum number of supported user-plane resources if there is currently:

1) no user-plane resources established for the UE;

2) user-plane resources established for:

i) one PDU session and the Multiple user-plane resources support bit was set to "Multiple user-plane resources not supported" in the 5GMM capability IE; or

ii) two PDU sessions and the Multiple user-plane resources support bit was set to "Multiple user-plane resources supported" in the 5GMM capability IE; or

b) for additional PDU sessions, if the number of PDU sessions for which user-plane resources are currently established is equal to the UE's maximum number of supported user-plane resources.

The service request procedure is initiated by the UE, however, it can be triggered by the network by means of:

- the paging procedure (see subclause 5.6.2) for the transfer of downlink signalling or user data pending over 3GPP access to a UE in 5GMM-IDLE mode over 3GPP access;

- the paging procedure (see subclause 5.6.2) for the transfer of downlink signalling or user data pending over non-3GPP access to a UE in 5GMM-IDLE mode over 3GPP access and in 5GMM-IDLE mode over non-3GPP access;

- the notification procedure (see subclause 5.6.3) for the transfer of downlink signalling or user data pending over non-3GPP access to a UE in 5GMM-CONNECTED mode over 3GPP access and in 5GMM-IDLE mode over non-3GPP access; or

- the notification procedure (see subclause 5.6.3) for the transfer of downlink signalling or user data pending over 3GPP access to a UE in 5GMM-IDLE mode over 3GPP access and in 5GMM-CONNECTED mode over non-3GPP access.

NOTE 2: In case the UE is in 5GMM-IDLE mode over 3GPP access and in 5GMM-CONNECTED mode over non-3GPP access and downlink signalling or user data pending over 3GPP access needs to be transferred, the AMF can trigger either the notification procedure or the paging procedure based on implementation.

The UE shall invoke the service request procedure when:

a) the UE, in 5GMM-IDLE mode over 3GPP access, receives a paging request from the network;

NOTE 3: As an implementation option, the MUSIM capable UE is allowed to not invoke service request to respond to paging based on the paging cause indication.

b) the UE, in 5GMM-CONNECTED mode over 3GPP access, receives a notification from the network with access type indicating non-3GPP access;

c) the UE, in 5GMM-IDLE mode over 3GPP access, has uplink signalling pending (except in case i);

d) the UE, in 5GMM-IDLE mode over 3GPP access, has uplink user data pending (except in case j);

e) the UE, in 5GMM-CONNECTED mode or in 5GMM-CONNECTED mode with RRC inactive indication, has user data pending due to no user-plane resources established for PDU session(s) used for user data transport;

f) the UE in 5GMM-IDLE mode over non-3GPP access, with T3346 not active or upon expiry of T3346, receives or has already received an indication from the lower layers of non-3GPP access, that the access stratum connection is established between UE and network;

g) the UE, in 5GMM-IDLE mode over 3GPP access, receives a notification from the network with access type indicating 3GPP access when the UE is in 5GMM-CONNECTED mode over non-3GPP access;

h) the UE, in 5GMM-IDLE, 5GMM-CONNECTED mode over 3GPP access, or 5GMM-CONNECTED mode with RRC inactive indication, receives a request from the upper layers to perform emergency services fallback and performs emergency services fallback as specified in subclause 4.13.4.2 of 3GPP TS 23.502 [9];

i) the UE, in 5GMM-CONNECTED mode over 3GPP access or in 5GMM-CONNECTED mode with RRC inactive indication, receives a fallback indication from the lower layers (see subclauses 5.3.1.2 and 5.3.1.4) and the UE has a pending NAS procedure other than a registration, service request, or de-registration procedure;

j) the UE, in 5GMM-CONNECTED mode over 3GPP access or in 5GMM-CONNECTED mode with RRC inactive indication, receives a fallback indication from the lower layers (see subclauses 5.3.1.2 and 5.3.1.4) and the UE has pending uplink user data for PDU session(s) with user-plane resources already established but no pending NAS procedure;

k) the UE, in 5GMM-CONNECTED mode and has a NAS signalling connection only, is using 5GS services with control plane CIoT 5GS optimization and has pending user data to be sent via user-plane resources;

l) the UE in 5GMM-IDLE mode over 3GPP access has to request resources for V2X communication over PC5 (see 3GPP TS 23.287 [6C]);

m) the network supports the paging restriction, the UE that is MUSIM capable and in 5GMM-IDLE mode is requesting the network to remove the paging restriction;

n) the UE in 5GMM-IDLE mode over 3GPP access

- has to request resources for 5G ProSe direct discovery over PC5 or 5G ProSe direct communication over PC5 (see 3GPP TS 23.304 [6E]); or

- acts as 5G ProSe layer-2 UE-to-network relay UE and receives a trigger from lower layers to establish the NAS signalling connection (see 3GPP TS 23.304 [6E]);

o) the network supports the N1 NAS signalling connection release, the UE supports MUSIM,

- is in 5GMM-CONNECTED mode requests the network to release the NAS signalling connection and optionally includes paging restrictions;

- is in 5GMM-CONNECTED mode with RRC inactive indication requests the network to release the NAS signalling connection and optionally includes paging restrictions; or

- is in 5GMM-CONNECTED mode with RRC inactive indication, rejects the RAN paging;

 and requests the network to release the NAS signalling connection and, if the network supports the paging restriction, optionally includes paging restrictions; or

p) the network supports the reject paging request, the UE supports MUSIM, in 5GMM-IDLE mode when responding to paging rejects the paging request from the network, requests the network to release the NAS signalling connection and, if the network supports the paging restriction, optionally includes paging restrictions.

If one of the above criteria to invoke the service request procedure is fulfilled, then the service request procedure shall only be initiated by the UE when the following conditions are fulfilled:

- its 5GS update status is 5U1 UPDATED, and the TAI of the current serving cell is included in the TAI list; and

- no 5GMM specific procedure is ongoing.

The UE shall not invoke the service request procedure when the UE is in the state 5GMM-SERVICE-REQUEST-INITIATED.

The UE that is MUSIM capable shall not initiate service request procedure for requesting the network to release the N1 NAS signalling connection if the UE is registered for emergency services or if the UE has an emergency PDU session established.



Figure 5.6.1.1.1: Service Request procedure (Part 1)



Figure 5.6.1.1.2: Service Request procedure (Part 2)

A service request attempt counter is used to limit the number of service request attempts and no response from the network. The service request attempt counter shall be incremented as specified in subclause 5.6.1.7.

The service request attempt counter shall be reset when:

- a registration procedure for mobility and periodic registration update is successfully completed;

- a service request procedure is successfully completed;

- a service request procedure is rejected as specified in subclause 5.6.1.5 or subclause 5.3.20; or

- the UE moves to 5GMM-DEREGISTERED state.

\* \* \* Next Change \* \* \*

#### 5.6.2.1 General

The paging procedure is performed only in 3GPP access and used by the network to request the establishment of a NAS signalling connection to the UE. The paging procedure is also used by the network to request the UE to re-establish the user-plane resources of PDU sessions for downlink user data transport. Another purpose of the paging procedure is to request the UE to re-establish the user-plane resources of PDU session(s) associated with non-3GPP access over 3GPP access.

Additionally, the network can use the paging procedure to initiate the mobile terminating SMS.

For the UE using eDRX, the network initiates the paging procedure when NAS signalling messages or user data is pending to be sent to the UE within the paging time window. If NAS signalling messages or user data is pending to be sent to the UE outside the paging time window and the eDRX value that the network provides to the UE in the Negotiated extended DRX parameters IE during the last registration procedure indicates:

a) the eDRX cycle length duration of the E-UTRA cell connected to 5GCN, is higher than 5.12 seconds; or

b) the eDRX cycle length duration of the NR cell connected to 5GCN, is higher than 10.24 seconds,

the network initiates the paging procedure at T time ahead of the beginning of the next paging time window.

NOTE: T time is a short time period based on implementation. The operator can take possible imperfections in the synchronization between the 5GCN and the UE into account when choosing T time.

If the network detects that the pending user data to be sent to the UE is related to the voice service as specified in 3GPP TS 23.502 [9] and the network decides to initiate the paging procedure based on the stored paging restriction information, if any, the AMF should request the lower layer to include the Voice Service Indication in the paging message when the UE and the network support the paging cause feature.

\* \* \* Next Change \* \* \*

##### 5.6.2.2.1 General

The network shall initiate the paging procedure for 5GS services when NAS signalling messages or user data is pending to be sent to the UE in 5GMM-IDLE mode over 3GPP access (see example in figure 5.6.2.2.1.1) and there is no paging restriction applied in the network for that paging.



Figure 5.6.2.2.1.1: Paging procedure

To initiate the procedure the 5GMM entity in the AMF requests the lower layer to start paging and shall start timer T3513.

If downlink signalling or user data is pending to be sent over non-3GPP access, the 5GMM entity in the AMF shall indicate to the lower layer that the paging is associated to non-3GPP access.

The network shall not page the UE to re-establish user-plane resources of PDU session(s) associated with non-3GPP access over 3GPP access if all the PDU sessions of the UE that are established over the 3GPP access are associated with control plane only indication.

The 5GMM entity in the AMF may provide the lower layer with the "allowed CAG list" and an "indication that the UE is only allowed to access 5GS via CAG cells" for the current PLMN, if available, and with the "allowed CAG list" and an "indication that the UE is only allowed to access 5GS via CAG cells" per equivalent PLMN, if available. If there is an active emergency PDU session, the 5GMM entity in the AMF shall not provide the lower layer with the "allowed CAG list" and an "indication that the UE is only allowed to access 5GS via CAG cells" for the current PLMN, even if available, or with the "allowed CAG list" and an "indication that the UE is only allowed to access 5GS via CAG cells" per equivalent PLMN, even if available.

Upon reception of a paging indication, the UE shall stop the timer T3346, if running, and:

a) if control plane CIoT 5GS optimization is not used by the UE, the UE shall:

1) initiate a service request procedure over 3GPP access to respond to the paging as specified in subclauses 5.6.1.2.1 if the UE is in 5GMM-REGISTERED.NORMAL-SERVICE or 5GMM-REGISTERED.NON-ALLOWED-SERVICE (as described in subclause 5.3.5.2) state and the UE is in the 5GMM-IDLE mode without suspend indication;

2) initiate a service request procedure over non-3GPP access to respond to the paging as specified in subclauses 5.6.1;

3) initiate a registration procedure for mobility and periodic registration update over 3GPP access to respond to the paging as specified in subclauses 5.5.1.3.2; or

4) proceed as specified in subclause 5.3.1.5 if the UE is in the 5GMM-IDLE mode with suspend indication; or

b) if control plane CIoT 5GS optimization is used by the UE, the UE shall:

1) initiate a service request procedure as specified in subclause 5.6.1.2.2 if the UE is in the 5GMM-IDLE mode without suspend indication;

2) initiate a registration procedure for mobility and periodic registration update over 3GPP access as specified in subclauses 5.5.1.3.2; or

3) proceed as specified in subclause 5.3.1.5 if the UE is in the 5GMM-IDLE mode with suspend indication.

NOTE 1: If the UE is in the 5GMM-IDLE mode without suspend indication and has an uplink user data to be sent to the network using control plane CIoT 5GS optimization when receiving the paging indication, the UE can piggyback the uplink user data during the service request procedure initiated to respond to the paging, as specified in subclause 5.6.1.2.2.

Upon reception of a paging indication, if the network supports the rejection of paging request and if a MUSIM capable UE decides not to accept the paging, the UE may initiate a service request procedure to reject the paging as specified in clause 5.6.1.1.

NOTE 2: As an implementation option, MUSIM-capable UE is allowed to not respond to paging based on the paging cause indication.

If TMGI is used as paging identity and the TMGI matches with MBS multicast session which the has UE joined, the UE shall respond to the paging. Otherwise, the UE shall not respond to the paging.

The network shall stop timer T3513 for the paging procedure when an integrity-protected response is received from the UE and successfully integrity checked by the network or when the 5GMM entity in the AMF receives an indication from the lower layer that it has received the NGAP UE context resume request message as specified in 3GPP TS 38.413 [31]. If the response received is not integrity protected, or the integrity check is unsuccessful, timer T3513 for the paging procedure shall be kept running unless:

a) the UE is registered for emergency services;

b) the UE has an emergency PDU session; or

c) the response received is a REGISTRATION REQUEST message for mobility and periodic registration update and the security mode control procedure or authentication procedure performed during mobility and periodic registration update has completed successfully.

Upon expiry of timer T3513, the network may reinitiate paging.

If the network, while waiting for a response to the paging sent without paging priority, receives downlink signalling or downlink data associated with priority user-plane resources for PDU sessions, the network shall stop timer T3513, and then initiate the paging procedure with paging priority.

\* \* \* End of Change \* \* \*