**3GPP TSG-WG SA2 Meeting #164S2-2409116**

**Maastricht, NL, 19th Aug – 23rd Aug, 2024 (revision of S2-2408378, 8853)**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **23.501** | **CR** | **5569** | **rev** | **2** | **Current version:** | **18.6.0** |  |
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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:*** | Clarification on PRU timer considering start of unavailability period | | | | | | | | | |
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| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | SA2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5GSAT\_Ph2 | | | | |  | ***Date:*** | | | 2024-08-22 |
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| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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 can be 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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
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| ***Reason for change:*** | | The current text in 5.4.1.4 describes that AMF provide a PRU timer longer than or equal to the combination of the Unavailability Period Duration and Start of Unavailability Period. And this also apply to 24.501, as described in clause 5.3.26.  “4) The AMF may take the Unavailability Period Duration (if available) and Start of Unavailability Period into account when determining Periodic Registration Update timer value. The AMF may provide a Periodic Registration Update time longer than or equal to the combination of the Unavailability Period Duration and Start of Unavailability Period to avoid interfering with the UE dealing with the event that causes the unavailability;”  The Start of Unavailability Period can be 1) the time at which the AMF receives the Registration Request message from the UE; or 2) the time at which the the UE is to be unavailable.  “1) If the UE did not include a Start of Unavailability Period, the AMF considers implicitly the Start of Unavailability Period to be the time at which it has received the Registration Request message from the UE. If the UE included a Start of Unavailability Period, the Start of Unavailability Period indicates the time at which the UE determines it expects to be unavailable, i.e. time until which the UE determines it is available.”  The PRU timer is a time interval to control the UE to initiate PRU procedure,  T3512(min), e.g., 54min. While the Start of Unavailability Period is a time. It is confusing about the AMF setting a time interval based on a time.  This contribution clarifies that the AMF considers that the registration timer is set to avoid the unavailability period. | | | | | | | | |
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| ***Summary of change:*** | | AMF considers the duration of time between when it receives the Registration Request message from the UE and the Start of Unavailability Period as well after the unavailability period as possible when determining the PRU timer duration. | | | | | | | | |
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| ***Consequences if not approved:*** | | It is confusing about the AMF setting a time interval based on an absolute time. | | | | | | | | |
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| ***Clauses affected:*** | | 5.4.1.4 | | | | | | | | |
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|  | | **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 \* \* \* \*

#### 5.4.1.4 Support of Unavailability Period

During Registration procedure, the UE supporting the Unavailability Period feature provides "Unavailability Period Support" indication as part of 5GMM Core Network Capability in Registration Request message for initial registration and for every mobility registration. The AMF indicates whether the corresponding feature is supported in the AMF by providing the "Unavailability Period Support" indication in Registration Accept message.

If the UE and network support Unavailability Period and an event is triggered in the UE that would make the UE unavailable or lose coverage (see clause 5.4.13.1) for a certain period of time, the UE uses Support of Unavailability Period to inform the AMF of the expected unavailability and whether it is due to NR satellite access discontinuous coverage. Use of Support of Unavailability Period for loss of coverage due to NR satellite access discontinuous coverage shall only be used if both UE and the AMF signalled "Unavailability Period Support", see clause 5.4.13.1.

If the use of Support of Unavailability Period procedure is not due to NR satellite access discontinuous coverage, the UE may store its MM and SM context in the USIM or Non-Volatile memory in the ME to be able to reuse it after its unavailability period. If the UE can store its contexts the UE may trigger Mobility Registration Update procedure otherwise the UE shall trigger UE-initiated Deregistration procedure.

NOTE 1: How and where the UE stores its contexts depends upon the UE implementation and the Unavailability Type. The UE can store some or all of its contexts in the ME or USIM using existing ME or USIM functionality.

Before the start of an event that makes the UE unavailable, the UE triggers either Mobility Registration Update or UE initiated Deregistration procedure:

a) If the UE initiates Mobility Registration Update procedure:

0) The UE includes an Unavailability Type to describe the cause of unavailability (e.g. the unavailability caused by NR satellite access discontinuous coverage), the Start of the Unavailability Period if known and the Unavailability Period Duration (if known).

1) If the UE did not include a Start of Unavailability Period, the AMF considers implicitly the Start of Unavailability Period to be the time at which it has received the Registration Request message from the UE. If the UE included a Start of Unavailability Period, the Start of Unavailability Period indicates the time at which the UE determines it expects to be unavailable, i.e. time until which the UE determines it is available.

2) The AMF may determine, if not provided by the UE, or update the Unavailability Period Duration and/or the Start of Unavailability Period.

If the AMF knows an Unavailability Period Duration and/or the Start of Unavailability Period (e.g. based on the Unavailability Type and other information available to the AMF as described in clause 5.4.13.3), and the UE did not include an Unavailability Period Duration and/or the Start of Unavailability Period or the UE included an Unavailability Period Duration and/or the Start of Unavailability Period different to the Unavailability Period Duration and/or the Start of Unavailability Period known to the AMF, the AMF may use either the Unavailability Period Duration and/or the Start of Unavailability Period known to the AMF or the Unavailability Period Duration and/or the Start of Unavailability Period from the UE as the Unavailability Period Duration and/or the Start of Unavailability Period. The AMF should include the Unavailability Period Duration and/or the Start of Unavailability Period known to the AMF in the Registration Accept. How the UE treats the AMF provided Unavailability Period Duration and/or the Start of Unavailability Period is up to UE implementation e.g. to help to determine when to return to coverage after a discontinuous coverage period, whether to listen to paging in eDRX, not to initiate any NAS signalling (including Service Request for MO data) within the discontinuous coverage period in case of any UL signalling/data request or the UE may deactivate its Access Stratum functions for NR satellite access in order to optimise power consumption until coverage returns, etc.

3) The AMF indicates to the UE in the Registration Accept whether the UE is not required to perform a Registration procedure when the unavailability period has ended.

4) The AMF may take the Unavailability Period Duration (if available) and Start of Unavailability Period into account when determining Periodic Registration Update timer value. The AMF may provide a Periodic Registration Update so the timer does not expire during the Unavailability Period to avoid interfering with the UE dealing with the event that causes the unavailability;

5) The AMF stores the information that the UE is unavailable at the Start of Unavailability Period in UE context, and considers the UE is unreachable (i.e. clear the PPF in AMF) from then until the UE enters CM-CONNECTED state;

6) While the UE is unreachable, all high latency communication solutions (see clause 5.31.8) apply if supported in the network, e.g. extended data buffering, downlink data buffering status report, etc; and

7) If there is "Loss of Connectivity" event subscription for the UE by AF, the AMF at the start of Unavailability Period considers the remaining time in the Unavailability Period (if available) when constructing the "Loss of Connectivity" event report towards the NEF and the remaining time in the Unavailability Period is reported to the respective subscribed AF.

b) If the UE initiates UE-initiated Deregistration procedure:

0) The UE includes Unavailability Period Duration (if known).

1) If there is "Loss of Connectivity" event subscription for the UE by AF, the AMF considers the remaining time in the Unavailability Period when constructing the "Loss of Connectivity" event report towards the NEF and the Unavailability Period is reported to the respective subscribed AF;

Furthermore, if the UE initiates Initial Registration procedure and indicates supporting the Unavailability Period feature by providing "Unavailability Period Support" indication as part of 5GMM Core Network Capability, if the AMF is able to determine the Unavailability Period Duration and/or the Start of Unavailability Period of a UE during the UE's initial Registration procedure, the AMF should provide the Unavailability Period Duration and/or the Start of Unavailability Period to the UE in the Registration Accept message and follow the procedure described in bullet a), steps 2 to 7 above.

NOTE 2: The Unavailability Period Duration and/or the Start of Unavailability Period when received in Registration Accept during the initial registration is for NR satellite access discontinuous coverage.

Unless the AMF indicated that the UE is not required to perform a Registration procedure when the unavailability period has ended, then once the event which makes the UE unavailable is completed in the UE, the UE triggers a Registration procedure. If the event which makes the UE unavailable is delayed to a future time or cancelled in the UE or unavailability period deviates from negotiated value, the UE triggers Registration procedure. The UE may also trigger a Registration procedure before the Unavailability Period has started for other reasons. Depending on the UE state, the Registration procedure can be Initial Registration procedure or Mobility Registration Update procedure.

While the UE is in 5GS and if the UE determines that an upcoming loss of coverage no longer applies or determines a new Start of Unavailability Period or Unavailability Period Duration related to the upcoming loss of coverage, the UE sends a new Mobility Registration Update Request to the AMF to update the Start of Unavailability Period and/or Unavailability Period Duration.

The UE and the AMF re-negotiate unavailability at every Registration procedure, if it is required. If Start of Unavailability Period and/or Unavailability Period Duration is not included in a Registration procedure any pending unavailability configuration stored in the UE context at AMF is discarded.

If the UE moves to EPS, the UE performs Attach or Tracking Area update procedure depending on the interworking mechanisms defined in clause 5.17.2.

For discontinuous coverage in E-UTRAN satellite access in EPS, the "Unavailability Period" is also supported (see clause 4.13.8.2 of TS 23.401 [26]).

NOTE 3: In this release of specification there is no transfer of "unavailability period" between AMF and MME and vice versa.

\* \* \* \* End of changes \* \* \* \*