**3GPP TSG-RAN2#127R2-2406465**

**Maastricht, Netherlands, August 19 – 23, 2024**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | 38.331 | **CR** | 4788 | **rev** | 1 | **Current version:** | 18.2.0 |  |
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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 | **X** | Core Network |  |

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| In | | | | | | | | | | |
| ***Title:*** | Paging monitoring for extended CG period [CG-SDT-Enh] | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | ZTE Corporation, Sanechips, Mediatek, Qualcomm, Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI18 | | | | |  | ***Date:*** | | | 2024-05-07 |
|  |  | | | |  | |  | | |  |
| ***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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | When extended CG-periodicity was introduced for Rel-18, it was agreed that the UE shall monitor paging whilst waiting for the CG period (otherwise, the long CG-periodicity could mean that the UE would not monitor paging for a prolonged period of time once SDT is triggered. However, such a change was necessary only when the extended CG periodicity is configured. Although there was a discussion on whether we should tie this to specific capability, there was no conclusion at this time and in RRC it was implemented in such a way that from Rel-18 onwards all UEs have to monitor paging whilst T319a is not running. However, such a requirement is unnecessary for RA-SDT case and also for legacy CG-SDT case. Furthermore, if the UE is performing SDT on a BWP where there is no CD-SSB, then the UE has to switch to the BWP with CD-SSB to monitor paging. This is also a new requirement for the UE and hence needs to be considered as a separate capability.  As such, the requirement to monitor paging whilst SDT is ongoing is not there in Rel-17 for this reason. So, it is necessary to restrict the paging monitoring requirement to those UEs that are configured with extended CG periodicities (thus making this as feature to be supported if the UE supports extended CG-SDT periodicities defined in Rel-18). | | | | | | | | |
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| ***Summary of change:*** | | In section 4.2.1, it is clarified that when extended CG periodicity is configured, the UE is required to monitor paging when T319a is not running. If extended CG periodicity is not configured, then UE is is required to monitor paging only when SDT is not ongoing (same as Rel-17).  **Impact analysis**  Impacted 5G architecture options:  NR SA  Impacted functionality:  Paging monitoring during SDT.  Inter-operability:   1. If the UE is implemented according to the CR and the network is not, then the during CG-SDT procedure the UE will only monitor the RAN paging if extended CG period is configured and otherwise, it will monitor RAN paging only when SDT procedure is not ongoing, but this has no impact to network behaviour for paging and hence there is no interoperability issue. 2. If the network is implemented according to the CR and the UE is not, there are no interoperability issues because the UE will monitor the paging when T319 is not running, but the network behaviour for paging is again not impacted by this CR. | | | | | | | | |
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| ***Consequences if not approved:*** | | UE is required to monitor paging when SDT is ongoing even if extended CG-periodicities are not configured whilst the reason for changing this behaviour in Rel-18 is because of the introduction of extended CG periodicities. | | | | | | | | |
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| ***Clauses affected:*** | | 4.2.1 | | | | | | | | |
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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:*** | |  | | | | | | | | |

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| ***First change*** |

## 4.2 Architecture

### 4.2.1 UE states and state transitions including inter RAT

A UE is either in RRC\_CONNECTED state or in RRC\_INACTIVE state when an RRC connection has been established. If this is not the case, i.e. no RRC connection is established, the UE is in RRC\_IDLE state. The RRC states can further be characterised as follows:

**- RRC\_IDLE**:

- A UE specific DRX may be configured by upper layers;

- At lower layers, the UE may be configured with a DRX for PTM transmission of MBS broadcast;

- UE controlled mobility based on network configuration;

- The UE:

- Monitors Short Messages transmitted with P-RNTI over DCI (see clause 6.5);

- Monitors a Paging channel for CN paging using 5G-S-TMSI, except if the UE is acting as a L2 U2N Remote UE;

- If configured by upper layers for MBS multicast reception, monitors a Paging channel for CN paging using TMGI;

- Performs neighbouring cell measurements and cell (re-)selection;

- Performs measurements on L2 U2N Relay UEs and relay (re-)selection;

- Acquires system information and can send SI request (if configured);

- Performs logging of available measurements together with location and time for logged measurement configured UEs;

- Performs idle/inactive measurements for idle/inactive measurement configured UEs;

- If configured by upper layers for MBS broadcast reception, acquires MCCH change notification and MBS broadcast control information and data.

**- RRC\_INACTIVE**:

- A UE specific DRX may be configured by upper layers or by RRC layer;

- At lower layers, the UE may be configured with a DRX for PTM transmission of MBS broadcast and/or a DRX for PTM transmission of MBS multicast;

- UE controlled mobility based on network configuration;

- The UE stores the UE Inactive AS context;

- A RAN-based notification area is configured by RRC layer;

- Transfer of unicast data and/or signalling to/from UE over radio bearers configured for SDT.

- The UE:

- Monitors Short Messages transmitted with P-RNTI over DCI (see clause 6.5);

- While T319a is running, monitors control channels associated with the shared data channel to determine if data is scheduled for it;

- While SDT procedure is ongoing and T319a is not running, if CG-SDT is selected and if extended CG-SDT periodicity is configured (i.e. *cg-SDT-PeriodicityExt* is configured), monitors a Paging channel for CN paging using 5G-S-TMSI and RAN paging using fullI-RNTI except if the UE is acting as a L2 U2N Remote UE;

- While SDT procedure is not ongoing, monitors a Paging channel for CN paging using 5G-S-TMSI and RAN paging using fullI-RNTI, except if the UE is acting as a L2 U2N Remote UE;

- If configured by upper layers for MBS multicast reception, while SDT procedure is not ongoing, monitors a Paging channel for paging using TMGI;

- Performs neighbouring cell measurements and cell (re-)selection;

- Performs measurements on L2 U2N Relay UEs and relay (re-)selection;

- Performs RAN-based notification area updates periodically and when moving outside the configured RAN-based notification area;

- Acquires system information and, while SDT procedure is not ongoing, can send SI request (if configured);

- While SDT procedure is not ongoing, performs logging of available measurements together with location and time for logged measurement configured UEs;

- While SDT procedure is not ongoing, performs idle/inactive measurements for idle/inactive measurement configured UEs;

- If configured by upper layers for MBS broadcast reception, acquires MCCH change notification and MBS broadcast control information and data;

- If configured for MBS multicast reception in RRC\_INACTIVE, acquires multicast MCCH change notification and MBS multicast control information and data;

- Transmits SRS for Positioning.

**- RRC\_CONNECTED:**

- The UE stores the AS context;

- Transfer of unicast data to/from UE;

- Transfer of MBS multicast data to UE;

- At lower layers, the UE may be configured with a UE specific DRX;

- At lower layers, the UE may be configured with a DRX for PTM transmission of MBS broadcast and/or a DRX for MBS multicast;

- At lower layers, the UE may be configured with a cell specific cell DTX/DRX;

- For UEs supporting CA, use of one or more SCells, aggregated with the SpCell, for increased bandwidth;

- For UEs supporting DC, use of one SCG, aggregated with the MCG, for increased bandwidth;

- Network controlled mobility within NR, to/from E-UTRA, and to UTRA-FDD;

- Network controlled mobility (path switch) between a serving cell and a L2 U2N Relay UE, or vice versa, or between a source L2 U2N Relay UE and a target L2 U2N Relay UE;

- Network controlled MP operation.

- The UE:

- Monitors Short Messages transmitted with P-RNTI over DCI (see clause 6.5), if configured;

- Monitors control channels associated with the shared data channel to determine if data is scheduled for it;

- Provides channel quality and feedback information;

- Performs neighbouring cell and/or L2 U2N relay measurements and measurement reporting;

- Acquires system information;

- Performs immediate MDT measurement together with available location reporting;

- If configured by upper layers for MBS broadcast reception, acquires MCCH change notification and MBS broadcast control information and data.

Figure 4.2.1-1 illustrates an overview of UE RRC state machine and state transitions in NR. A UE has only one RRC state in NR at one time.



Figure 4.2.1-1: UE state machine and state transitions in NR

Figure 4.2.1-2 illustrates an overview of UE state machine and state transitions in NR as well as the mobility procedures supported between NR/5GC, E-UTRA/EPC and E-UTRA/5GC.



Figure 4.2.1-2: UE state machine and state transitions between NR/5GC, E-UTRA/EPC and E-UTRA/5GC

Figure 4.2.1-3 illustrates the mobility procedure supported between NR/5GC and UTRA-FDD.



Figure 4.2.1-3: Mobility procedure supported between NR/5GC and UTRA-FDD

### 4.2.2 Signalling radio bearers

"Signalling Radio Bearers" (SRBs) are defined as Radio Bearers (RBs) that are used only for the transmission of RRC and NAS messages. More specifically, the following SRBs are defined:

- SRB0 is for RRC messages using the CCCH logical channel (except SRB0 of L2 U2N Remote UE);

- SRB1 is for RRC messages (which may include a piggybacked NAS message) as well as for NAS messages prior to the establishment of SRB2, all using DCCH logical channel (except SRB1 of L2 U2N Remote UE);

- SRB2 is for NAS messages and for RRC messages which include logged measurement information, all using DCCH logical channel (except SRB2 of L2 U2N Remote UE). SRB2 has a lower priority than SRB1 and may be configured by the network after AS security activation;

- SRB3 is for specific RRC messages when UE is in (NG)EN-DC or NR-DC, all using DCCH logical channel;

- SRB4 is for RRC messages which include application layer measurement report information, all using DCCH logical channel. SRB4 has a lower priority than SRB1 and can only be configured by the network after AS security activation.

- SRB5 is for RRC messages which include application layer measurement report information, all using DCCH logical channel. SRB5 has a lower priority than SRB1 and SRB3 and can only be configured by the SN serving the SCG when the UE is in NR-DC, after AS security activation.

In downlink, piggybacking of NAS messages is used only for one dependant (i.e. with joint success/failure) procedure: bearer establishment/modification/release. In uplink piggybacking of NAS message is used only for transferring the initial NAS message during connection setup and connection resume.

NOTE 1: The NAS messages transferred via SRB2 are also contained in RRC messages, which however do not include any RRC protocol control information.

Once AS security is activated, all RRC messages on SRB1, SRB2, SRB3, SRB4 and SRB5, including those containing NAS messages, are integrity protected and ciphered by PDCP. NAS independently applies integrity protection and ciphering to the NAS messages, see TS 24.501 [23].

Split SRB is supported for all the MR-DC options as well as MP in both SRB1 and SRB2 (split SRB is not supported for SRB0, SRB3, SRB4 and SRB5).

For operation with shared spectrum channel access in FR1, SRB0, SRB1 and SRB3 are assigned with the highest priority Channel Access Priority Class (CAPC), (i.e. CAPC = 1) while CAPC for SRB2 is configurable.

For the NR sidelink L2 U2N relay operations, SRB0, SRB1, SRB2 of a L2 U2N Remote UE are not using Uu CCCH/DCCH logical channels. The SRB0, SRB1, SRB2 of a L2 U2N Remote UE are transmitted via the PC5 Relay RLC channels over PC5 and Uu Relay RLC channels over Uu.