**3GPP TSG-CT WG1 Meeting #128-eC1-21xxxx**

**Electronic meeting, 25 Feb - 05 March 2021 (was C1-210814, C1-207565, C1-207212)**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  | **24.501** | **CR** | **2865** | **rev** | **3** | **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 | **x** | Radio Access Network |  | Core Network |  |

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| ***Title:***  | Conflict of sub-state NON-ALLOWED-SERVICE with other 5GMM-REGISTERED sub-states |
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| ***Source to WG:*** | Apple |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | 5GProtoc17 |  | ***Date:*** | 2021-02-17 |
|  |  |  |  |  |
| ***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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)* |
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| ***Reason for change:*** | The substate 5GMM-REGISTERED.NON-ALLOWED-SERVICE shall only be entered if the UE is successfully registered in the TA of the camped cell, i.e. when the UE would enter 5GMM-REGISTERED.NORMAL service. However this is not explicitly stated in many places where the state 5GMM-REGISTERED.NORMAL-SERVICE is used as a condition. Further the substate 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE and UPDATE-NEEDED could be entered even if the UE is camped on a cell whose tracking area is subject to service area restritions. In these states the same service restrictions shall be applied as they are defined for NON-ALLOWED-SERVICE. |
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| ***Summary of change:*** | It is clarified that 5GMM-REGISTERED.NON-ALLOWED-SERVICE is only entered if the tracking area of the current cell is in the registration area and the 5GS update status is 5U1. It is clarified that in 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE and UPDATE-NEEDED, the same service restrictions shall be applied as they are defined for NON-ALLOWED-SERVICE.It is clarified in various cases where only substate 5GMM-REGISTERED. NORMAL-SERVICE is mentioned, that the UE might be either in 5GMM-REGISTERED.NORMAL-SERVICE or NON-ALLOWED-SERVICE if this is applicable. |
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| ***Consequences if not approved:*** | The normative requirements which are based on the 5GMM-REGISTERED.NORMAL-SERVICE would not be applicable for UPDATE-NEEDED in consequence the UE might be implemented so that it violates legacy requirements which are still applicable.The normative requirements defined for the old sub-states (e.g. ATTEMPTING-REGISTRATION-UPDATE, UPDATE-NEEDED) are not any longer applicable even they need to be applied if the UE camps on a cell which is part of a non-allowed service area and in consequence the UE might be implemented so that it violates legacy requirements which are still applicable.  |
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| ***Clauses affected:*** | 5.1.3.2.1.4.2, 5.1.3.2.1.4.3, 5.1.3.2.1.4.8, 5.1.4.2, 5.1.4.3, 5.3.5.2, 5.3.6, 5.5.1.3.7, 5.6.2.2.1, 5.6.3.2, 10.2 |
|  |  |
|  | **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 \*\*\*\*\*

5.1.3.2.1.4.2 5GMM-REGISTERED.NORMAL-SERVICE

The substate 5GMM-REGISTERED.NORMAL-SERVICE is chosen by the UE as the primary substate when the UE enters the state 5GMM-REGISTERED, and:

- for 3GPP access, the cell the UE selected is known to be in an allowed area (see subclause 5.3.5.2); or

- for wireline access, the wireline access service area restrictions are not enforced.

5.1.3.2.1.4.3 5GMM-REGISTERED.NON-ALLOWED-SERVICE

The substate 5GMM-REGISTERED.NON-ALLOWED-SERVICE is chosen in the UE, if:

- for 3GPP access, the cell the UE selected is known to be in a non-allowed area (see subclause 5.3.5.2); or

- for wireline access, the wireline access service area restrictions are enforced.

This substate is applicable only to 3GPP access and to wireline access.

5.1.3.2.1.4.4 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE

The substate 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE is chosen by the UE if the registration procedure for mobility and periodic registration update failed due to a missing response from the network, or due to the circumstances described in subclauses 5.3.9, 5.5.1.3.5 and 5.5.1.3.7. No 5GMM procedure except registration procedure for mobility and periodic registration update (i.e. the 5GS registration type IE set to "mobility registration updating" in the REGISTRATION REQUEST message) shall be initiated by the UE in this substate. No data shall be sent or received.

NOTE 1: The registration procedure for mobility and periodic registration update over non-3GPP access can be triggered by, e.g. the change of S1 UE network capability or renegotiating some parameters.

NOTE 2: This substate is entered irrespective whether the UE is is camped on a cell which is in the registered PLMN or a PLMN from the list of equivalent PLMNs and whose TAI is not in the list of "allowed tracking areas” or is camped on a cell whose TAI is in the list of "non-allowed tracking areas”.

5.1.3.2.1.4.8 5GMM-REGISTERED.UPDATE-NEEDED

This state can be entered if the UE has to perform a registration procedure for mobility and periodic registration update but:

a) the access is barred due to unified access control when in 3GPP access;

b) the network rejects the N1 NAS signalling connection establishment when in 3GPP access or in non-3GPP access; or

c) the UE in 5GMM-CONNECTED mode with RRC inactive indication receives an indication from the lower layers that the resumption of the RRC connection has failed and for access is barred for all categories except categories '0' and '2' as specified in subclause 5.3.1.4.

No 5GMM procedure except:

a) registration procedure for mobility and periodic registration update; and

b) service request procedure as a response to paging or notification

shall be initiated by the UE in this substate.

NOTE: This substate is entered irrespective whether the UE is is camped on a cell which is in the registered PLMN or a PLMN from the list of equivalent PLMNs and whose TAI is not in the list of "allowed tracking areas” or is camped on a cell whose TAI is in the list of "non-allowed tracking areas”.

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

#### 5.1.4.2 Coordination between 5GMM for 3GPP access and EMM with N26 interface

A UE that is not registered shall be in state EMM-DEREGISTERED and state 5GMM-DEREGISTERED for 3GPP access.

In N1 mode, upon successful completion of a registration procedure over 3GPP access, the UE operating in single-registration mode shall enter substates 5GMM-REGISTERED.NORMAL-SERVICE or 5GMM-REGISTERED.NON-ALLOWED-SERVICE as described in subclause 5.3.5.2 for 3GPP access and EMM-REGISTERED.NO-CELL-AVAILABLE. The UE shall reset the registration attempt counter for 3GPP access and the attach attempt counter (see 3GPP TS 24.301 [15]).

At inter-system change from S1 mode to N1 mode, the UE shall enter substates 5GMM-REGISTERED.NORMAL-SERVICE or 5GMM-REGISTERED.NON-ALLOWED-SERVICE as described in subclause 5.3.5.2 for 3GPP accessand EMM-REGISTERED.NO-CELL-AVAILABLE and initiate a registration procedure for mobility and periodic registration update over 3GPP access indicating "mobility registration updating" in the 5GS registration type IE of the REGISTRATION REQUEST message (see subclause 5.5.1.3).

In S1 mode, upon successful completion of an attach or tracking area updating procedure, the UE operating in single-registration mode shall enter substates 5GMM-REGISTERED.NO-CELL-AVAILABLE for 3GPP access and EMM-REGISTERED.NORMAL-SERVICE. The UE shall reset the registration attempt counter for 3GPP access and the attach attempt counter (see 3GPP TS 24.301 [15]).

At inter-system change from N1 mode to S1 mode when there is no active PDU session for which interworking with EPS is supported as specified in subclause 6.1.4.1, and EMM-REGISTERED without PDN connection is not supported by the UE or the MME, the UE shall enter state 5GMM-DEREGISTERED for 3GPP access and state EMM-DEREGISTERED and then initiate the EPS attach procedure. If EMM-REGISTERED without PDN connection is supported by the UE and the MME, the UE shall enter substates EMM-REGISTERED.NORMAL-SERVICE and 5GMM-REGISTERED.NO-CELL-AVAILABLE for 3GPP access and initiate a tracking area updating procedure.

At inter-system change from N1 mode to S1 mode when there is at least one active PDU session for which interworking with EPS is supported as specified in subclause 6.1.4.1, the UE shall enter substates EMM-REGISTERED.NORMAL-SERVICE and 5GMM-REGISTERED.NO-CELL-AVAILABLE for 3GPP access and initiate a tracking area updating procedure (see 3GPP TS 24.301 [15]).

#### 5.1.4.3 Coordination between 5GMM for 3GPP access and EMM without N26 interface

A UE operating in the single-registration mode that is not registered over 3GPP access shall be in state EMM-DEREGISTERED and in state 5GMM-DEREGISTERED for 3GPP access.

In N1 mode, upon successful completion of a registration procedure over 3GPP access, the UE operating in the single-registration mode shall enter substates 5GMM-REGISTERED.NORMAL-SERVICE or 5GMM-REGISTERED.NON-ALLOWED-SERVICE as described in subclause 5.3.5.2 for 3GPP access and EMM-REGISTERED.NO-CELL-AVAILABLE.

At inter-system change from N1 mode to S1 mode in 5GMM-IDLE mode, the UE shall behave as specified in subclause 4.8.2.3.

In S1 mode, upon successful completion of an attach or tracking area updating procedure, the UE operating in the single-registration mode shall enter substates 5GMM-REGISTERED.NO-CELL-AVAILABLE for 3GPP access and EMM-REGISTERED.NORMAL-SERVICE.

At inter-system change from S1 mode to N1 mode in 5GMM-IDLE mode, the UE operating in the single-registration mode shall enter substates EMM-REGISTERED.NO-CELL-AVAILABLE and 5GMM- REGISTERED.NORMAL-SERVICE for 3GPP access and then initiate the registration procedure for mobility and periodic registration update over 3GPP access indicating "mobility registration updating" in the 5GS registration type IE of the REGISTRATION REQUEST message (see subclause 5.5.1.3).

\*\*\*\*\* 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, 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;

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 \*\*\*\*\*

#### 5.3.5.2 3GPP access service area restrictions

The service area restrictions consist of tracking areas forming either an allowed area, or a non-allowed area. The tracking areas belong to either the registered PLMN or its equivalent PLMNs in the registration area. The allowed area can contain up to 16 tracking areas or include all tracking areas in the registered PLMN and its equivalent PLMN(s) in the registration area. The non-allowed area can contain up to 16 tracking areas. The network conveys the service area restrictions to the UE by including either an allowed area, or a non-allowed area, but not both, in the Service area list IE of a REGISTRATION ACCEPT message or a CONFIGURATION UPDATE COMMAND message.

If the network does not convey the service area restrictions to the UE in the Service area list IE of a REGISTRATION ACCEPT message, the UE shall treat all tracking areas in the registered PLMN and its equivalent PLMN(s) in the registration area as allowed area and delete the stored list of "allowed tracking areas" or the stored list of "non-allowed tracking areas".

When the UE receives a Service area list IE with an allowed area indication during a registration procedure or a generic UE configuration update procedure:

a) if the "Type of list" included in the Service area list IE does not indicate "all TAIs belonging to the PLMNs in the registration area are allowed area", the UE shall delete the old list of "allowed tracking areas" and store the tracking areas in the allowed area as the list of "allowed tracking areas". If the UE has a stored list of "non-allowed tracking areas", the UE shall delete that list; or

b) if the "Type of list" included in the Service area list IE indicates "all TAIs belonging to the PLMNs in the registration area are allowed area", the UE shall treat all tracking areas in the registered PLMN and its equivalent PLMN(s) as allowed area and delete the stored list of "allowed tracking areas" or the stored list of "non-allowed tracking areas".

When the UE receives a Service area list IE with a non-allowed area indication during a registration procedure or a generic UE configuration update procedure, the UE shall delete the old list of "non-allowed tracking areas" and store the tracking areas in the non-allowed area as the list of "non-allowed tracking areas". If the UE has a stored list of "allowed tracking areas", the UE shall delete that list.

If the UE is successfully registered to a PLMN and has a stored list of "allowed tracking areas":

a) while camped on a cell whose TAI is in the list of "allowed tracking areas", the UE shall stay in, or enter, the state 5GMM-REGISTERED.NORMAL-SERVICE and is allowed to initiate any 5GMM and 5GSM procedures; and

b) while camped on a cell which is in the registered PLMN or a PLMN from the list of equivalent PLMNs and whose TAI is not in the list of "allowed tracking areas", the UE shall enter the state 5GMM-REGISTERED.NON-ALLOWED-SERVICE, and:

1) if the UE is in 5GMM-IDLE mode or 5GMM-IDLE mode with suspend indication over 3GPP access, the UE:

i) shall not include the Uplink data status IE in the registration procedure for mobility and periodic registration update except for emergency services or for high priority access;

ii) shall not perform the registration procedure for mobility and periodic registration update with Follow-on request indicator set to "Follow-on request pending", except for:

- emergency services;

- high priority access;

- indicating a change of 3GPP PS data off UE status;

- sending an SOR transparent container;

- sending a UE policy container; or

- sending a UE parameters update transparent container;

iii) shall not initiate a service request procedure or request the lower layers to resume a suspended connection, except for:

- emergency services;

- emergency services fallback;

- high priority access;

- responding to paging;

- responding to notification received over non-3GPP access;

- indicating a change of 3GPP PS data off UE status;

- sending an SOR transparent container;

- sending a UE policy container; or

- sending a UE parameters update transparent container; and

2) if the UE is in 5GMM-CONNECTED mode or 5GMM-CONNECTED mode with RRC inactive indication over 3GPP access, the UE:

i) shall not perform the registration procedure for mobility and periodic registration update with Uplink data status IE except for emergency services or for high priority access;

ii) shall not initiate a service request procedure except for:

- emergency services;

- emergency services fallback;

- high priority access;

- responding to paging or responding to notification received over non-3GPP access;

iii) shall not initiate a 5GSM procedure except for:

- emergency services;

- high priority access; or

- indicating a change of 3GPP PS data off UE status; and

iv) shall not perform the NAS transport procedure except for the sending:

- SMS;

- an LPP message;

- a location services message;

- an SOR transparent container;

- a UE policy container;

- a UE parameters update transparent container; or

- a CIoT user data container.

If the UE is successfully registered to a PLMN and has a stored list of "non-allowed tracking areas":

a) while camped on a cell which is in the registered PLMN or a PLMN from the list of equivalent PLMNs and whose TAI is not in the list of "non-allowed tracking areas", the UE shall stay in, or enter, the state 5GMM-REGISTERED.NORMAL-SERVICE and is allowed to initiate any 5GMM and 5GSM procedures; and

b) while camped on a cell whose TAI is in the list of "non-allowed tracking areas", the UE shall enter the state 5GMM-REGISTERED.NON-ALLOWED-SERVICE, and:

1) if the UE is in 5GMM-IDLE mode or 5GMM-IDLE mode with suspend indication over 3GPP access, the UE:

i) shall not include the Uplink data status IE in the registration procedure for mobility and periodic registration update except for emergency services or for high priority access;

ii) shall not perform the registration procedure for mobility and periodic registration update with Follow-on request indicator set to "Follow-on request pending", except for:

- emergency services;

- high priority access;

- indicating a change of 3GPP PS data off UE status;

- sending an SOR transparent container;

- sending a UE policy container; or

- sending a UE parameters update transparent container; and

iii) shall not initiate a service request procedure or request the lower layers to resume a suspended connection, except for:

- emergency services;

- emergency services fallback;

- high priority access;

- responding to paging;

- responding to notification received over non-3GPP access;

- indicating a change of 3GPP PS data off UE status;

- sending an SOR transparent container;

- sending a UE policy container; or

- sending a UE parameters update transparent container; and

2) if the UE is in 5GMM-CONNECTED mode or 5GMM-CONNECTED mode with RRC inactive indication over 3GPP access, the UE:

i) shall not perform the registration procedure for mobility and registration update with the Uplink data status IE except for emergency services or for high priority access;

ii) shall not initiate a service request procedure or request the lower layers to resume a suspended connection, except for:

- emergency services;

- emergency services fallback;

- high priority access; or

- responding to paging or responding to notification received over non-3GPP access;

iii) shall not initiate a 5GSM procedure except for:

- emergency services;

- high priority access; or

- indicating a change of 3GPP PS data off UE status; and

iv) shall not perform the NAS transport procedure except for the sending:

- SMS;

- an LPP message;

- a location services message;

- an SOR transparent container;

- a UE policy container;

- a UE parameters update transparent container; or

- a CIoT user data container.

The list of "allowed tracking areas", as well as the list of "non-allowed tracking areas" shall be erased when:

a) the UE is switched off; and

b) the UICC containing the USIM is removed or an entry of the "list of subscriber data" with the SNPN identity of the SNPN is updated.

When a tracking area is added to the list of "5GS forbidden tracking areas for roaming" or to the list of "5GS forbidden tracking areas for regional provision of service" as specified in the subclauses 5.5.1.2.5 or 5.5.1.3.5, the tracking area shall be removed from the list of "allowed tracking areas" if the tracking area is already present in the list of "allowed tracking areas" and from the list of "non-allowed tracking areas" if the tracking area is already present in the list of "non-allowed tracking areas".

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

### 5.3.6 Mobile initiated connection only mode

The UE can request the use of mobile initiated connection only (MICO) mode during the registration procedure (see 3GPP TS 23.501 [8] and 3GPP TS 23.502 [9]). The UE shall not request use of MICO mode over non-3GPP access. Furthermore, the UE in 3GPP access shall not request the use of MICO mode during:

a) a registration procedure for initial registration for emergency services (see subclause 5.5.1.2);

b) a registration procedure for initial registration for initiating an emergency PDU session (see subclause 5.5.1.2);

c) a registration procedure for mobility and periodic registration update (see subclause 5.5.1.3) for initiating an emergency PDU session if the UE is in the state 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE; or

d) a registration procedure for mobility and periodic registration update (see subclause 5.5.1.3) when the UE has an emergency PDU session established.

If the UE requests the use of MICO mode, the network can accept the use of MICO mode by providing a MICO indication when accepting the registration procedure. The UE may use MICO mode only if the network has provided the MICO indication IE during the last registration procedure. The UE may also request an active time value together with the MICO mode indication during the registration procedure.

If the network accepts the use of MICO mode and does not include an active time value in T3324 IE to the UE, the AMF may include an "all PLMN registration area allocated" indication in the MICO indication IE to the UE. If the UE indicated the support for strictly periodic registration timer in the MICO indication IE to the network, the network may include a "strictly periodic registration timer supported" indication in the MICO indication IE to the UE.

If the UE requested the use of active time by including an active time value and the network accepts the use of MICO mode and the use of active time, the AMF shall include an active time value in the T3324 IE to the UE. If the AMF indicates active time value to the UE, AMF should not indicate "all PLMN registration area allocated" indication in the MICO indication IE to the UE. Upon entering 5GMM-IDLE mode, AMF shall start the active timer with the active time value indicated to the UE and shall consider the UE is reachable for paging as long as the timer is running. If the UE enters 5GMM-CONNECTED mode over 3GPP access when the active timer is running, the AMF shall stop the active timer.

NOTE 1: The active time value assigned by AMF can be different from the active time value requested by the UE. AMF assigns the active time value based on several factors, e.g. local configuration, expected UE behaviour, UE requested active time value, UE subscription information, network policies etc.

If the network accepts the use of MICO mode, the UE may deactivate the AS layer and activate MICO mode by entering the state 5GMM-REGISTERED.NO-CELL-AVAILABLE if:

a) the UE is in 5GMM-IDLE mode over3GPP access;

b) the UE is in the 5GMM-REGISTERED.NORMAL-SERVICE or 5GMM-REGISTERED.NON-ALLOWED-SERVICE (as described in subclause 5.3.5.2) state for 3GPP access; and

c) no T3324 value is received from the network.

If the network accepts the use of MICO mode and indicates an active time value to the UE in a successful registration procedure, the UE shall start the timer T3324 with the value received from the network after entering 5GMM-IDLE mode over 3GPP access. At the expiry of the timer T3324, the UE may activate MICO mode by entering the state 5GMM-REGISTERED.NO-CELL-AVAILABLE if the UE is in the 5GMM-REGISTERED.NORMAL-SERVICE or 5GMM-REGISTERED.NON-ALLOWED-SERVICE (as described in subclause 5.3.5.2) state for 3GPP access. If the UE enters 5GMM-CONNECTED mode over 3GPP access when the timer T3324 is running, the UE shall stop the timer T3324.

When MICO mode is activated, all NAS timers are stopped and associated procedures aborted except for timers T3512, T3346, T3447, T3396, T3584, T3585, any back-off timers, T3247, and the timer T controlling the periodic search for HPLMN or EHPLMN or higher prioritized PLMNs (see 3GPP TS 23.122 [5]).

NOTE 2: When MICO mode is activated and if the UE is also registered over the non-3GPP access, the AMF will not send a NOTIFICATION message with access type indicating 3GPP access over the non-3GPP access for PDU sessions associated with 3GPP access.

The UE may deactivate MICO mode and activate the AS layer at any time. Upon deactivating MICO mode, the UE may initiate 5GMM procedures (e.g. for the transfer of mobile originated signalling or user data).

When an emergency PDU session is successfully established after the MICO mode was enabled, the UE and the AMF shall locally disable MICO mode. The UE and the AMF shall not enable MICO mode until the AMF accepts the use of MICO mode in the next registration procedure. To enable an emergency call back, the UE should wait for a UE implementation-specific duration of time before requesting the use of MICO mode after the release of the emergency PDU session.

If the AMF accepts the use of MICO mode and does not indicate "strictly periodic registration timer supported" in the MICO indication IE to the UE, the AMF starts the implicit de-registration timer for 3GPP access when entering 5GMM-IDLE mode for 3GPP access. If AMF accepts the use of MICO mode and indicates "strictly periodic registration timer supported" in the MICO indication IE to the UE, AMF shall start the strictly periodic monitoring timer with T3512 value indicated in the T3512 value IE after the registration procedure is completed. The AMF shall neither stop nor reset the strictly periodic monitoring timer when the NAS signalling connection is established or released for the UE. If the strictly periodic monitoring timer expires when NAS signalling connection is established for the UE, AMF shall restart the strictly periodic monitoring timer with the T3512 value, otherwise AMF shall start the implicit de-registration timer.

When an emergency PDU session is successfully established and the MICO mode is disabled, the UE shall stop timer T3512 if running and the AMF shall stop strictly periodic monitoring timer if running. The UE and the AMF shall behave as if no "strictly periodic registration timer supported" indication was given to the UE in the last registration attempt.

Upon successful completion of an attach procedure or tracking area updating procedure after inter-system change from N1 mode to S1 mode (see 3GPP TS 24.301 [15]), the UE operating in single-registration mode shall locally disable MICO mode. After inter-system change from S1 mode to N1 mode, the UE operating in single-registration mode may re-negotiate MICO mode with the network during the registration procedure for mobility and periodic registration update.

\*\*\*\*\* 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;

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 1: 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;

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;

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

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.

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 the UE shall indicate "mobility registration updating".

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 2: 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 3: 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 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 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 4: 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 5: 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;

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 mapped S-NSSAI(s) available, the UE shall include these S-NSSAI(s) in the Requested mapped NSSAI IE.

NOTE 6: The REGISTRATION REQUEST message can include both the Requested NSSAI IE and the Requested mapped NSSAI IE as described below.

If the UE has allowed NSSAI or configured NSSAI 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, if the UE has no allowed NSSAI for the current PLMN;

b) the allowed NSSAI for the current PLMN, or a subset thereof as described below, if the UE has an allowed NSSAI for the current PLMN; 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 for the current PLMN nor in the rejected NSSAI for the current registration area nor in the rejected NSSAI for the failed or revoked NSSAA 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.

The Requested mapped NSSAI IE shall include mapped S-NSSAI(s), if available, when the UE does not have S-NSSAI(s) applicable in the current PLMN 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 7: The Requested NSSAI IE is used instead of Requested mapped NSSAI IE in REGISTRATION REQUEST message when the UE enters (E)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 for the current PLMN nor in the rejected NSSAI for the current registration area nor in the rejected NSSAI for the failed or revoked NSSAA.

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 8: 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 9: 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 10: The UE is not required to set the Follow-on request indicator to "Follow-on request pending" even if the UE has to request resources for V2X communication over PC5 reference point.

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.

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.

If the UE supports extended rejected NSSAI, then 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 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].



Figure 5.5.1.3.2.1: Registration procedure for mobility and periodic registration update

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

##### 5.5.1.3.7 Abnormal cases in the UE

The following abnormal cases can be identified:

a) Timer T3346 is running.

 The UE shall not start the registration procedure for mobility and periodic registration update unless:

1) the UE is in 5GMM-CONNECTED mode;

2) the UE received a paging;

3) the UE receives a NOTIFICATION message over non-3GPP access when the UE is in 5GMM-CONNECTED mode over non-3GPP access and in 5GMM-IDLE mode over 3GPP access;

4) the UE is a UE configured for high priority access in selected PLMN;

5) the UE has an emergency PDU session established or is establishing an emergency PDU session;

6) the UE receives a request from the upper layers to perform emergency services fallback;

7) the UE receives the CONFIGURATION UPDATE COMMAND message as specified in subclause 5.4.4.3; or

8) the UE in NB-N1 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 [17] or the USIM file EFNASCONFIG in 3GPP TS 31.102 [22]); and

- timer T3346 was not started when N1 NAS signalling connection was established with RRC establishment cause set to "mo-ExceptionData".

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

NOTE 1: It is considered an abnormal case if the UE needs to initiate a registration procedure for mobility and periodic registration update while timer T3346 is running independent on whether timer T3346 was started due to an abnormal case or a non-successful case.

 If the registration procedure for mobility and periodic registration update was initiated for an MO MMTEL voice call (i.e. access category 4), for an MO MMTEL video call (i.e. access category 5), for an MO IMS registration related signalling (i.e. access category 9) or for NAS signalling connection recovery during an ongoing MO MMTEL voice call (i.e. access category 4), or during an MO MMTEL video call (i.e. access category 5) or during an ongoing MO IMS registration related signalling (i.e. access category 9), then a notification that the procedure was not initiated due to network congestion shall be provided to upper layers.

b) The lower layers indicate that the access attempt is barred.

 The UE shall not start the registration procedure for mobility and periodic registration update. The UE stays in the current serving cell and applies the normal cell reselection process. Receipt of the access barred indication shall not trigger the selection of a different core network type (EPC or 5GCN).

 The registration procedure for mobility and periodic registration update is started, if still needed, when the lower layers indicate that the barring is alleviated for the access category with which the access attempt was associated.

ba) The lower layers indicate that access barring is applicable for all access categories except categories 0 and 2 and the access category with which the access attempt was associated is other than 0 and 2.

 If the REGISTRATION REQUEST message has not been sent, the UE shall proceed as specified for case b. If the REGISTRATION REQUEST message has been sent, the UE shall proceed as specified for case e and, additionally, the registration procedure for mobility and periodic registration update is started, if still needed, when the lower layers indicate that the barring is alleviated for the access category with which the access attempt was associated. For additional UE requirements for both cases see subclause 4.5.5.

c) T3510 timeout.

 The UE shall abort the registration update procedure and the N1 NAS signalling connection, if any, shall be released locally.

 If the UE has initiated the registration procedure in order to enable performing the service request procedure for emergency services fallback,the UE . Otherwise, the UE shall proceed as described below.

d) REGISTRATION REJECT message, other 5GMM cause values than those treated in subclause 5.5.1.3.5, and cases of 5GMM cause values #11, #22, #31, #72, #73, #74, #75, #76 and #77, if considered as abnormal cases according to subclause 5.5.1.3.5.

 Upon reception of the 5GMM causes #95, #96, #97, #99 and #111 the UE should set the registration attempt counter to 5.

 The UE shall proceed as described below.

e) Lower layer failure, release of the NAS signalling connection received from lower layers or the lower layers indicate that the RRC connection has been suspended without a cell change before the REGISTRATION ACCEPT or REGISTRATION REJECT message is received.

 The UE shall abort the registration procedure and proceed as described below.

f) Change of cell into a new tracking area.

 If a cell change into a new tracking area occurs before the registration procedure for mobility and periodic registration update is completed, the registration procedure for mobility and periodic registration update shall be aborted and re-initiated immediately. The UE shall set the 5GS update status to 5U2 NOT UPDATED.

g) Registration procedure for mobility and periodic registration update and de-registration procedure collision.

 If the UE receives a DEREGISTRATION REQUEST message without 5GMM cause value #11, #12, #13 or #15 before the registration procedure for mobility and periodic registration update has been completed, the registration procedure for mobility and periodic registration update shall be aborted and the de-registration procedure shall be progressed.

 If the UE receives a DEREGISTRATION REQUEST message with 5GMM cause value #11, #12, #13 or #15 before the registration procedure for mobility and periodic registration update has been completed, the registration procedure for mobility and periodic registration update shall be progressed and the de-registration procedure shall be aborted.

NOTE 2: The registration procedure for mobility and periodic registration update shall be aborted only if the DEREGISTRATION REQUEST message indicates in the access type that the access in which the registration procedure for mobility and periodic registration update was attempted shall be de-registered. Otherwise both the procedures shall be progressed.

h) Void

i) Transmission failure of REGISTRATION REQUEST message indication from the lower layers or the lower layers indicate that the RRC connection has been suspended with a cell change.

 The registration procedure for mobility and periodic registration update shall be aborted and re-initiated immediately. The UE shall set the 5GS update status to 5U2 NOT UPDATED.

j) Transmission failure of REGISTRATION COMPLETE message indication with TAI change from lower layers.

 If the current TAI is not in the TAI list, the registration procedure for mobility and periodic registration update shall be aborted and re-initiated immediately. The UE shall set the 5GS update status to 5U2 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.

k) Transmission failure of REGISTRATION COMPLETE message indication without TAI change from lower layers.

 It is up to the UE implementation how to re-run the ongoing procedure.

l) UE-initiated de-registration required.

 De-registration due to removal of USIM or entry update in the "list of subscriber data" or due to switch off:

 The registration procedure for mobility and periodic registration update shall be aborted, and the UE initiated de-registration procedure shall be performed.

 De-registration not due to removal of USIM or entry update in the "list of subscriber data" and not due to switch off:

 the UE initiated de-registration procedure shall be initiated after successful completion of the registration procedure for mobility and periodic registration update.

m) Timer T3447 is running

 The UE shall not start any mobility and periodic registration update procedure with Uplink data status IE or Follow-on request indicator set to "Follow-on request pending" unless:

- the UE received a paging;

- the UE is a UE configured for high priority access in selected PLMN;

- the UE has an emergency PDU session established or is establishing an emergency PDU session; or

- the UE receives a request from the upper layers to perform emergency services fallback;

 The UE stays in the current serving cell and applies the normal cell reselection process. The mobility and periodic registration update procedure is started, if still necessary, when timer T3447 expires or timer T3447 is stopped.

n) Timer T3448 is running

 The UE in 5GMM-IDLE mode shall not start any mobility and periodic registration update procedure with Follow-on request indicator set to "Follow-on request pending" unless:

1) the UE is a UE configured for high priority access in selected PLMN;

2) the UE which is only using 5GS services with control plane CIoT 5GS optimization received a paging request; or

3) the UE in NB-N1 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 [17] or the USIM file EFNASCONFIG in 3GPP TS 31.102 [22]).

 The UE stays in the current serving cell and applies the normal cell reselection process. The mobility and periodic registration update procedure is started, if still necessary, when timer T3448 expires.

For the cases c, d and e the UE shall proceed as follows:

 Timer T3510 shall be stopped if still running.

 If the registration procedure is not for initiating an emergency PDU session, the registration attempt counter shall be incremented, unless it was already set to 5.

 If the registration attempt counter is less than 5:

- if the TAI of the current serving cell is not included in the TAI list or the 5GS update status is different to 5U1 UPDATED or if the registration procedure was triggered due to cases c, g, n, v in subclause 5.5.1.3.2, the UE shall start timer T3511, shall set the 5GS update status to 5U2 NOT UPDATED and change to state 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE. When timer T3511 expires, the registration update procedure is triggered again.

- if the TAI of the current serving cell is included in the TAI list, the 5GS update status is equal to 5U1 UPDATED, and the UE is not performing the registration procedure after an inter-system change from S1 mode to N1 mode, the UE shall keep the 5GS update status to 5U1 UPDATED and enter state 5GMM-REGISTERED.NORMAL-SERVICE or 5GMM-REGISTERED.NON-ALLOWED-SERVICE (as described in subclause 5.3.5.2). The UE shall start timer T3511. If in addition the REGISTRATION REQUEST message did not include the MICO indication IE or the Extended DRX IE, and:

- the REGISTRATION REQUEST message indicated "periodic registration updating";

- the registration procedure was initiated to recover the NAS signalling connection due to "RRC Connection failure" from the lower layers; or

- the registration procedure was initiated by the UE in 5GMM-CONNECTED mode with RRC inactive indication entering a cell in the current registration area belonging to an equivalent PLMN of the registered PLMN and not belonging to the registered PLMN,

 and none of the other reasons for initiating the registration updating procedure listed in subclause 5.5.1.3.2 was applicable, the timer T3511 may be stopped when the UE enters 5GMM-CONNECTED mode.

- if the TAI of the current serving cell is included in the TAI list, the 5GS update status is equal to 5U1 UPDATED and the UE is performing the registration procedure after an inter-system change from S1 mode to N1 mode, the UE shall change the 5GS update status to 5U2 NOT UPDATED and enter state 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE. The UE shall start timer T3511.

- If the procedure is performed via 3GPP access and the UE is operating in single-registration mode, the UE shall in addition handle the EPS update status as specified in 3GPP TS 24.301 [15] for the abnormal cases when a normal or periodic tracking area updating procedure fails and the tracking area attempt counter is less than 5 and the EPS update status is different from EU1 UPDATED.

 If the registration attempt counter is equal to 5

- the UE shall start timer T3502, shall set the 5GS update status to 5U2 NOT UPDATED.

- the UE shall delete the list of equivalent PLMNs (if any) and shall change to state 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE or optionally to 5GMM-REGISTERED.PLMN-SEARCH in order to perform a PLMN selection or SNPN selection according to 3GPP TS 23.122 [5].

- if the procedure is performed via 3GPP access and the UE is operating in single-registration mode:

- the UE shall in addition handle the EPS update status as specified in 3GPP TS 24.301 [15] for the abnormal cases when a normal or periodic tracking area updating procedure fails and the tracking area attempt counter is equal to 5; and

- if the UE does not change to state 5GMM-REGISTERED.PLMN-SEARCH, the UE shall attempt to select E-UTRAN radio access technology. The UE may disable the N1 mode capability as specified in subclause 4.9.

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

#### 5.6.2.2 Paging for 5GS services

##### 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).



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: 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.

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.

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

#### 5.6.3.2 Notification procedure initiation

The network shall initiate the notification procedure by sending the NOTIFICATION message to the UE and start timer T3565 (see example in figure 5.6.3.2.1).

For case a) in subclause 5.6.3.1, the NOTIFICATION message is sent from the network to the UE via 3GPP access with access type indicating non-3GPP access.

For case b) in subclause 5.6.3.1, the NOTIFICATION message is sent from the network to the UE via non-3GPP access with access type indicating 3GPP access when the UE is not in MICO mode.



Figure 5.6.3.2.1: Notification procedure

Upon reception of a NOTIFICATION message, the UE shall stop the timer T3346, if running.

For case a) in subclause 5.6.3.1, upon reception of NOTIFICATION message, the UE shall initiate a service request procedure over 3GPP access as specified in subclauses 5.6.1.

For case b) in subclause 5.6.3.1, upon reception of NOTIFICATION message:

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 as specified in subclause 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 over 3GPP access or 5GMM-REGISTERED.NON-ALLOWED-SERVICE state (see subclause 5.3.5.2), and 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 subclause 5.5.1.3.2, if the UE is in 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE state over 3GPP access; or

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

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

1) initiate a service request procedure over 3GPP access as specified in subclause 5.6.1.2.2, 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 registration procedure for mobility and periodic registration update over 3GPP access as specified in subclause 5.5.1.3.2, if the UE is in 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE state; or

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

c) if the UE is in 5GMM-REGISTERED.NO-CELL-AVAILABLE state, 5GMM-REGISTERED.PLMN-SEARCH state, 5GMM-REGISTERED.LIMITED-SERVICE state or 5GMM-REGISTERED.UPDATE-NEEDED state over 3GPP access, the UE shall respond with NOTIFICATION RESPONSE message indicating failure to re-establish the user-plane resources of PDU sessions and may include the PDU session status information element to indicate:

1) the single access PDU session(s) not in 5GSM state PDU SESSION INACTIVEin the UE associated with the 3GPP access type; and

2) the MA PDU session(s) not in 5GSM state PDU SESSION INACTIVE in the UE and having user plane resources established associated with the 3GPP access type.

Upon reception of NOTIFICATION message:

 For case b) in subclause 5.6.3.1, if the UE is in 5GMM-REGISTERED.NO-CELL-AVAILABLE state or 5GMM-REGISTERED.PLMN-SEARCH state and a local release was performed in the UE for the single access PDU sessions associated with the 3GPP access or for user plane resources on the 3GPP access of MA PDU sessions;

then the UE shall respond with NOTIFICATION RESPONSE message indicating with the PDU session status information element that:

- the local release of its single access PDU sessions associated with the 3GPP access was performed; and

- the local release of its 3GPP access user plane resources of MA PDU sessions was performed.

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

## 10.2 Timers of 5GS mobility management

Timers of 5GS mobility management are shown in table 10.2.1 and table 10.2.2

NOTE: Timers T3324, T3346 and T3245 are defined in 3GPP TS 24.008 [12]. Timers T3444, T3445, T3447 and T3448 are defined in 3GPP TS 24.301 [15].

Table 10.2.1: Timers of 5GS mobility management – UE side

| TIMER NUM. | TIMER VALUE | STATE | CAUSE OF START | NORMAL STOP | ON EXPIRY |
| --- | --- | --- | --- | --- | --- |
| T3502 | Default 12 min.NOTE 1 | 5GMM-DEREGISTERED 5GMM-REGISTERED | At registration failure and the attempt counter is equal to 5 | Transmission of REGISTRATION REQUEST message | Initiation of the registration procedure, if still required |
| T3510 | 15sNOTE 7NOTE 8In WB-N1/CE mode, 85s | 5GMM-REGISTERED-INITIATED | Transmission of REGISTRATION REQUEST message | REGISTRATION ACCEPT message received or REGISTRATION REJECT message received | Start T3511 or T3502 as specified in subclause 5.5.1.2.7 if T3510 expired during registration procedure for initial registration.Start T3511 or T3502 as specified in subclause 5.5.1.3.7 if T3510 expired during the registration procedure for mobility and periodic registration update |
| T3511 | 10s | 5GMM-DEREGISTERED.ATTEMPTING-REGISTRATION5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE5GMM-REGISTERED.NORMAL-SERVICE or 5GMM-REGISTERED.NON-ALLOWED-SERVICE | At registration failure due to lower layer failure, T3510 timeout or registration rejected with other 5GMM cause values than those treated in subclause 5.5.1.2.5 for initial registration or subclause 5.5.1.3.5 for mobility and periodic registration | Transmission of REGISTRATION REQUEST message5GMM-CONNECTED mode entered (NOTE 5) | Retransmission of the REGISTRATION REQUEST, if still required |
| T3512 | Default 54 minNOTE 1NOTE 2 | 5GMM-REGISTERED | In 5GMM-REGISTERED, when 5GMM-CONNECTED mode is left and if the NW does not indicate support for strictly periodic registration timer as specified in subclause 5.3.7.If the network indicates support for strictly periodic registration timer, T3512 is started after the successful completion of registration update procedure. T3512 is restarted if it expires in 5GMM-CONNECTED mode as specified in subclause 5.3.7. | When entering state 5GMM-DEREGISTERED When entering 5GMM-CONNECTED mode if the NW does not indicate support for strictly periodic registration timer as specified in subclause 5.3.7. | In 5GMM-IDLE mode, Initiation of the periodic registration procedure if the UE is not registered for emergency services.In 5GMM-CONNECTED mode, restart the timer T3512.Locally deregister if the UE is registered for emergency services |
| T3516 | 30sNOTE 7NOTE 8In WB-N1/CE mode, 48s | 5GMM-REGISTERED-INITIATED5GMM-REGISTERED5GMM-DEREGISTERED-INITIATED5GMM-SERVICE-REQUEST-INITIATED | RAND and RES\* stored as a result of an 5G authentication challenge | SECURITY MODE COMMAND receivedSERVICE REJECT receivedREGISTRATION ACCEPT receivedAUTHENTICATION REJECT receivedAUTHENTICATION FAILURE sent5GMM-DEREGISTERED, 5GMM-NULL or5GMM-IDLE mode entered | Delete the stored RAND and RES\* |
| T3517 | (a) 5s for case h) in subclause 5.6.1.1; or(b) 15s for cases other than h) in subclause 5.6.1.1NOTE 7NOTE 8 In WB-N1/CE mode, 61s | 5GMM-SERVICE-REQUEST-INITIATED | Transmission of SERVICE REQUEST message, or CONTROL PLANE SERVICE REQUEST message | (a) Indication from the lower layers that the UE has changed to S1 mode or E-UTRA connected to 5GCN for case h) in subclause 5.6.1.1; or(b) SERVICE ACCEPT message received, orSERVICE REJECT message received for cases other than h) in subclause 5.6.1.1 see subclause 5.6.1.4.2 | Abort the procedure |
| T3519 | 60sNOTE 7NOTE 8 In WB-N1/CE mode, 90s | 5GMM-REGISTERED-INITIATED5GMM-REGISTERED5GMM-DEREGISTERED-INITIATED5GMM-SERVICE-REQUEST-INITIATED (NOTE 6) | Transmission of IDENTITY RESPONSE message, REGISTRATION REQUEST message, or DEREGISTRATION REQUEST message with freshly generated SUCI | REGISTRATION ACCEPT message with new 5G-GUTI receivedCONFIGURATION UPDATE COMMAND message with new 5G-GUTI received DEREGISTRATION ACCEPT message | Delete stored SUCI |
| T3520 | 15sNOTE 7NOTE 8In WB-N1/CE mode, 33s | 5GMM-REGISTERED-INITIATED5GMM-REGISTERED5GMM-DEREGISTERED-INITIATED5GMM-SERVICE-REQUEST-INITIATED | Transmission of AUTHENTICATION FAILURE message with any of the 5GMM cause #20, #21, #26 or #71Transmission of AUTHENTICATION RESPONSE message with an EAP-response message after detection of an error as described in subclause 5.4.1.2.2.4 | AUTHENTICATION REQUEST message received or AUTHENTICATION REJECT message receivedorSECURITY MODE COMMAND message receivedwhen entering 5GMM-IDLE modeindication of transmission failure of AUTHENTICATION FAILURE message from lower layers | On first expiry during a 5G AKA based primary authentication and key agreement procedure, the UE should consider the network as false and follow item g of subclause 5.4.1.3.7, if the UE is not registered for emergency services.On first expiry during a 5G AKA based primary authentication and key agreement procedure, the UE will follow subclause 5.4.1.3.7 under "For items c, d, e and f:", if the UE is registered for emergency services.On first expiry during an EAP based primary authentication and key agreement procedure, the UE should consider the network as false and follow item e of subclause 5.4.1.2.4.5, if the UE is not registered for emergency services.On first expiry during an EAP based primary authentication and key agreement procedure, the UE will follow subclause 5.4.1.2.4.5 under "For item e:", if the UE is registered for emergency services |
| T3521 | 15sNOTE 7NOTE 8In WB-N1/CE mode, 45s | 5GMM-DEREGISTERED-INITIATED | Transmission of DEREGISTRATION REQUEST message when de-registration procedure is not due to a "switch off" | DEREGISTRATION ACCEPT message received | Retransmission of DEREGISTRATION REQUEST message |
| T3525 | Default 60sNOTE 3NOTE 7NOTE 8In WB-N1/CE mode, default 120s | 5GMM-REGISTERED.NORMAL-SERVICE or 5GMM-REGISTERED.NON-ALLOWED-SERVICE  | T3517 expires and service request attempt counter is greater than or equal to 5 | When entering state other than 5GMM-REGISTERED.NORMAL-SERVICE state or 5GMM-REGISTERED.NON-ALLOWED-SERVICE,orUE camped on a new PLMN other than the PLMN on which timer started,orUser-plane resources established with the network | The UE may initiate service request procedure |
| T3540 | 10s | 5GMM-DEREGISTERED5GMM-REGISTERED | REGISTRATION REJECT message or DEREGISTRATION REQUEST message received with any of the 5GMM cause #3, #6, #7, #11, #12, #13, #15, #27, #31, #62, #72, #73, #74, #75 or #76SERVICE REJECT message received with any of the 5GMM cause #3, #6, #7, #11, #12, #13, #15, #27, #72, #73, #74, #75 or #76.REGISTRATION ACCEPT message received as described in subclause 5.3.1.3 case b)SERVICE ACCEPT message received as described in subclause 5.3.1.3 case f)AUTHENTICATION REJECT message received | N1 NAS signalling connection releasedPDU sessions have been set up | Release the NAS signalling connection for the cases a), b), f) and g) as described in subclause 5.3.1.3 |
| 5GMM-REGISTERED | CONFIGURATION UPDATE COMMAND message received as described in subclause 5.3.1.3 case e) and h) | N1 NAS signalling connection released | Release the NAS signalling connection for the case e) and perform a new registration procedure as described in subclause 5.5.1.3.2Release the NAS signalling connection for the case h) as described in subclause 5.3.1.3 |
| 5GMM-DEREGISTERED5GMM-DEREGISTERED.NORMAL-SERVICE5GMM-REGISTERED.NON-ALLOWED-SERVICE | REGISTRATION REJECT message received with the 5GMM cause #9 or #10SERVICE REJECT message received with the 5GMM cause #9, #10 or #28 | Release the NAS signalling connection for the cases c) and d) as described in subclause 5.3.1.3 and initiation of the registration procedure as specified in subclause 5.5.1.2.2 or 5.5.1.3.2 |
| Non-3GPP de-registration timer | Default 54 min.NOTE 1NOTE 2NOTE 4 | All 5GMM state over non-3GPP access except 5GMM-DEREGISTERED over non-3GPP access | Entering 5GMM-IDLE mode over non-3GPP access | N1 NAS signalling connection over non-3GPP access established or when entering state 5GMM-DEREGISTERED over non-3GPP access | Implicitly de-register the UE for non-3GPP access on 1st expiry |
| NOTE 1: The value of this timer is provided by the network operator during the registration procedure.NOTE 2: The default value of this timer is used if the network does not indicate a value in the REGISTRATION ACCEPT message and the UE does not have a stored value for this timer.NOTE 3: The value of this timer is UE implementation specific, with a minimum value of 60 seconds if not in NB-N1 mode and if not in WB-N1/CE mode.NOTE 4: If the T3346 value received in the mobility management messages is greater than the value of the non-3GPP de-registration timer, the UE sets the non-3GPP de-registration timer value to be 4 minutes greater than the value of timer T3346.NOTE 5: The conditions for which this applies are described in subclause 5.5.1.3.7.NOTE 6: The conditions for which this applies to the 5GMM-SERVICE-REQUEST-INITIATED state are described in subclause 5.4.1.3.7 case c) and case d).NOTE 7: In NB-N1 mode, the timer value shall be calculated as described in subclause 4.17.NOTE 8: In WB-N1 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-N1/CE mode (see subclause 4.19). |

Table 10.2.2: Timers of 5GS mobility management – AMF side

| TIMER NUM. | TIMER VALUE | STATE | CAUSE OF START | NORMAL STOP | ON EXPIRY |
| --- | --- | --- | --- | --- | --- |
| T3513NOTE 7 NOTE 9 | NOTE 4 | 5GMM-REGISTERED | Paging procedure initiated | Paging procedure completed as specified in subclause 5.6.2.2.1 | Network dependent |
| T3522NOTE 6NOTE 8 | 6sIn WB-N1/CE mode, 24s | 5GMM-DEREGISTERED-INITIATED | Transmission of DEREGISTRATION REQUEST message | DEREGISTRATION ACCEPT message received | Retransmission of DEREGISTRATION REQUEST message |
| T3550NOTE 6NOTE 8 | 6sIn WB-N1/CE mode, 18s | 5GMM-COMMON-PROCEDURE-INITIATED | Transmission of REGISTRATION ACCEPT message as specified in subclause 5.5.1.2.4 and 5.5.1.3.4 | REGISTRATION COMPLETE message received | Retransmission of REGISTRATION ACCEPT message |
| T3555NOTE 6NOTE 8 | 6sIn WB-N1/CE mode, 24s | 5GMM-REGISTERED | Transmission of CONFIGURATION UPDATE COMMAND message with "acknowledgement requested" set in the Acknowldgement bit of the Configuration update indication IE | CONFIGURATION UPDATE COMPLETE message received | Retransmission of CONFIGURATION UPDATE COMMAND message |
| T3560NOTE 6NOTE 8 | 6sIn WB-N1/CE mode, 24s | 5GMM-COMMON-PROCEDURE-INITIATED | Transmission of AUTHENTICATION REQUEST messageTransmission of SECURITY MODE COMMAND message | AUTHENTICATION RESPONSE message receivedAUTHENTICATION FAILURE message receivedSECURITY MODE COMPLETE message receivedSECURITY MODE REJECT message received | Retransmission of AUTHENTICATION REQUEST message or SECURITY MODE COMMAND message |
| T3565NOTE 6NOTE 8 | 6sIn WB-N1/CE mode, 24s | 5GMM-REGISTERED | Transmission of NOTIFICATION message | SERVICE REQUEST message receivedNOTIFICATION RESPONSE message receivedREGISTRATION REQUESTMessage receivedDEREGISTRATION REQUEST message received NGAP UE context resume request message as specified in 3GPP TS 38.413 [31] received | Retransmission of NOTIFICATION message |
| T3570NOTE 6NOTE 8 | 6sIn WB-N1/CE mode, 24s | 5GMM-COMMON-PROCEDURE-INITIATED | Transmission of IDENTITY REQUEST message | IDENTITY RESPONSE message received | Retransmission of IDENTITY REQUEST message |
| T3575 | 15s | 5GMM-REGISTERED | Transmission of NETWORK SLICE-SPECIFIC AUTHENTICATION COMMAND message | NETWORK SLICE-SPECIFIC AUTHENTICATION COMPLETE message received | Retransmission of NETWORK SLICE-SPECIFIC AUTHENTICATION COMMAND message |
| Active timer | NOTE 10 | All except 5GMM-DEREGISTERED | Entering 5GMM-IDLE mode after indicating MICO mode activation to the UE with an active timer value. | N1 NAS signallingconnection established | Activate MICO mode for the UE. |
| Implicit de-registration timer | NOTE 2 | All except 5GMM-DEREGISTERED | The mobile reachable timer expires while the network is in 5GMM-IDLE modeEntering 5GMM-IDLE mode over 3GPP access if the MICO mode is activated and strictly periodic monitoring timer is not runningThe strictly periodic monitoring timer expires while the network is in 5GMM-IDLE mode | N1 NAS signalling connection established | Implicitly de-register the UE on 1st expiry |
| Mobile reachable timer | NOTE 1  | All except 5GMM-DEREGISTERED | Entering 5GMM-IDLE mode | N1 NAS signalling connection established | Network dependent, but typically paging is halted on 1st expiry, and start implicit de-registration timer, if the UE is not registered for emergency services.Implicitly de-register the UE which is registered for emergency services |
| Non-3GPP implicit de-registration timer | NOTE 3 | All except 5GMM-DEREGISTERED | Entering 5GMM-IDLE mode over non-3GPP access | N1 NAS signalling connection over non-3GPP access established | Implicitly de-register the UE for non-3GPP access on 1s expiry |
| Strictly periodic monitoring timer | NOTE 5 | All except 5GMM-DEREGISTERED | At the successful completion of registration update procedure if strictly periodic registration timer indication is supported as specified in subclause 5.3.7. | Entering 5GMM-DEREGISTERED. | In 5GMM-IDLE mode, start implicit de-registration timer as specified in subclause 5.3.7.In 5GMM-CONNECTED mode, Strictly periodic monitoring timer is started again as specified in subclause 5.3.7. |
| NOTE 1: The default value of this timer is 4 minutes greater than the value of timer T3512. If the UE is registered for emergency services, the value of this timer is set equal to the value of timer T3512. If the T3346 value provided in the mobility management messages is greater than the value of the timer T3512, the AMF sets the mobile reachable timer and the implicit de-registration timer such that the sum of the timer values is greater than the value of timer T3346.NOTE 2: The value of this timer is network dependent. If MICO is activated, the default value of this timer is 4 minutes greater than the value of timer T3512.NOTE 3: The value of this timer is network dependent. The default value of this timer is 4 minutes greater than the non-3GPP de-registration timer. If the T3346 value provided in the mobility management messages is greater than the value of the non-3GPP de-registration timer, the AMF sets the non-3GPP implicit de-registration timer value to be 8 minutes greater than the value of timer T3346.NOTE 4: The value of this timer is network dependent.NOTE 5: The value of this timer is the same as the value of timer T3512.NOTE 6: In NB-N1 mode, the timer value shall be calculated as described in subclause 4.17.NOTE 7: In NB-N1 mode, the timer value shall be calculated by using an NAS timer value which is network dependent.NOTE 8: In WB-N1 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-N1/CE mode (see subclause 4.19).NOTE 9: In WB-N1 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.NOTE 10: If the AMF includes timer T3324 in the REGISTRATION ACCEPT message and if the UE is not registered for emergency services, the value of this timer is equal to the value of timer T3324. |