**3GPP TSG-CT WG1 Meeting #128-eC1-211015**

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

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  | **24.501** | **CR** | **3076** | **rev** | **-** | **Current version:** | **17.1.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **x** |

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|  |
| ***Title:***  | Prevention of loop scenario for 5GMM cause #62 |
|  |  |
| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | 5GProtoc17 |  | ***Date:*** | 2021-02-16 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)...Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | CT1 had discussed a registration loop scenario caused by #62 in CT1-124\_e meeting and the solution for this loop issue was agreed in C1-204155. The detailed discussion on the loop issue C1-203737.In the solution, it was clarified that when the requested NSSAI is not included in the registration request, NW needs to use a reject cause other than #62, so that the UE comes out of the registration loop.Later C1-206509 was agreed in C1-126-e meeting which accidently restored the condition that the NW can reject the UE with #62 even if requested NSSAI is not included in the registration request message. This can cause the loop issue again. This needs to be reverted.Also in an associated Note that was added as part of C1-204155, it was stated that the NW uses #11, #13 , #15 etc in such situation as these reject causes have ‘back off’ mechanism with the help of forbidden lists. But as #11 will forbid the entire PLMN, it is not good to use #11 in such scenarios. So #11 needs to be removed from the Note. |
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| ***Summary of change:*** | 1. It is clarified that the NW shall not use #62 if UE does not include any requested NSSAI.
2. Reject cause #11 is removed from Note.
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| ***Consequences if not approved:*** | UE goes into a registration loop with the network. |
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| ***Clauses affected:*** | 5.5.1.3.5, A.3 |
|  |  |
|  | **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 \* \* \* \*

##### 5.5.1.3.5 Mobility and periodic registration update not accepted by the network

If the mobility and periodic registration update request cannot be accepted by the network, the AMF shall send a REGISTRATION REJECT message to the UE including an appropriate 5GMM cause value.

If the mobility and periodic registration update request is rejected due to general NAS level mobility management congestion control, the network shall set the 5GMM cause value to #22 "congestion" and assign a value for back-off timer T3346.

In NB-N1 mode, if the mobility and periodic registration update request is rejected due to operator determined barring (see 3GPP TS 29.503 [20AB]), the network shall set the 5GMM cause value to #22 "congestion" and assign a value for back-off timer T3346.

When the UE performs inter-system change from S1 mode to N1 mode, if the AMF is informed that verification of the integrity protection of the TRACKING AREA UPDATE REQUEST message included by the UE in the EPS NAS message container IE of the REGISTRATION REQUEST message has failed in the MME, then:

a) If the AMF can retrieve the current 5G NAS security context as indicated by the ngKSI and 5G-GUTI sent by the UE, the AMF shall proceed as specified in subclause 5.5.1.3.4;

b) if the AMF cannot retrieve the current 5G NAS security context as indicated by the ngKSI and 5G-GUTI sent by the UE, or the ngKSI or 5G-GUTI was not sent by the UE, the AMF may initiate the identification procedure by sending the IDENTITY REQUEST message with the "Type of identity" of the 5GS identity type IE set to "SUCI" before taking actions as specified in subclause 4.4.4.3; or

c) If the AMF needs to reject the mobility and periodic registration update procedure, the AMF shall send REGISTRATION REJECT message including 5GMM cause #9 "UE identity cannot be derived by the network".

If the REGISTRATION REJECT message with 5GMM cause #76 was received without integrity protection, then the UE shall discard the message.

Based on operator policy, if the mobility and periodic registration update request is rejected due to core network redirection for CIoT optimizations, the network shall set the 5GMM cause value to #31 "Redirection to EPC required".

NOTE 1: The network can take into account the UE's S1 mode capability, the EPS CIoT network behaviour supported by the UE or the EPS CIoT network behaviour supported by the EPC to determine the rejection with the 5GMM cause value #31 "Redirection to EPC required".

If the mobility and periodic registration update request is rejected because:

a) all the S-NSSAI(s) included in the requested NSSAI (i.e. Requested NSSAI IE or Requested mapped NSSAI IE) are either rejected for the current registration area, rejected for the current PLMN, or rejected for the failed or revoked NSSAA;

b) the UE set the NSSAA bit in the 5GMM capability IE to:

1) "Network slice-specific authentication and authorization supported" and;

i) there are no subscribed S-NSSAIs marked as default;

ii) all subscribed S-NSSAIs marked as default are not allowed; or

iii) network slice-specific authentication and authorization has failed or been revoked for all subscribed S-NSSAIs marked as default and based on network local policy, the network decides not to initiate the network slice-specific re-authentication and re-authorization procedures for any subscribed S-NSSAI marked as default requested by the UE; or

2) "Network slice-specific authentication and authorization not supported" and;

i) there are no subscribed S-NSSAIs which are marked as default; or

ii) all subscribed S-NSSAIs marked as default are either not allowed or are subject to network slice-specific authentication and authorization; and

c) no emergency PDU session has been established for the UE;

the network shall set the 5GMM cause value to #62 "No network slices available". If the UE had included requested NSSAI in the REGISTRATION REQUEST message, then the network shall include the rejected S-NSSAI(s) in the Rejected NSSAI of the REGISTRATION REJECT message. Otherwise, the network may include the rejected S-NSSAI(s) in the Rejected NSSAI of the REGISTRATION REJECT message.

If the UE has set the ER-NSSAI bit to "Extended rejected NSSAI supported" in the 5GMM capability IE of the REGISTRATION REQUEST message, the rejected S-NSSAI(s) shall be included in the Extended rejected NSSAI IE of the REGISTRATION REJECT message. Otherwise the rejected S-NSSAI(s) shall be included in the Rejected NSSAI IE of the REGISTRATION REJECT message.

If the mobility and periodic registration update request from a UE supporting CAG is rejected due to CAG restrictions, the network shall set the 5GMM cause value to #76 "Not authorized for this CAG or authorized for CAG cells only" and should include the "CAG information list" in the CAG information list IE in the REGISTRATION REJECT message.

NOTE 2: The network cannot be certain that "CAG information list" stored in the UE is updated as result of sending of the REGISTRATION REJECT message with the CAG information list IE, as the REGISTRATION REJECT message is not necessarily delivered to the UE (e.g due to abnormal radio conditions).

If the mobility and periodic registration update request from a UE not supporting CAG is rejected due to CAG restrictions, the network shall operate as described in bullet i) of subclause 5.5.1.3.8.

The UE shall take the following actions depending on the 5GMM cause value received in the REGISTRATION REJECT message.

#3 (Illegal UE); or

#6 (Illegal ME).

 The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete any 5G-GUTI, last visited registered TAI, TAI list and ngKSI.

 In case of PLMN, the UE shall consider the USIM as invalid for 5GS services until switching off or the UICC containing the USIM is removed.

 In case of SNPN, the UE shall consider the entry of the "list of subscriber data" with the SNPN identity of the current SNPN as invalid until the UE is switched off or the entry is updated. Additionally, if EAP based primary authentication and key agreement procedure using EAP-AKA' or 5G AKA based primary authentication and key agreement procedure was performed in the current SNPN, the UE shall consider the USIM as invalid for the current SNPN until switching off or the UICC containing the USIM is removed.

 The UE shall delete the list of equivalent PLMNs (if any) and shall move to 5GMM-DEREGISTERED.NO-SUPI state. If the message has been successfully integrity checked by the NAS, then the UE shall:

1) set the counter for "SIM/USIM considered invalid for GPRS services" events and the counter for "USIM considered invalid for 5GS services over non-3GPP access" events in case of PLMN; or

2) set the counter for "the entry for the current SNPN considered invalid for 3GPP access" events and the counter for "the entry for the current SNPN considered invalid for non-3GPP access" events in case of SNPN;

3) delete the 5GMM parameters stored in non-volatile memory of the ME as specified in annex C.

 to UE implementation-specific maximum value.

 If the message was received via 3GPP access and the UE is operating in single-registration mode, the UE shall handle the EMM parameters EMM state, EPS update status, 4G-GUTI, last visited registered TAI, TAI list and eKSI as specified in 3GPP TS 24.301 [15] for the case when the normal tracking area updating procedure is rejected with the EMM cause with the same value. The USIM shall be considered as invalid also for non-EPS services until switching off or the UICC containing the USIM is removed. If the UE is in EMM-REGISTERED state, the UE shall move to EMM-DEREGISTERED state. If the message has been successfully integrity checked by the NAS and the UE maintains a counter for "SIM/USIM considered invalid for non-GPRS services", then the UE shall set this counter to UE implementation-specific maximum value.

 If the message has been successfully integrity checked by the NAS and the UE also supports the registration procedure over the other access, the UE shall in addition handle 5GMM parameters and 5GMM state for this access, as described for this 5GMM cause value.

#7 (5GS services not allowed).

 The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete any 5G-GUTI, last visited registered TAI, TAI list and ngKSI.

 In case of PLMN, the UE shall consider the USIM as invalid for 5GS services until switching off or the UICC containing the USIM is removed;

 In case of SNPN, the UE shall consider the entry of the "list of subscriber data" with the SNPN identity of the current SNPN as invalid for 5GS services until the UE is switched off or the entry is updated. Additionally, if EAP based primary authentication and key agreement procedure using EAP-AKA' or 5G AKA based primary authentication and key agreement procedure was performed in the current SNPN, the UE shall consider the USIM as invalid for the current SNPN until switching off or the UICC containing the USIM is removed.

 The UE shall move to 5GMM-DEREGISTERED.NO-SUPI state. If the message has been successfully integrity checked by the NAS, then the UE shall:

1) set the counter for "SIM/USIM considered invalid for GPRS services" events and the counter for "USIM considered invalid for 5GS services over non-3GPP access" events in case of PLMN; or

2) set the counter for "the entry for the current SNPN considered invalid for 3GPP access" events and the counter for "the entry for the current SNPN considered invalid for non-3GPP access" events in case of SNPN;

 to UE implementation-specific maximum value.

3) delete the 5GMM parameters stored in non-volatile memory of the ME as specified in annex C.

 If the message was received via 3GPP access and the UE is operating in single-registration mode, the UE shall handle the EMM parameters EMM state, EPS update status, 4G-GUTI, last visited registered TAI, TAI list and eKSI as specified in 3GPP TS 24.301 [15] for the case when the normal tracking area updating procedure is rejected with the EMM cause with the same value.

 If the message has been successfully integrity checked by the NAS and the UE also supports the registration procedure over the other access, the UE shall in addition handle 5GMM parameters and 5GMM state for this access, as described for this 5GMM cause value.

#9 (UE identity cannot be derived by the network).

 The UE shall set the 5GS update status to 5U2 NOT UPDATED (and shall store it according to subclause 5.1.3.2.2) and shall delete any 5G-GUTI, last visited registered TAI, TAI list and ngKSI. The UE shall enter the state 5GMM-DEREGISTERED.

 If the UE has initiated the registration procedure in order to enable performing the service request procedure for emergency services fallback, the UE shall attempt to select an E-UTRA cell connected to EPC or 5GCN according to the domain priority and selection rules specified in 3GPP TS 23.167 [6]. If the UE finds a suitable E-UTRA cell, it then proceeds with the appropriate EMM or 5GMM procedures.

 If the rejected request was neither for initiating an emergency PDU session nor for emergency services fallback, the UE shall subsequently, automatically initiate the initial registration procedure.

NOTE 3: User interaction is necessary in some cases when the UE cannot re-establish the PDU session(s) automatically.

 If the message was received via 3GPP access and the UE is operating in single-registration mode, the UE shall handle the EMM parameters EMM state, EPS update status, 4G-GUTI, last visited registered TAI, TAI list and eKSI as specified in 3GPP TS 24.301 [15] for the case when the normal tracking area updating procedure is rejected with the EMM cause with the same value.

#10 (implicitly de-registered).

 The UE shall enter the state 5GMM-DEREGISTERED.NORMAL-SERVICE. The UE shall delete any mapped 5G NAS security context or partial native 5G NAS security context.

 If the registration rejected request was not for initiating an emergency PDU session, the UE shall perform a new registration procedure for initial registration.

NOTE 4: User interaction is necessary in some cases when the UE cannot re-establish the PDU session(s) automatically.

 If the message was received via 3GPP access and the UE is operating in single-registration mode, the UE shall handle the EMM state as specified in 3GPP TS 24.301 [15] for the case when the normal tracking area updating procedure is rejected with the EMM cause with the same value.

#11 (PLMN not allowed).

 This cause value received from a cell belonging to an SNPN is considered as an abnormal case and the behaviour of the UE is specified in subclause 5.5.1.3.7.

 The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete any 5G-GUTI, last visited registered TAI, TAI list and ngKSI. The UE shall store the PLMN identity in the forbidden PLMN list as specified in subclause 5.3.13A, delete the list of equivalent PLMNs, reset the registration attempt counter and enter the state 5GMM-DEREGISTERED.PLMN-SEARCH. The UE shall perform a PLMN selection according to 3GPP TS 23.122 [5]. If the message has been successfully integrity checked by the NAS, the UE shall set the PLMN-specific attempt counter and the PLMN-specific attempt counter for non-3GPP access for that PLMN to the UE implementation-specific maximum value.

 If the message was received via 3GPP access and the UE is operating in single-registration mode, the UE shall in addition handle the EMM parameters EMM state, EPS update status, 4G-GUTI, last visited registered TAI, TAI list, eKSI and tracking area updating attempt counter as specified in 3GPP TS 24.301 [15] for the case when the normal tracking area updating procedure is rejected with the EMM cause with the same value.

 If the message has been successfully integrity checked by the NAS and the UE also supports the registration procedure over the other access to the same PLMN, the UE shall in addition handle 5GMM parameters and 5GMM state for this access, as described for this 5GMM cause value.

#12 (Tracking area not allowed).

 The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete 5G-GUTI, last visited registered TAI, TAI list and ngKSI. Additionally, the UE shall reset the registration attempt counter.

 If:

1) the UE is not operating in SNPN access mode, the UE shall store the current TAI in the list of "5GS forbidden tracking areas for regional provision of service" and enter the state 5GMM-DEREGISTERED.LIMITED-SERVICE. If the REGISTRATION REJECT message is not integrity protected, the UE shall memorize the current TAI was stored in the list of "5GS forbidden tracking areas for regional provision of service" for non-integrity protected NAS reject message; or

2) the UE is operating in SNPN access mode, the UE shall store the current TAI in the list of "5GS forbidden tracking areas for regional provision of service" for the current SNPN and enter the state 5GMM-DEREGISTERED.LIMITED-SERVICE. If the REGISTRATION REJECT message is not integrity protected, the UE shall memorize the current TAI was stored in the list of "5GS forbidden tracking areas for regional provision of service" for the current SNPN for non-integrity protected NAS reject message.

 If the message was received via 3GPP access and the UE is operating in single-registration mode, the UE shall handle the EMM parameters EMM state, EPS update status, 4G-GUTI, last visited registered TAI, TAI list, eKSI and tracking area updating attempt counter as specified in 3GPP TS 24.301 [15] for the case when the normal tracking area updating procedure is rejected with the EMM cause with the same value.

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

 The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete the list of equivalent PLMNs (if available). The UE shall reset the registration attempt counter and shall change to state 5GMM-REGISTERED.PLMN-SEARCH.

 If the UE is registered in S1 mode and operating in dual-registration mode, the PLMN that the UE chooses to register in is specified in subclause 4.8.3. Otherwise if:

1) the UE is not operating in SNPN access mode, the UE shall store the current TAI in the list of "5GS forbidden tracking areas for roaming" and shall remove the current TAI from the stored TAI list if present. If the REGISTRATION REJECT message is not integrity protected, the UE shall memorize the current TAI was stored in the list of "5GS forbidden tracking areas for roaming" for non-integrity protected NAS reject message; or

2) the UE is operating in SNPN access mode, the UE shall store the current TAI in the list of "5GS forbidden tracking areas for roaming" for the current SNPN. If the REGISTRATION REJECT message is not integrity protected, the UE shall memorize the current TAI was stored in the list of "5GS forbidden tracking areas for roaming" for the current SNPN for non-integrity protected NAS reject message.

 The UE shall perform a PLMN selection or SNPN selection according to 3GPP TS 23.122 [5].

 If the message was received via 3GPP access and the UE is operating in single-registration mode, the UE shall handle the EMM parameters EMM state, EPS update status and tracking area updating attempt counter as specified in 3GPP TS 24.301 [15] for the case when the normal tracking area updating procedure is rejected with the EMM cause with the same value.

#15 (No suitable cells in tracking area).

 The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2). The UE shall reset the registration attempt counter and shall enter the state 5GMM-REGISTERED.LIMITED-SERVICE.

 If the UE has initiated the registration procedure in order to enable performing the service request procedure for emergency services fallback, the UE shall attempt to select an E-UTRA cell connected to EPC or 5GC according to the emergency services support indicator (see 3GPP TS 36.331 [25A]). If the UE finds a suitable E-UTRA cell, it then proceeds with the appropriate EMM or 5GMM procedures. Otherwise, the UE shall search for a suitable cell in another tracking area according to 3GPP TS 38.304 [28] or 3GPP TS 36.304 [25C].

 If:

1) the UE is not operating in SNPN access mode, the UE shall store the current TAI in the list of "5GS forbidden tracking areas for roaming" and shall remove the current TAI from the stored TAI list, if present. If the REGISTRATION REJECT message is not integrity protected, the UE shall memorize the current TAI was stored in the list of "5GS forbidden tracking areas for roaming" for non-integrity protected NAS reject message; or

2) the UE is operating in SNPN access mode, the UE shall store the current TAI in the list of "5GS forbidden tracking areas for roaming" for the current SNPN and shall remove the current TAI from the stored TAI list, if present. If the REGISTRATION REJECT message is not integrity protected, the UE shall memorize the current TAI was stored in the list of "5GS forbidden tracking areas for roaming" for the current SNPN for non-integrity protected NAS reject message.

 If the message was received via 3GPP access and the UE is operating in single-registration mode, the UE shall handle the EMM parameters EMM state, EPS update status and tracking area updating attempt counter as specified in 3GPP TS 24.301 [15] for the case when the normal tracking area updating procedure is rejected with the EMM cause with the same value.

#22 (Congestion).

 If the T3346 value IE is present in the REGISTRATION REJECT message and the value indicates that this timer is neither zero nor deactivated, the UE shall proceed as described below, otherwise it shall be considered as an abnormal case and the behaviour of the UE for this case is specified in subclause 5.5.1.3.7.

 The UE shall abort the registration procedure for mobility and periodic registration update. If the rejected request was not for initiating an emergency PDU session, the UE shall set the 5GS update status to 5U2 NOT UPDATED, reset the registration attempt counter and change to state 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE.

 The UE shall stop timer T3346 if it is running.

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

 If the REGISTRATION REJECT message is not integrity protected, the UE shall start timer T3346 with a random value from the default range specified in 3GPP TS 24.008 [12].

 The UE stays in the current serving cell and applies the normal cell reselection process. The registration procedure for mobility and periodic registration update is started, if still necessary, when timer T3346 expires or is stopped.

 If the message was received via 3GPP access and the UE is operating in single-registration mode, the UE shall handle the EMM parameters EMM state, EPS update status and tracking area updating attempt counter as specified in 3GPP TS 24.301 [15] for the case when the normal tracking area updating procedure is rejected with the EMM cause with the same value.

 If the registration procedure for mobility and periodic registration update was initiated for an MO MMTEL voice call (i.e. access category 4), or an MO MMTEL video call (i.e. access category 5), or 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 ongoing 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 request was not accepted due to network congestion shall be provided to upper layers.

#27 (N1 mode not allowed).

 The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2). Additionally, the UE shall reset the registration attempt counter and shall enter the state 5GMM-REGISTERED.LIMITED-SERVICE. If the message has been successfully integrity checked by the NAS, the UE shall set:

1) the PLMN-specific N1 mode attempt counter for 3GPP access and the PLMN-specific N1 mode attempt counter for non-3GPP access for that PLMN in case of PLMN; or

2) the SNPN-specific attempt counter for 3GPP access for the current SNPN and the SNPN-specific attempt counter for non-3GPP access for the current SNPN in case of SNPN;

 to the UE implementation-specific maximum value.

 The UE shall disable the N1 mode capability for the specific access type for which the message was received (see subclause 4.9).

 If the message has been successfully integrity checked by the NAS, the UE shall disable the N1 mode capability also for the other access type (see subclause 4.9).

 If the message was received via 3GPP access and the UE is operating in single-registration mode, the UE shall in addition set the EPS update status to EU3 ROAMING NOT ALLOWED. Additionally, the UE shall reset the tracking area updating attempt counter and enter the state EMM-REGISTERED.

#31 (Redirection to EPC required).

 5GMM cause #31 received by a UE that has not indicated support for CIoT optimizations or received by a UE over non-3GPP access is considered an abnormal case and the behaviour of the UE is specified in subclause 5.5.1.3.7.

 This cause value received from a cell belonging to an SNPN is considered as an abnormal case and the behaviour of the UE is specified in subclause 5.5.1.3.7.

 The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2). The UE shall reset the registration attempt counter and enter the state 5GMM- REGISTERED.LIMITED-SERVICE.

 The UE shall enable the E-UTRA capability if it was disabled and disable the N1 mode capability for 3GPP access (see subclause 4.9.2).

 If the message was received via 3GPP access and the UE is operating in single-registration mode, the UE shall handle the EMM parameters EMM state, EPS update status, and tracking area updating attempt counter as specified in 3GPP TS 24.301 [15] for the case when the normal tracking area updating procedure is rejected with the EMM cause with the same value.

#62 (No network slices available).

 The UE shall abort the registration procedure for mobility and periodic registration update procedure, set the 5GS update status to 5U2 NOT UPDATED and enter state 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE. Additionally, the UE shall reset the registration attempt counter.

 The UE receiving the rejected NSSAI in the REGISTRATION REJECT message takes the following actions based on the rejection cause in the rejected S-NSSAI(s):

 "S-NSSAI not available in the current PLMN or SNPN"

 The UE shall add the rejected S-NSSAI(s) in the rejected NSSAI for the current PLMN or SNPN as specified in subclause 4.6.2.2 and shall not attempt to use this S-NSSAI(s) in the current PLMN or SNPN until switching off the UE, the UICC containing the USIM is removed, an entry of the "list of subscriber data" with the SNPN identity of the current SNPN is updated, or the rejected S-NSSAI(s) are removed as described in subclause 4.6.2.2.

 "S-NSSAI not available in the current registration area"

 The UE shall add the rejected S-NSSAI(s) in the rejected NSSAI for the current registration area as specified in subclause 4.6.2.2 and shall not attempt to use this S-NSSAI(s) in the current registration area until switching off the UE, the UE moving out of the current registration area, the UICC containing the USIM is removed, an entry of the "list of subscriber data" with the SNPN identity of the current SNPN is updated, or the rejected S-NSSAI(s) are removed as described in subclause 4.6.2.2.

 "S-NSSAI not available due to the failed or revoked network slice-specific authentication and authorization"

 The UE shall store the rejected S-NSSAI(s) in the rejected NSSAI for the failed or revoked NSSAA as specified in subclause 4.6.2.2 and shall not attempt to use this S-NSSAI in the current PLMN over any access until switching off the UE, the UICC containing the USIM is removed, the entry of the "list of subscriber data" with the SNPN identity of the current SNPN is updated, or the rejected S-NSSAI(s) are removed or deleted as described in subclause 4.6.1 and 4.6.2.2.

 If the UE has an allowed NSSAI or configured NSSAI that contains S-NSSAIs which are not included in any of the rejected NSSAI for the PLMN or SNPN, the rejected NSSAI for the current registration area, and the rejected NSSAI for the failed or revoked NSSAA, the UE may stay in the current serving cell, apply the normal cell reselection process and start a registration procedure for mobility and periodic registration update with a requested NSSAI that includes any S-NSSAI from the allowed S-NSSAI or the configured NSSAI that is neither in the rejected NSSAI for the PLMN or SNPN nor in the rejected NSSAI for the current registration area nor in the rejected NSSAI for the failed or revoked NSSAA. Otherwise the UE may perform a PLMN selection or SNPN selection according to 3GPP TS 23.122 [5] and additionally, the UE may disable the N1 mode capability for the current PLMN or SNPN if the UE does not have an allowed NSSAI and each S-NSSAI in the configured NSSAI, if available, was rejected with cause "S-NSSAI not available in the current PLMN or SNPN" or "S-NSSAI not available due to the failed or revoked network slice-specific authentication and authorization" as described in subclause 4.9.

 If the message was received via 3GPP access and the UE is operating in single-registration mode, the UE shall in addition set the EPS update status to EU2 NOT UPDATED, reset the attach attempt counter and enter the state EMM-REGISTERED.

#72 (Non-3GPP access to 5GCN not allowed).

 When received over non-3GPP access the UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete 5G-GUTI, last visited registered TAI, TAI list and ngKSI. Additionally, the UE shall reset the registration attempt counter and enter the state 5GMM-DEREGISTERED. If the message has been successfully integrity checked by the NAS, the UE shall set:

1) the PLMN-specific N1 mode attempt counter for non-3GPP access for that PLMN in case of PLMN; or

2) the SNPN-specific attempt counter for non-3GPP access for that SNPN in case of SNPN;

 to the UE implementation-specific maximum value.

NOTE 5: The 5GMM sublayer states, the 5GMM parameters and the registration status are managed per access type independently, i.e. 3GPP access or non-3GPP access (see subclauses 4.7.2 and 5.1.3).

 The UE shall disable the N1 mode capability for non-3GPP access (see subclause 4.9.3).

 As an implementation option, the UE may enter the state 5GMM-DEREGISTERED.PLMN-SEARCH in order to perform a PLMN selection according to 3GPP TS 23.122 [5].

 If received over 3GPP access the cause shall be considered as an abnormal case and the behaviour of the UE for this case is specified in subclause 5.5.1.3.7.

#73 (Serving network not authorized).

 This cause value received from a cell belonging to an SNPN is considered as an abnormal case and the behaviour of the UE is specified in subclause 5.5.1.3.7.

 The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete any 5G-GUTI, last visited registered TAI, TAI list and ngKSI. The UE shall delete the list of equivalent PLMNs, reset the registration attempt counter, store the PLMN identity in the forbidden PLMN list as specified in subclause 5.3.13A, and enter state 5GMM-DEREGISTERED.PLMN-SEARCH in order to perform a PLMN selection according to 3GPP TS 23.122 [5]. If the message has been successfully integrity checked by the NAS, the UE shall set the PLMN-specific attempt counter and the PLMN-specific attempt counter for non-3GPP access for that PLMN to the UE implementation-specific maximum value.

 If the message was received via 3GPP access and the UE is operating in single-registration mode, the UE shall in addition set the EPS update status to EU3 ROAMING NOT ALLOWED and shall delete any 4G-GUTI, last visited registered TAI, TAI list and eKSI. Additionally, the UE shall reset the tracking area updating attempt counter and enter the state EMM-DEREGISTERED.

#74 (Temporarily not authorized for this SNPN).

 5GMM cause #74 is only applicable when received from a cell belonging to an SNPN. 5GMM cause #74 received from a cell not belonging to an SNPN is considered as an abnormal case and the behaviour of the UE is specified in subclause 5.5.1.3.7.

 The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete any 5G-GUTI, last visited registered TAI, TAI list and ngKSI. The UE shall reset the registration attempt counter and store the SNPN identity in the "temporarily forbidden SNPNs" list for the specific access type for which the message was received. The UE shall enter state 5GMM-DEREGISTERED.PLMN-SEARCH and perform an SNPN selection according to 3GPP TS 23.122 [5]. If the message has been successfully integrity checked by the NAS, the UE shall set the SNPN-specific attempt counter for 3GPP access and the SNPN-specific attempt counter for non-3GPP access for the current SNPN to the UE implementation-specific maximum value.

 If the message has been successfully integrity checked by the NAS and the UE also supports the registration procedure over the other access to the same SNPN, the UE shall in addition handle 5GMM parameters and 5GMM state for this access, as described for this 5GMM cause value.

NOTE 6: When 5GMM cause #74 is received over 3GPP access, the term "other access" in "the UE also supports the registration procedure over the other access to the same SNPN" is used to express access to SNPN services via a PLMN.

#75 (Permanently not authorized for this SNPN).

 5GMM cause #75 is only applicable when received from a cell belonging to an SNPN with a globally-unique SNPN identity. 5GMM cause #75 received from a cell not belonging to an SNPN or a cell belonging to an SNPN with a non-globally-unique SNPN identity is considered as an abnormal case and the behaviour of the UE is specified in subclause 5.5.1.3.7.

 The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete any 5G-GUTI, last visited registered TAI, TAI list and ngKSI. The UE shall reset the registration attempt counter and store the SNPN identity in the "permanently forbidden SNPNs" list for the specific access type for which the message was received. The UE shall enter state 5GMM-DEREGISTERED.PLMN-SEARCH and perform an SNPN selection according to 3GPP TS 23.122 [5]. If the message has been successfully integrity checked by the NAS, the UE shall set the SNPN-specific attempt counter for 3GPP access and the SNPN-specific attempt counter for non-3GPP access for the current SNPN to the UE implementation-specific maximum value.

 If the message has been successfully integrity checked by the NAS and the UE also supports the registration procedure over the other access to the same SNPN, the UE shall in addition handle 5GMM parameters and 5GMM state for this access, as described for this 5GMM cause value.

NOTE 7: When 5GMM cause #75 is received over 3GPP access, the term "other access" in "the UE also supports the registration procedure over the other access to the same SNPN" is used to express access to SNPN services via a PLMN.

#76 (Not authorized for this CAG or authorized for CAG cells only).

 This cause value received from a cell belonging to an SNPN is considered as an abnormal case and the behaviour of the UE is specified in subclause 5.5.1.3.7.

 The UE shall set the 5GS update status to 5U3.ROAMING NOT ALLOWED, store the 5GS update status according to clause 5.1.3.2.2, and reset the registration attempt counter.

 If 5GMM cause #76 is received from:

1) a CAG cell, and if the UE receives a "CAG information list" in the CAG information list IE included in the REGISTRATION REJECT message, the UE shall:

i) replace the "CAG information list" stored in the UE with the received CAG information list IE when received in the HPLMN, a PLMN equivalent to the HPLMN, or EHPLMN;

ii) replace the serving VPLMN's entry of the "CAG information list" stored in the UE with the serving VPLMN's entry of the received CAG information list IE when the UE receives the CAG information list IE in a serving PLMN other than the HPLMN, a PLMN equivalent to the HPLMN, or EHPLMN; or

NOTE 8: When the UE receives the CAG information list IE in a serving PLMN other than the HPLMN, a PLMN equivalent to the HPLMN, or EHPLMN, entries of a PLMN other than the serving VPLMN, if any, in the received CAG information list IE are ignored.

iii) remove the serving VPLMN's entry of the "CAG information list" stored in the UE when the UE receives the CAG information list IE in a serving PLMN other than the HPLMN, a PLMN equivalent to the HPLMN, or EHPLMN and the CAG information list IE does not contain the serving VPLMN's entry.

 Otherwise, the UE shall delete the CAG-ID(s) of the cell from the "allowed CAG list" for the current PLMN. In addition:

i) if the entry in the "CAG information list" for the current PLMN does not include an "indication that the UE is only allowed to access 5GS via CAG cells" or if the entry in the "CAG information list" for the current PLMN includes an "indication that the UE is only allowed to access 5GS via CAG cells" and the updated "allowed CAG list" for the current PLMN includes one or more CAG-IDs, then the UE shall enter the state 5GMM-REGISTERED.LIMITED-SERVICE and shall search for a suitable cell according to 3GPP TS 38.304 [28] or 3GPP TS 36.304 [25C] with the updated "CAG information list";

ii) if the entry in the "CAG information list" for the current PLMN includes an "indication that the UE is only allowed to access 5GS via CAG cells" and the updated "allowed CAG list" for the current PLMN does not include any CAG-ID, then the UE shall enter the state 5GMM-DEREGISTERED.PLMN-SEARCH and shall apply the PLMN selection process defined in 3GPP TS 23.122 [6] with the updated "CAG information list"; or

iii) if the "CAG information list" does not include an entry for the current PLMN, then the UE shall enter the state 5GMM-DEREGISTERED.LIMITED-SERVICE and shall search for a suitable cell according to 3GPP TS 38.304 [28] or 3GPP TS 36.304 [25C] with the updated "CAG information list".

2) a non-CAG cell, and if the UE receives a "CAG information list" in the CAG information list IE included in the REGISTRATION REJECT message, the UE shall:

i) replace the "CAG information list" stored in the UE with the received CAG information list IE when received in the HPLMN, a PLMN equivalent to the HPLMN, or EHPLMN;

ii) replace the serving VPLMN's entry of the "CAG information list" stored in the UE with the serving VPLMN's entry of the received CAG information list IE when the UE receives the CAG information list IE in a serving PLMN other than the HPLMN, a PLMN equivalent to the HPLMN, or EHPLMN; or

NOTE 9: When the UE receives the CAG information list IE in a serving PLMN other than the HPLMN, a PLMN equivalent to the HPLMN, or EHPLMN, entries of a PLMN other than the serving VPLMN, if any, in the received CAG information list IE are ignored.

iii) remove the serving VPLMN's entry of the "CAG information list" stored in the UE when the UE receives the CAG information list IE in a serving PLMN other than the HPLMN, a PLMN equivalent to the HPLMN, or EHPLMN and the CAG information list IE does not contain the serving VPLMN's entry.

 Otherwise, the UE shall store an "indication that the UE is only allowed to access 5GS via CAG cells" in the entry of the "CAG information list" for the current PLMN. In addition:

i) if the "allowed CAG list" for the current PLMN includes one or more CAG-IDs, then the UE shall enter the state 5GMM-REGISTERED.LIMITED-SERVICE and shall search for a suitable cell according to 3GPP TS 38.304 [28] with the updated CAG information; or

ii) if the "allowed CAG list" for the current PLMN does not includes any CAG-ID, then the UE shall enter the state 5GMM-DEREGISTERED.PLMN-SEARCH and shall apply the PLMN selection process defined in 3GPP TS 23.122 [6] with the updated "CAG information list".

 If the message was received via 3GPP access and the UE is operating in single-registration mode, the UE shall in addition set the EPS update status to EU3 ROAMING NOT ALLOWED, reset the attach attempt counter and enter the state EMM-REGISTERED.

#77 (Wireline access area not allowed).

 5GMM cause #77 is only applicable when received from a wireline access network by the 5G-RG or the W-AGF acting on behalf of the FN-CRG (or on behalf of the N5GC device). 5GMM cause #77 received from a 5G access network other than a wireline access network and 5GMM cause #77 received by the W-AGF acting on behalf of the FN-BRG are considered as abnormal cases and the behaviour of the UE is specified in subclause 5.5.1.3.7.

 When received over wireline access network, the 5G-RG and the W-AGF acting on behalf of the FN-CRG (or on behalf of the N5GC device) shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2), shall delete 5G-GUTI, last visited registered TAI, TAI list and ngKSI, shall reset the registration attempt counter, shall enter the state 5GMM-DEREGISTERED and shall act as specified in subclause 5.3.23.

NOTE 10: The 5GMM sublayer states, the 5GMM parameters and the registration status are managed per access type independently, i.e. 3GPP access or non-3GPP access (see subclauses 4.7.2 and 5.1.3).

Other values are considered as abnormal cases. The behaviour of the UE in those cases is specified in subclause 5.5.1.3.7.

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

## A.3 Causes related to PLMN or SNPN specific network failures and congestion/authentication failures

Cause #20 – MAC failure

 This 5GMM cause is sent to the network if the USIM detects that the MAC in the AUTHENTICATION REQUEST message is not fresh.

Cause #21 – Synch failure

 This 5GMM cause is sent to the network if the USIM detects that the SQN in the AUTHENTICATION REQUEST message is out of range.

Cause #22 – Congestion

 This 5GMM cause is sent to the UE because of congestion in the network (e.g. no channel, facility busy/congested etc.).

Cause #23 – UE security capabilities mismatch

 This 5GMM cause is sent to the network if the UE detects that the UE security capability does not match the one sent back by the network.

Cause #24 – Security mode rejected, unspecified

 This 5GMM cause is sent to the network if the security mode command is rejected by the UE for unspecified reasons.

Cause #26 – Non-5G authentication unacceptable

 This 5GMM cause is sent to the network in N1 mode if the "separation bit" in the AMF field of AUTN is set to 0 in the AUTHENTICATION REQUEST message (see 3GPP TS 33.501 [24]).

Cause #28 – Restricted service area

 This 5GMM cause is sent to the UE if it requests service in a tracking area of the 3GPP access or in an area of the wireline access, which is a part of the UE's non-allowed area or is not a part of the UE's allowed area.

Cause #43 – LADN not available

 This 5GMM cause is sent to the UE if the user-plane resources of the PDU session are not established when the UE is located outside the LADN service area.

Cause #62 – No network slices available

 This 5GMM cause is sent by the network if none of the requested network slice(s) in the registration request are allowed and there are no default network slice(s) configured in the network.

NOTE: Network does not send this cause in REGISTRATION REJECT message if the UE does not include a requested NSSAI in the REGISTRATION REQUEST message. In that case, the Network uses other causes (e.g. #13, #15) etc based on the subscription.

Cause #65 – Maximum number of PDU sessions reached

 This 5GMM cause is used by the network to indicate that the procedure requested by the UE was rejected as the network has reached the maximum number of simultaneously active PDU sessions for the UE.

Cause #67 – Insufficient resources for specific slice and DNN

 This 5GMM cause is sent by the network to indicate that the requested service cannot be provided due to insufficient resources for specific slice and DNN.

Cause #69 – Insufficient resources for specific slice

 This 5GMM cause is sent by the network to indicate that the requested service cannot be provided due to insufficient resources for specific slice.

Cause #71 – ngKSI already in use

 This 5GMM cause is sent to the network in N1 mode if the ngKSI value received in the AUTHENTICATION REQUEST message is already associated with one of the 5G security contexts stored in the UE.

Cause #73 – Serving network not authorized

 This 5GMM cause is sent to the UE if the UE initiates registration towards a serving network and the serving network fails to be authorized by the UE's home network.

Cause #90 – Payload was not forwarded

 This 5GMM cause is sent by the network to indicate that the requested service cannot be provided because payload could not be forwarded by AMF.

Cause #91 – DNN not supported or not subscribed in the slice

 This 5GMM cause is sent by the network to indicate that the requested service cannot be provided because payload could not be forwarded by AMF because the DNN is not supported or not subscribed in the slice selected by the network if the UE did not indicate a slice, or the DNN is not supported or not subscribed in the slice indicated by the UE.

Cause #92 – Insufficient user-plane resources for the PDU session

 This 5GMM cause is sent by the network to indicate that the requested service cannot be provided due to insufficient user-plane resources for the PDU session.