**3GPP TSG-RAN WG2 Meeting #127 R2-2407738**

**Maastricht, The Netherlands, Aug 19th – 23rd 2024**

**Title : Summary of [AT127][507][MBS] MBS and MT-SDT co-existence (Sharp)**

**Source : Sharp**

**Agenda Item : 7.11.2**

**Document for : Discussion and Decision**

1. Introduction

This is the summary of below offline discussion.

* [AT127][507][MBS] MBS and MT-SDT co-existence (Sharp)

Scope: Continue discussion on R2-2406661 to check whether/what needs to be captured in specifications

Intended outcome: Report with TP in R2-2407738

Deadline: Report available for CB session on Thursday

1. Discussion

This offline considers the following scenario:

UE configured to receive MC in RRC\_INACTIVE receives a paging message which triggers the UE to initiate RRC resume procedure for MT-SDT and also indicates the UE to receive multicast sessions in RRC\_INACTIVE.

According to the current RRC specification, when receiving a paging message, UE will not start monitoring the G-RNTIs of the TMGIs indicated to be received in RRC\_INACTIVE in the paging message which triggers the UE to initiate a RRC Resume procedure.

If UE is switched into RRC\_CONNECTED state when initiates the RRC Resume procedure and these multicasts indicated to be received in RRC\_INACTIVE in paging message can be received in RRC\_CONNECTED state. But if the UE initiates RRC Resume procedure for mt-SDT, UE will be not switch into RRC\_CONNECTED state. For this case, not start monitoring the G-RNTIs lead to MC data losing.

About how to avoid MC data losing for the above scenario, as we discussed during on-line discussion, it can not be left to NW implementation for that NW may not have information about UE being configured to receive MC in RRC\_INACTIVE. So, we can focus on the following two solutions which were raised during online discussion:

**Option 1:** When UE initiates RRC resume procedure only for mt-SDT, it should start monitoring G-RNTI(s) of joined MBS session(s) indicated by the TMGI(s) included in the paging message.

**Option 2:** When UE initiates RRC resume procedure only for mt-SDT, it should start monitoring G-RNTI(s) of joined MBS session(s) indicated by the TMGI(s) included in the paging message only if the UE keeps in RRC\_INACTIVE.

**Benefits/drawbacks**

For Option 1, start monitoring G-RNTIs has no harm even if UE will transit to RRC\_CONNECTED for that UE will stop the monitoring when receives RRCResume message. In addition, option 1 only has RRC impacts. The draft TPs for option 1 is provided in Annex A.

For Option 2, we need to further discuss how/when UE can consider it keeps in RRC\_INACTIVE. From RRC perspective, after sending RRCResumeRequest message, UE does not know whether keeps in RRC\_INACTIVE or transits to RRC\_CONNECTED until receives the response message. But the response message may not be received until SDT is finished. So, MAC layer should be involved. For example, UE considers it keeps in RRC\_INACTIVE if the first received DL assignment only includes the data for DRBs. The draft TPs for option 2 is provided in Annex B.

**Offline Discussion**

## Conclusion

This offline discussion report is summarized with final proposal as follows,

## Annex A

**Draft TP for TS38.331**

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| 5.3.2.3 Reception of the *Paging* *message* by the UE or *PagingRecord* by the L2 U2N Remote UE Upon receiving the *Paging* message by the UE or receiving *PagingRecord* from its connected L2 U2N Relay UE by a L2 U2N Remote UE, the UE shall:  1> if in RRC\_IDLE, for each of the *PagingRecord*, if any, included in the *Paging* message, or  1> if in RRC\_IDLE, for the *PagingRecord*, if any, included in the *UuMessageTransferSidelink* message received from the connected L2 U2N Relay UE:  2> if the *ue-Identity* included in the *PagingRecord* matches the UE identity allocated by upper layers:  3> if upper layers indicate the support of paging cause:  4> forward the *ue-Identity,* *accessType* (if present) and paging cause (if determined) to the upper layers;  3> else:  4> forward the *ue-Identity* and *accessType* (if present) to the upper layers;  NOTE 1: If the L2 U2N Relay UE supports the MUSIM feature, it can forward the paging cause to the connected L2 U2N Remote UE.  1> if in RRC\_INACTIVE, for each of the *PagingRecord*, if any, included in the *Paging* message, or  1> if in RRC\_INACTIVE, for the *PagingRecord*, if any, included in the *UuMessageTransferSidelink* message received from the connected L2 U2N Relay UE:  2> if the *ue-Identity* included in the *PagingRecord* matches the UE's stored *fullI-RNTI*:  3> if the UE is configured by upper layers with Access Identity 1:  4> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *mps-PriorityAccess*;  3> else if the UE is configured by upper layers with Access Identity 2:  4> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *mcs-PriorityAccess*;  3> else if the UE is configured by upper layers with one or more Access Identities equal to 11-15:  4> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *highPriorityAccess*;  3> else if *mt-SDT* indication was included in the *Paging* message and if the conditions for initiating SDT for a resume procedure initiated in response to RAN paging according to 5.3.13.1b are fulfilled:  4> if *pagingGroupList* was not included in the *Paging* message; or:  4> if *pagingGroupList* was included in the *Paging* message but the UE has not joined any MBS session(s) indicated by the *TMGI(s)* included in the *pagingGroupList* or:  4> if *pagingGroupList* was included in the *Paging* message, the UE is configured to receive MBS multicast in RRC\_INACTIVE, and *inactiveReceptionAllowed* was included for all the MBS session(s) indicated by the TMGI(s) that the UE has joined:  5> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *mt-SDT*:  4> else:  5> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *mt-Access*;  3> else:  4> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *mt-Access*;  NOTE 2: If both conditions for initiating MT-SDT and MO-SDT according to 5.3.13.1b are fulfilled, UE may initiate RRC connection resumption procedure for MT-SDT or MO-SDT based on implementation.  NOTE 3: A MUSIM UE may not initiate the RRC connection resumption procedure, e.g. when it decides not to respond to the *Paging* message due to UE implementation constraints as specified in TS 24.501 [23].  2> else if the *ue-Identity* included in the *PagingRecord* matches the UE identity allocated by upper layers:  3> if upper layers indicate the support of paging cause:  4> forward the *ue-Identity*, *accessType* (if present) and paging cause (if determined) to the upper layers;  3> else:  4> forward the *ue-Identity* and *accessType* (if present) to the upper layers;  3> perform the actions upon going to RRC\_IDLE as specified in 5.3.11 with release cause 'other';  1> if in RRC\_IDLE, for each *TMGI* included in *pagingGroupList*, if any, included in the *Paging* message:  2> if the UE has joined an MBS session indicated by the *TMGI* included in the *pagingGroupList*:  3> forward the *TMGI* to the upper layers;  1> if in RRC\_INACTIVE and the UE has joined one or more MBS session(s) indicated by the *TMGI(s)* included in the *pagingGroupList*:  2> if *PagingRecordList* is not included in the *Paging* message; or  2> if none of the *ue-Identity* included in any of the *PagingRecord* matches the UE identity allocated by upper layers or the UE's stored *fullI-RNTI*, or  2> if the *ue-Identity* included in the *PagingRecord* matches the UE's stored *fullI-RNTI and* if *mt-SDT* indication was included in the *Paging* message and if the conditions for initiating SDT for a resume procedure initiated in response to RAN paging according to 5.3.13.1b are fulfilled:  3> if *mt-SDT* for the UE was not included in the paging message:4> if the UE is not configured to receive multicast in RRC\_INACTIVE for at least one of the MBS sessions indicated by the *TMGI(s)* that the UE has joined; or  4> if *inactiveReceptionAllowed* is not included for at least one of the MBS sessions indicated by the *TMGI(s)* that the UE has joined:  5> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set as below:  6> if the UE is configured by upper layers with Access Identity 1:  7> set *resumeCause* to *mps-PriorityAccess*;  6> else if the UE is configured by upper layers with Access Identity 2:  7> set *resumeCause* to *mcs-PriorityAccess*;  6> else if the UE is configured by upper layers with one or more Access Identities equal to 11-15:  7> set *resumeCause* to *highPriorityAcces*s;  6> else:  7> set *resumeCause* to *mt-Access*;  3> else:  4> start monitoring the G-RNTI(s), if configured, corresponding to the *TMGI(s)*;  4> if the UE was notified to stop monitoring the G-RNTI(s) for all the joined multicast sessions that are configured for reception in RRC\_INACTIVE:  5> if multicast MCCH is present:  6> start monitoring the Multicast MCCH-RNTI;  6> acquire the *MBSMulticastConfiguration* message on multicast MCCH;  5> else if the UE selected or re-selected to a cell which is different from the cell where the multicast service(s) was received in RRC\_CONNECTED:  6> initiate RRC connection resume procedure for multicast reception as specified in 5.3.13.1d;  4> else if the UE was notified to stop monitoring the G-RNTI for at least one multicast session for which the PTM configuration was not included in *RRCRelease* message:  5> acquire the *MBSMulticastConfiguration* message on multicast MCCH;  2> else if the *ue-Identity* included in any of the *PagingRecord* matches the UE identity allocated by upper layers:  3> forward the *TMGI(s)* to the upper layers;  1> if the UE is acting as a L2 U2N Relay UE, for each of the *PagingRecord*, if any, included in the *Paging* message:  2> if the *ue-Identity* included in the *PagingRecord* in the *Paging* message matches the UE identity in *sl-PagingIdentityRemoteUE* included in *sl-PagingInfo-RemoteUE* received in *RemoteUEInformationSidelink* message from a L2 U2N Remote UE:  3> inititate the Uu Message transfer in sidelink to that UE as specified in 5.8.9.9; |  |

## Annex B

**Draft TP for TS38.331**

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| 5.3.2.3 Reception of the *Paging* *message* by the UE or *PagingRecord* by the L2 U2N Remote UE Upon receiving the *Paging* message by the UE or receiving *PagingRecord* from its connected L2 U2N Relay UE by a L2 U2N Remote UE, the UE shall:  1> if in RRC\_IDLE, for each of the *PagingRecord*, if any, included in the *Paging* message, or  1> if in RRC\_IDLE, for the *PagingRecord*, if any, included in the *UuMessageTransferSidelink* message received from the connected L2 U2N Relay UE:  2> if the *ue-Identity* included in the *PagingRecord* matches the UE identity allocated by upper layers:  3> if upper layers indicate the support of paging cause:  4> forward the *ue-Identity,* *accessType* (if present) and paging cause (if determined) to the upper layers;  3> else:  4> forward the *ue-Identity* and *accessType* (if present) to the upper layers;  NOTE 1: If the L2 U2N Relay UE supports the MUSIM feature, it can forward the paging cause to the connected L2 U2N Remote UE.  1> if in RRC\_INACTIVE, for each of the *PagingRecord*, if any, included in the *Paging* message, or  1> if in RRC\_INACTIVE, for the *PagingRecord*, if any, included in the *UuMessageTransferSidelink* message received from the connected L2 U2N Relay UE:  2> if the *ue-Identity* included in the *PagingRecord* matches the UE's stored *fullI-RNTI*:  3> if the UE is configured by upper layers with Access Identity 1:  4> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *mps-PriorityAccess*;  3> else if the UE is configured by upper layers with Access Identity 2:  4> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *mcs-PriorityAccess*;  3> else if the UE is configured by upper layers with one or more Access Identities equal to 11-15:  4> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *highPriorityAccess*;  3> else if *mt-SDT* indication was included in the *Paging* message and if the conditions for initiating SDT for a resume procedure initiated in response to RAN paging according to 5.3.13.1b are fulfilled:  4> if *pagingGroupList* was not included in the *Paging* message; or:  4> if *pagingGroupList* was included in the *Paging* message but the UE has not joined any MBS session(s) indicated by the *TMGI(s)* included in the *pagingGroupList* or:  4> if *pagingGroupList* was included in the *Paging* message, the UE is configured to receive MBS multicast in RRC\_INACTIVE, and *inactiveReceptionAllowed* was included for all the MBS session(s) indicated by the TMGI(s) that the UE has joined:  5> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *mt-SDT*:  4> else:  5> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *mt-Access*;  3> else:  4> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *mt-Access*;  NOTE 2: If both conditions for initiating MT-SDT and MO-SDT according to 5.3.13.1b are fulfilled, UE may initiate RRC connection resumption procedure for MT-SDT or MO-SDT based on implementation.  NOTE 3: A MUSIM UE may not initiate the RRC connection resumption procedure, e.g. when it decides not to respond to the *Paging* message due to UE implementation constraints as specified in TS 24.501 [23].  2> else if the *ue-Identity* included in the *PagingRecord* matches the UE identity allocated by upper layers:  3> if upper layers indicate the support of paging cause:  4> forward the *ue-Identity*, *accessType* (if present) and paging cause (if determined) to the upper layers;  3> else:  4> forward the *ue-Identity* and *accessType* (if present) to the upper layers;  3> perform the actions upon going to RRC\_IDLE as specified in 5.3.11 with release cause 'other';  1> if in RRC\_IDLE, for each *TMGI* included in *pagingGroupList*, if any, included in the *Paging* message:  2> if the UE has joined an MBS session indicated by the *TMGI* included in the *pagingGroupList*:  3> forward the *TMGI* to the upper layers;  1> if in RRC\_INACTIVE and the UE has joined one or more MBS session(s) indicated by the *TMGI(s)* included in the *pagingGroupList*:  2> if *PagingRecordList* is not included in the *Paging* message; or  2> if none of the *ue-Identity* included in any of the *PagingRecord* matches the UE identity allocated by upper layers or the UE's stored *fullI-RNTI,* or  2> if the *ue-Identity* included in the *PagingRecord* matches the UE's stored *fullI-RNTI* and if *mt-SDT* indication was included in the *Paging* message and if the conditions for initiating SDT for a resume procedure initiated in response to RAN paging according to 5.3.13.1b are fulfilled:  3> if *mt-SDT* for the UE was not included in the paging message:4> if the UE is not configured to receive multicast in RRC\_INACTIVE for at least one of the MBS sessions indicated by the *TMGI(s)* that the UE has joined; or  4> if *inactiveReceptionAllowed* is not included for at least one of the MBS sessions indicated by the *TMGI(s)* that the UE has joined:  5> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set as below:  6> if the UE is configured by upper layers with Access Identity 1:  7> set *resumeCause* to *mps-PriorityAccess*;  6> else if the UE is configured by upper layers with Access Identity 2:  7> set *resumeCause* to *mcs-PriorityAccess*;  6> else if the UE is configured by upper layers with one or more Access Identities equal to 11-15:  7> set *resumeCause* to *highPriorityAcces*s;  6> else:  7> set *resumeCause* to *mt-Access*;  3> else:  4> if RRC Resume procedure was not triggered by the paging message, or  4> if keeps in RRC\_INACTIVE indication is received from lower layer ;  5> start monitoring the G-RNTI(s), if configured, corresponding to the *TMGI(s)*;  5> if the UE was notified to stop monitoring the G-RNTI(s) for all the joined multicast sessions that are configured for reception in RRC\_INACTIVE:  6> if multicast MCCH is present:  7> start monitoring the Multicast MCCH-RNTI;  7> acquire the *MBSMulticastConfiguration* message on multicast MCCH;  6> else if the UE selected or re-selected to a cell which is different from the cell where the multicast service(s) was received in RRC\_CONNECTED:  7> initiate RRC connection resume procedure for multicast reception as specified in 5.3.13.1d;  5> else if the UE was notified to stop monitoring the G-RNTI for at least one multicast session for which the PTM configuration was not included in *RRCRelease* message:  6> acquire the *MBSMulticastConfiguration* message on multicast MCCH;  2> else if the *ue-Identity* included in any of the *PagingRecord* matches the UE identity allocated by upper layers:  3> forward the *TMGI(s)* to the upper layers;  1> if the UE is acting as a L2 U2N Relay UE, for each of the *PagingRecord*, if any, included in the *Paging* message:  2> if the *ue-Identity* included in the *PagingRecord* in the *Paging* message matches the UE identity in *sl-PagingIdentityRemoteUE* included in *sl-PagingInfo-RemoteUE* received in *RemoteUEInformationSidelink* message from a L2 U2N Remote UE:  3> inititate the Uu Message transfer in sidelink to that UE as specified in 5.8.9.9; |  |

**Draft TP for TS38.321**

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| 5.1.5 Contention Resolution Once Msg3 is transmitted the MAC entity shall:  1> if the Msg3 transmission (i.e. initial transmission or HARQ retransmission) is scheduled with PUSCH repetition Type A:  2> if Msg3 is transmitted on a non-terrestrial network:  3> start or restart the ra-ContentionResolutionTimer in the first symbol after the end of all repetitions of the Msg3 transmission plus the UE-gNB RTT.  2> else:  3> start or restart the *ra-ContentionResolutionTimer* in the first symbol after the end of all repetitions of the Msg3 transmission.  1> else if Msg3 transmission (i.e. initial transmission or HARQ retransmission) is transmitted on a non-terrestrial network:  2> start or restart the ra-ContentionResolutionTimer in the first symbol after the end of the Msg3 transmission plus the UE-gNB RTT.  1> else:  2> start or restart the *ra-ContentionResolutionTimer* in the first symbol after the end of the Msg3 transmission.  1> monitor the PDCCH while the *ra-ContentionResolutionTimer* is running regardless of the possible occurrence of a measurement gap;  1> if notification of a reception of a PDCCH transmission of the SpCell is received from lower layers:  2> if the C-RNTI MAC CE was included in Msg3:  3> if the Random Access procedure was initiated for SpCell beam failure recovery or for beam failure recovery of both BFD-RS sets of SpCell (as specified in clause 5.17) and the PDCCH transmission is addressed to the C-RNTI; or  3> if the Random Access procedure was initiated by a PDCCH order and the PDCCH transmission is addressed to the C-RNTI; or  3> if the Random Access procedure was initiated for SDT beam failure recovery (as specified in clause 5.27.1) and the PDCCH transmission is addressed to the C-RNTI; or  3> if the Random Access procedure was initiated by the MAC sublayer itself or by the RRC sublayer and the PDCCH transmission is addressed to the C-RNTI and contains a UL grant for a new transmission:  4> consider this Contention Resolution successful;  4> stop *ra-ContentionResolutionTimer*;  4> discard the *TEMPORARY\_C-RNTI*;  4> consider this Random Access procedure successfully completed.  2> else if the CCCH SDU was included in Msg3 and the PDCCH transmission is addressed to its *TEMPORARY\_C-RNTI*:  3> if the MAC PDU is successfully decoded:  4> stop *ra-ContentionResolutionTimer*;  4> if the MAC PDU contains a UE Contention Resolution Identity MAC CE; and  4> if the UE Contention Resolution Identity in the MAC CE matches the CCCH SDU transmitted in Msg3:  5> consider this Contention Resolution successful and finish the disassembly and demultiplexing of the MAC PDU;  5> if this Random Access procedure was initiated for SI request:  6> indicate the reception of an acknowledgement for SI request to upper layers.  5> else:  6> set the C-RNTI to the value of the *TEMPORARY\_C-RNTI*;  5> discard the *TEMPORARY\_C-RNTI*;  5> consider this Random Access procedure successfully completed.  5> if the RA procedure is initiated for MT-SDT and the PDSCH scheduled by the PDCCH does not includes data for SRBs:  6> indicate keeps in RRC\_INACTIVE to upper layer.  4> else:  5> discard the *TEMPORARY\_C-RNTI*;  5> consider this Contention Resolution not successful and discard the successfully decoded MAC PDU.  3> else, for eRedCap UE, if lower layer detects that PDSCH transmission scheduled by PDCCH has a larger bandwidth than UE can receive or process per slot:  4> stop *ra-ContentionResolutionTimer*;  4> discard the *TEMPORARY\_C-RNTI*;  4> consider this Contention Resolution not successful.  1> if *ra-ContentionResolutionTimer* expires:  2> if Msg3 transmission was transmitted on a non-terrestrial network:  3> if no PDCCH addressed to TC-RNTI indicating uplink grant for a Msg3 retransmission is received after the start of the *ra-ContentionResolutionTimer*:  4> discard the *TEMPORARY\_C-RNTI*;  4> consider the Contention Resolution not successful.  2> else:  3> discard the *TEMPORARY\_C-RNTI*;  3> consider the Contention Resolution not successful.  1> if the Contention Resolution is considered not successful:  2> flush the HARQ buffer used for transmission of the MAC PDU in the Msg3 buffer;  2> increment *PREAMBLE\_TRANSMISSION\_COUNTER* by 1;  2> if *PREAMBLE\_TRANSMISSION\_COUNTER* = *preambleTransMax* + 1:  3> indicate a Random Access problem to upper layers.  3> if this Random Access procedure was triggered for SI request:  4> consider the Random Access procedure unsuccessfully completed.  2> if the Random Access procedure is not completed:  3> if the *RA\_TYPE* is set to *4-stepRA*:  4> if the Random Access Preamble is transmitted with repetitions and contention-free Random Access Resources have not been provided for this Random Access procedure:  5> if *PREAMBLE\_TRANSMISSION\_COUNTER* = [*preambleTransMax-Msg1-Repetition*] + 1; or  5> if *PREAMBLE\_TRANSMISSION\_COUNTER* = 2 × [*preambleTransMax-Msg1-Repetition*] + 1:  6> if set of Random Access resources configured with the same *prach-ConfigurationIndex* and associated with a higher Msg1 repetition number with the same feature or feature combination as the current set of Random Access resources is available:  7> select the set of Random Access resources associated with the next higher Msg1 repetition number with the same feature or feature combination for this Random Access procedure;  7> initialize *startPreambleForThisPartition*, *numberOfPreamblesPerSSB-ForThisPartition*, *ssb-SharedRO-MaskIndex* and *numberOfRA-PreamblesGroupA* parameters for the Random Access procedure according to the values configured by RRC for the selected set of Random Access resources.  4> select a random backoff time according to a uniform distribution between 0 and the *PREAMBLE\_BACKOFF*;  4> if the criteria (as defined in clause 5.1.2) to select contention-free Random Access Resources is met during the backoff time:  5> perform the Random Access Resource selection procedure (see clause 5.1.2);  4> else:  5> perform the Random Access Resource selection procedure (see clause 5.1.2) after the backoff time.  3> else (i.e. the *RA\_TYPE* is set to *2-stepRA*):  4> if *msgA-TransMax* is applied (see clause 5.1.1a) and *PREAMBLE\_TRANSMISSION\_COUNTER* = *msgA-TransMax* + 1:  5> set the *RA\_TYPE* to *4-stepRA*;  5> perform initialization of variables specific to Random Access type as specified in clause 5.1.1a;  5> flush HARQ buffer used for the transmission of MAC PDU in the MSGA buffer;  5> discard explicitly signalled contention-free 2-step RA type Random Access Resources, if any;  5> perform the Random Access Resource selection as specified in clause 5.1.2.  4> else:  5> select a random backoff time according to a uniform distribution between 0 and the *PREAMBLE\_BACKOFF*;  5> if the criteria (as defined in clause 5.1.2a) to select contention-free Random Access Resources is met during the backoff time:  6> perform the Random Access Resource selection procedure for 2-step RA type as specified in clause 5.1.2a.  5> else:  6> perform the Random Access Resource selection for 2-step RA type procedure (see clause 5.1.2a) after the backoff time. |