**3GPP TSG-CT WG1 Meeting #133e-bisC1-22XXXX**

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

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  | **24.301** | **CR** | **3612** | **rev** | **2** | **Current version:** | **17.5.0** |  |
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| *For* [***HELP***](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:***  | EPS MUSIM Paging restriction clarification |
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| ***Source to WG:*** | Mediatek Inc., Nokia, Nokia Shanghai Bell, Samsung, Intel, Charter Communications |
| ***Source to TSG:*** | C1 |
|  |  |
| ***Work item code:*** | MUSIM |  | ***Date:*** | 2022-01-20 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***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:*** | In 23.401 4.3.33.6 Paging RestrictionThe Paging Restriction Information may indicate any of the following:a) all paging is restricted, orb) all paging is restricted, except paging for voice service (MMTel voice or CS domain voice), orc) all paging is restricted, except for certain PDN Connection(s), ord) all paging is restricted, except for certain PDN Connection(s) and voice service (MMTel voice or CS domain voice).NOTE 1: The UE expects not to be paged for any purpose in case a). The UE expects to be paged only for voice service in case b). The UE expects to be paged only for certain PDN Connection(s) in case c). The UE expects be paged for voice service and certain PDN Connection(s) in case d). The MME can page the UE for **mobile terminated signalling** based on local policy considering the stored Paging Restriction Information, **except for case a)**. In this case, to comply with UE provided Paging Restriction Information, the MME can **trigger S1 release procedure** as soon as possible after the mobile terminated signalling procedure is executed. |
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| ***Summary of change:*** | Clearly specify what kinds of event can trigger to page UE when the Paging restriction type is used |
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| ***Consequences if not approved:*** | Unclear specification and undefined behaviour when paging restriction is used. |
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| ***Clauses affected:*** | 5.6.2.2.1.1, 5.6.2.3.1 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

\*\*\* change \*\*\*

##### 5.6.2.2.1.1 General

The network shall initiate the paging procedure for EPS services using S-TMSI with CN domain indicator set to "PS" when:

- NAS signalling messages, cdma2000® signalling messages or user data is pending to be sent to the UE;

- no NAS signalling connection exists (see example in figure 5.6.2.2.1.1); and

- there is no paging restriction applied in the network for that paging.

If the network has downlink user data pending for a UE, the MME has stored paging restriction of the UE and the Paging restriction type in the stored paging restriction is set to:

a) "All paging is restricted", the network should not initiate the paging procedure for EPS services using S-TMSI with CN domain indicator set to "PS" for the UE;

b) "All paging is restricted except for voice service", the network should initiate the paging procedure for EPS services using S-TMSI with CN domain indicator set to "PS" for the UE only when:

1) the pending downlink user data for the UE is considered as voice service related by the network;

c) "All paging is restricted except for specified PDN connection(s)", the network should initiate the paging procedure for EPS services using S-TMSI with CN domain indicator set to "PS" for the UE only when:

1) for PDN connection(s) that paging is not restricted based on the stored paging restriction, the network has downlink user data pending; or

d) "All paging is restricted except for voice service and specified PDN connection(s)", the network should initiate the paging procedure for EPS services using S-TMSI with CN domain indicator set to "PS" for the UE only when:

1) the pending downlink user data for the UE is considered as voice service related by the network; or

2) for PDN connection(s) that paging is not restricted based on the stored paging restriction, the network has downlink user data pending.

If the network has downlink signalling pending for a UE and the MME has stored paging restriction of the UE and the Paging restriction type in the stored paging restriction is set to:

a) "All paging is restricted", the network should not initiate the paging procedure for EPS services using S-TMSI with CN domain indicator set to "PS" for the UE;

b) "All paging is restricted except for voice service", the network should initiate the paging procedure for EPS services using S-TMSI with CN domain indicator set to "PS" for the UE only when:

1) the pending downlink signalling for the UE is EMM signalling or ESM signalling of the PDN connection of voice service;

c) "All paging is restricted except for specified PDN connection(s)", the network should initiate the paging procedure for EPS services using S-TMSI with CN domain indicator set to "PS" for the UE only when:

1) the pending downlink signalling for the UE is EMM signalling; or

2) for PDN connection(s) that paging is not restricted based on the stored paging restriction, the network has downlink ESM signalling pending; or

d) "All paging is restricted except for voice service and specified PDN connection(s)", the network should initiate the paging procedure for EPS services using S-TMSI with CN domain indicator set to "PS" for the UE only when:

1) the pending downlink signalling for the UE is EMM signalling or ESM signalling of the PDN connection of voice service; or

2) for PDN connection(s) that paging is not restricted based on the stored paging restriction, the network has downlink ESM signalling pending.

NOTE X: If the network pages the UE due to downlink signalling pending, the network initiates the release of the NAS signalling connection after network-requested procedure is completed.

For the UE using eDRX, the network initiates the paging procedure when NAS signalling messages, cdma2000® signalling messages or user data is pending to be sent to the UE within the paging time window. If NAS signalling messages, cdma2000® signalling messages or user data is pending to be sent to the UE outside the paging time window and the eDRX value that the network provides to the UE in the Extended DRX parameters IE during the last attach procedure or the last tracking area updating procedure is not all zeros (i.e. the E-UTRAN eDRX cycle length duration is higher than 5.12 seconds), the network initiates the paging procedure at T time ahead of the beginning of the next paging time window.

NOTE 1: T time is a short time period based on implementation. The operator can take possible imperfections in the synchronization between the CN and the UE into account when choosing T time.



Figure 5.6.2.2.1.1: Paging procedure using S-TMSI

To initiate the procedure the EMM entity in the network requests the lower layer to start paging (see 3GPP TS 36.300 [20], 3GPP TS 36.413 [23]) and shall start the timer:

- T3415 for this paging procedure, if the network accepted to use eDRX for the UE and the UE does not have a PDN connection for emergency bearer services.

- Otherwise, T3413 for this paging procedure.

If the network detects that the pending user data to be sent to the UE is related to the voice service as specified in 3GPP TS 23.401 [7] and the network decides to initiate the paging procedure based on the stored paging restriction information, if any, the EMM entity in the network should request the lower layer to include the Voice Service Indication in the Paging message when the UE and the network support the paging cause feature.

If the network starts timer T3415, the network shall set timer T3415 to a value smaller than the value of timer T3-RESPONSE (see 3GPP TS 29.274 [16D] for further details on timer T3-RESPONSE).

The EMM entity may provide the lower layer with a list of CSG IDs, including the CSG IDs of both the expired and the not expired subscriptions. If there is a PDN connection for emergency bearer services established, the EMM entity in the network shall not provide the list of CSG IDs to the lower layer.

If the negotiated UE paging probability information is available in the EMM context of the UE, the EMM entity shall provide the lower layer with the negotiated UE paging probability information (see 3GPP TS 36.300 [20], 3GPP TS 36.413 [23]).

Upon reception of a paging indication, if control plane CIoT EPS optimization is not used by the UE, the UE shall stop the timer T3346, if running, and shall initiate:

- a service request procedure to respond to the paging (see 3GPP TS 23.401 [10] and 3GPP TS 36.413 [23]); or

- a tracking area updating procedure as specified in clauses 5.5.3.2.2 and 5.5.3.3.2.

and additionally if the UE is in the EMM-IDLE mode with suspend indication, resume the suspended NAS signalling connection to the MME as specified in clause 5.3.1.3.

Upon reception of a paging indication, if control plane CIoT EPS optimization is used by the UE, the UE shall stop the timer T3346, if running, and shall additionally:

- initiate a service request procedure as specified in clause 5.6.1.2.2 if the UE is in the EMM-IDLE mode without suspend indication;

- initiate a tracking area updating procedure as specified in clauses 5.5.3.2.2; or

- proceed the behaviour as specified in clause 5.3.1.3 if the UE is in the EMM-IDLE mode with suspend indication.

NOTE 2: If the UE is in the EMM-IDLE mode without suspend indication and has an uplink user data to be sent to the network using control plane CIoT EPS 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 clause 5.6.1.2.2.

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

If the paging for EPS services was received during an ongoing UE-initiated EMM specific procedure or service request procedure, then the UE shall ignore the paging. The network shall proceed with the EMM specific procedure or the service request procedure, and stop the timer for the paging procedure (i.e. either timer T3413 or timer T3415). If the network receives an ATTACH REQUEST message when the paging procedure is ongoing, it should be considered as an abnormal case, and the behaviour of the network for this case is specified in clause 5.6.2.2.1.2.

The network shall stop the timer for the paging procedure (i.e. either timer T3413 or timer T3415) when an integrity-protected response is received from the UE and successfully integrity checked by the network or when the EMM entity in the MME receives an indication from the lower layer that it has received the S1-AP UE context resume request message as specified in 3GPP TS 36.413 [23]. If the response received is not integrity protected, or the integrity check is unsuccessful, the timer for the paging procedure (i.e. either timer T3413 or timer T3415) shall be kept running unless:

- the UE has a PDN connection for emergency bearer services; or

- the response received is a TRACKING AREA UPDATE REQUEST message and the security mode control procedure or authentication procedure performed during tracking area updating procedure has completed successfully.

Upon expiry of timer T3413, 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 EPS bearers, the network shall stop the timer for the paging procedure (i.e. either timer T3413 or timer T3415), and then initiate the paging procedure with paging priority.

Upon expiry of timer T3415, the network shall abort the paging procedure and shall proceed as specified in 3GPP TS 23.401 [10].

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##### 5.6.2.3.1 General

The network may initiate the paging procedure for CS fallback when the UE is IMSI attached for non-EPS services (see example in figure 5.6.2.3.1.1).

The network should not initiate the paging procedure for CS fallback for a UE if the MME has stored paging restriction of the UE and the Paging restriction type in the stored paging restriction preferences is set to:

a) "All paging is restricted"; or

b) "All paging is restricted except for specified PDN connection(s)".



Figure 5.6.2.3.1.1: Paging procedure for CS fallback to A/Gb or Iu mode

To initiate the procedure when no NAS signalling connection exists and no paging restriction applied in the network for that paging, the EMM entity in the network requests the lower layer to start paging (see 3GPP TS 36.300 [20], 3GPP TS 36.413 [23]). The EMM entity may provide the lower layer with a list of CSG IDs, including the CSG IDs of both the expired and the not expired subscriptions. If there is a PDN connection for emergency bearer services established, the EMM entity in the network shall not provide the list of CSG IDs to the lower layer. The paging message includes a UE Paging Identity set to either the UE's S-TMSI or the UE's IMSI, and a CN domain indicator set to "CS" in order to indicate that this is paging for CS fallback.

NOTE: The timers T3413 and T3415 are not started in the network when the paging procedure is initiated for CS fallback.

To notify the UE about an incoming mobile terminating CS service excluding SMS over SGs when a NAS signalling connection exists, the EMM entity in the network shall send a CS SERVICE NOTIFICATION message. This message may also include CS service related parameters (e.g. Calling Line Identification, SS or LCS related parameters).

Upon reception of a paging indication, a UE that is IMSI attached for non-EPS services shall initiate a service request procedure or combined tracking area updating procedure as specified in clause 5.5.3.3.2. If the paging is received in EMM-IDLE mode, the UE shall respond immediately.

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

If the paging is received as a CS SERVICE NOTIFICATION message in EMM-CONNECTED mode, the UE may request upper layers input i.e. to accept or reject CS fallback before responding with an EXTENDED SERVICE REQUEST. The response is indicated in the CSFB response information element in the EXTENDED SERVICE REQUEST message in both EMM-IDLE and EMM-CONNECTED modes.

\*\*\* end of change \*\*\*