3GPP TSG-RAN WG2 Meeting #113bis Electronic R2-210xxxx

Elbonia, 12 – 20 April 2021

**Agenda item: 8.1**

**Source: Rapporteur (Nokia)**

**Title: [AT113bis-e][031][MBS17] MBS session activation (Nokia)**

**WID/SID: NR\_MBS-Core - Release 17**

**Document for: Discussion and Decision**

# 1 Introduction

This is report for the email discussion initiated from the discussion on online meeting on 12th of April 2021::

[R2-2103278](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103278.zip) MBS session activation and group paging Nokia, Nokia Shanghai Bell discussion Rel-17 NR\_MBS-Core

DISCUSSION

- NEC support.

- QC support and think it should be restricted to cells supporting MBS. Nokia agrees. QC think that for cells not supporting MBS legacy paging shall be used. LG agrees.

- Ericsson agrees with P1 but think that also non-supporting nodes need to be supported with group paging, where CN allocates a specific group TMSI (transparent to RAN non supporting MBS).

- CATT think MCCH can be used, and think this may have less impact. Vivo agrees with CATT. MTK agrees as well. Vivo think that otherwise the UE need to wake up at more occasions.

- Oppo think MSB session ID can be used in the paging message and think inmpact to legacy UEs shall be considered.

- Xiaomi think that MCCH is not always best.

- Samsung think that gropu paging can only notify for on one service, and think that power consumption may be an issue.

- CMCC think we should first discuss what ID we would use.

* There is Support to have group notification for multicast for MBS supporting nodes (e.g. paging)

Go offline to attempt to progress slightly more (Nokia).

* [AT113bis-e][031][MBS17] MBS session activation (Nokia)

Scope: Based on the agreement, on-line comments and submitted papers, Progress the topic of session activation and group paging/notification to reach agreements if possible, FFS points otherwise. Can also collect comments on notification for non-supporting nodes.

 Intended outcome: Report, Agreements

 Deadline: Report/Agreements Friday April 16

In addition to above paper following papers were provided to the meeting on this topic:

[R2-2103905](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103905.zip) Discussion on group notification for multicast session activation Huawei, HiSilicon discussion Rel-17 NR\_MBS-Core

[R2-2103728](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103728.zip) Discussion on SA2 Reply LS on 5G MBS CMCC discussion Rel-17 NR\_MBS-Core

[R2-2103179](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103179.zip) NR Multicast group paging aspects Qualcomm Inc discussion Rel-17 NR\_MBS-Core

[R2-2103118](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103118.zip) Considerations on the SA2 questions about session activation vivo discussion

[R2-2103729](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103729.zip) Draft reply LS on Group Paging CMCC LS out Rel-17 NR\_MBS-Core To:SA2 Cc:RAN3

[R2-2103906](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103906.zip) Reply LS on 5MBS progress and issues to address Huawei, HiSilicon LS out Rel-17 NR\_MBS-Core To:SA2, RAN3

Additionally on supporting notification for non-MBS node was treated in this paper:

[R2-2103776](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103776.zip) Open issues for UEs in idle or inactive mode Ericsson discussion Rel-17 NR\_MBS-Core

# 2 Contact Points

Respondents to the email discussion are kindly asked to fill in the following table.

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| --- | --- | --- |
| Company | Name | Email Address |
| Nokia (Rapporteur) | Jarkko Koskela | Jarkko.t.koskela@nokia.com |
| Huawei | Dawid Koziol | dawid.koziol@huawei.com |
| Ericsson | Martin van der Zee | martin.van.der.zee@ericsson.com |
| Qualcomm | Prasad Kadiri | pkadiri@qti.qualcomm.com |
| CATT | Rui Zhou | zhourui@catt.cn |
| MediaTek | Xuelong Wang | Xuelong.Wang@mediatek.com |
| Futurewei | Jialin Zou | Jialinzou88@yahoo.com |
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# 3 Group Session Activation

So in the online session RAN2 agreed

* There is Support to have group notification for multicast for MBS supporting nodes (e.g. paging)

As this is not firm agreement yet we would need to first consider can we agree to support some sort of group notification for multicast for MBS supporting nodes. Independently to which channel (e.g. MCCH or PCCH) is used for group notification we could consider what are benefits compared to unicast paging.

In general alternative to support group notification one could use regular unicast paging i.e. NW would need to include UEs sharing same paging occasion a different *pagingRecords* thus causing size increase of paging message. Possible even that one cannot accommodate all the required paging records in a message which can add also latency as pagings need to be distributed in time.

**Observation 1:** Using unicast paging would increase the overhead on PCCH (need to include multiple paging records in single paging message to signal paging to all UEs)

**Question 3.1**: Do you agree with above observation 1 and do you consider that we need some type fo group notification mechanism?

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| Answers to Question 3.1 |
| Company | Yes/No | Technical Arguments |
| Nokia | Yes |  Capacity of PCCH and, if UEs ought to connect to the network, also PRACH would be issue with unicast paging which may result in longer latency with which a notification is delivered to UEs.  |
| Huawei, HiSilicon | Yes | Group notification can improve signalling efficiency, especially that a very large number of UEs can be Paged at the same time in an area where the service is provided. |
| Ericsson | Yes | We agree with the observation from the rapporteur about the increased paging record list which can lead to paging delay (until the next DRX cycle) and increased number of Paging message.The Paging message size is increased which may reduce performance at the cell border. Paging for multicast UEs may delay Paging for legacy UEs because the paging record list is full. Legacy UEs receive unnecessary Paging messages to indicate multicast session start.  |
| Qualcomm | Yes | Unicast paging for group of UEs at same time causes PCCH congestion, impacts unicast paging due to overload, paging delay and all UEs responding at same instance also causes PRACH overload and singnaling overload as well. |
| CATT | Yes | To transfer the same information(e.g. TMGI of multicast to be activated) to multiple UEs in a cell,obviously some kind of group notification(MCCH or PCCH) is an efficient way.Drawback of unicast paging can be summaried as below,1.increase the overhead of PCCH2.increase the signalling overload of NG-RAN node.3.not resource-efficient.4.increse the paging delay.5. may have impact to legacy UEs |
| MediaTek | Yes | Unicast approach cause too much resurce consumption at DL  |
| Futurewei | Yes | We agree on that unicast paging a group of UEs will increase the paging signaling overhead and delay. |
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For unicast paging minimum paging DRX currently is 320ms (*defaultPagingCycle* = 32rf). Thus the delay for providing unicast paging can be up to 320ms even with shortest paging drx cycle.

**Question 3.2**: Should the notification for multicast services have shorter latency than it is possible with regular unicast paging?

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| Answers to Question 3.2 |
| Company | Yes/No | Technical Arguments |
| Nokia | No | Some services could require much shorted delays but alternatively for services requiring very short delays it could be possible to keep UEs in RRC\_CONNECTED state as the network would need to do if the services are provided using unicast. Probably one would need to consider why would one require shorter delay for multicast session notification than for unicast session.Thus we do not see strong need to go for much shorter session notification period than for unicast services.  |
| Huawei, HiSilicon | No | We agree with the comments from Nokia, i.e. DRX cycle lengths already supported for unciast are sufficient as multicast services do not have higher requirements in this respect than unicast services. |
| Ericsson | No | Network can decide to keep the UE in connected after the UE has joined the session, and keep the UE in connected when the session is deactivated by the network, when there are latency constraints.  |
| Qualcomm | No | Agree with above companies comments. |
| CATT | No sure | We agree with Nokia that some services could require shorter delays(e.g.the minimum of sc-mcch-ModificationPeriod in LTE is 2rf) than the minimum legacy paging DRX.However, The notification is used to notify the multicast session activation to UE in idle/inactive mode,which is not case that often happens.so we are not sure whether it is worth to consider it. |
| MediaTek | No | We did not see the need to discuss this issue.  |
| Futurewei | No | Agree with above companies observations. We also don’t see a use case of multicast which requires lower paging delay than unicast. |
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**Question 3.3**: Do you see any other possible issues with using unicast paging for multicast session indications?

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| Answers to Question 3.3 |
| Company | Yes/No | Technical Arguments |
| Ericsson | Yes | There is not only impact on RAN, but also on CN with using unicast Paging for large groups. This is also why SA2/RAN3 considered it beneficial.  |
| QC  | Yes  | Same Q3.1 response. Same view as Ericsson comment. |
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*PROPOSAL TO BE ADDED Based on Q1/Q2/Q3 responses if we can live with unicast paging. Following questions are more valid if RAN2 sees need for group notification mechanism*

From UE point of view it would be desirable to have paging occasions simultaneously with unicast paging but naturally this does not work with group notification as there is no way to ensure that all the UEs listening to same group notification occasions would be also listening at the same time to unicast paging.

**Observation 2:** Group paging mechanism cannot be ensured to have same paging occasions as unicast paging.

Additionally if one tries to have group notification occasions collocated with unicast paging occasions there would be need to accommodate both regular unicast paging and group notification in the same occasion. This may have some impact what is capacity available for unicast paging and/or group notification.

**Question 3.4**: Should a special effort be taken in the design of group notification mechanism so that simultaneous group notification and unicast paging could be avoided?

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| Answers to Question 3.4 |
| Company | Yes/No | Technical Arguments |
| Nokia | Maybe | It seems unlikely that there would be need to page many multicast session activation in same occasions thus e.g. if one uses paging approach for group notification one would need only to add a paging record to paging message. But of course if there is desire in the group to avoid simultaneous occasions this would be OK for us. This could be achieved e.g. with new channel (e.g. MCCH / another PCCH) or modified paging formula |
| Huawei, HiSilicon | No | Contrary, we think that collocating unicast paging with multicast paging is beneficial for UE power consumption. However, there is no additional effort needed to align the paging occasions, i.e. the network may reuse UE’s unicast Paging Occasions. If different UEs that need to receive multicast paging are monitoring different POs, then multicast paging should be included in each of them. This still decreases signalling overhead with a very small specifications impact compared to other group paging schemes and without a negative impact on UE’s power consumption. |
| Ericsson | No | Perhaps the answer depends on the solution, but we answered no, assuming a group paging solution where the UEs that joined the multicast group are monitoring the same Paging Occasion (PO) for session start. We assume that this PO is also used for normal unicast Paging. We assume that MBS will support concurrent multicast sessions, but we think it is unlikely that a high number of sessions will start at the same time. For example for MCPTT there could be a voice, video and/or data session start at the same time, but we think there is no problem to handle that together with unicast Paging in the same PO.  |
| Qualcomm | No | We think multicast group PO and unicast PO can be different. All Multicast UEs can monitor same multicast group PO and unicast PO as well. For some UEs, it is possible that multicast PO and unicast PO may be same and for some UEs it may be different. Since Multicast session start is not very frequency and multicast UEs need to monitor Multicast PO only when U joins multicast session and waiting for session activation. In same paging message, it should be possible include Multicast group ID and UE paging identity for UEs having overlapped multicast PO and Unicast PO. |
| CATT | No | Using MCCH is much easier for the group notification purpose. With MCCH,we even do not need to discuss how to avoid simultaneous group notification and unicast paging,as it is supposed to be the part of MCCH design.We see efforts and impacts on either group paging on multicast group PO or collocating unicast paging with multicast paging on unicast PO.For group paging on multicast group PO,1.need special effort for the new design2.bring challage to UE capacity,a MBS UE may need to monitor unicast PO+ group PO+MCCHFor group paging on unicast PO,1.it is not resource-efficent,i.e.same group paging message need to sent on multiple POs2.it have impact to legacy UEsBTW, It is worth to noting that using group paging is not a conclusion of SA2. |
| MediaTek | No | We agree with CATT. Using MCCH notification is much easier for the group notification purpose of multicast service, as supported by legacy system. We did not see a reason to deviate from the mechanism as adopted by legacy system.  |
| Futurewei | No | We could not see a reason to impost a restriction that multicast PO and unicast PO cannot be the same. |
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Generally in this email we are considering how to notify group of UEs about multicast session activation in IDLE/INACTIVE states. But it would impact RAN2 discussion whether one expects a UE to monitor group notification channel (e.g. PCCH/MCCH) in RRC\_CONNECTED state e.g. should CONNECTED mode UE to check regularly to group notification channel about multicast session indications or is it signalled in dedicated signaling to the UE or by other means.

**Question 3.5**: Is UE expected to monitor Group notification channel in RRC\_CONNECTED?

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| Answers to Question 3.5 |
| Company | Yes/No | Technical Arguments |
| Nokia | No | We see no need for UE to monitor another channel for multicast session indications in RRC\_CONNECTED but, if the UE configuration needs changes depending on the UEs configuration at the time of multicast session activation, NW could signal it in dedicated signaling e.g. RRC reconfiguration or PTM leg activation as NW is aware which UE is registered to which MBS session.  |
| Huawei, HiSilicon | No | We already made the following agreement during the previous meeting:**If the UE which joined the multicast session is in RR CONNECTED state when the session is started, the gNB sends RRC Reconfiguration message with relevant MBS configuration to the UE and there is no need for separate session start notification for this UE. FFS for session activation.**Now that it is clear that only session activation is applicable to multicast, we think this agreement should be applied to session activation, not session start (which is only for broadcast session). |
| Ericsson | Maybe not | As Huawei indicated above RAN2 already agreed to use RRC reconfiguration. We are not sure yet, if there is a problem with RRC reconfiguration of large groups. And we are also not sure if a group notification in broadcast is the way forward, or if a pre-configuration with activation (as suggested by the rapporteur), or any other method, is the preferred way forward.  |
| Qualcomm | No | In general, we agree with Nokia, Huawei points. If UE is in RRC\_CONNECTED state and Multicast session is activated, gNB can either use RRC Reconfig message to configure MRB or if UE is already configured with MRB and PTM G-RNTI is deactivated then upon Multicast session activation, GNB can use L1/L2 signaling to activate G-RNTI monitoring.  |
| CATT | depends | It depends what Group notification channel(MCCH or PCCH) will be chosen finally.For MCCH,it is also used for delivery mode 2.So connected UE using delivery mode 2 should be able to monitor MCCH.* Assume it is possible to reuse LTE SC-PTM mechanism for the CONNECTED UEs to receive the PTM configuration for NR MBS delivery mode 2, i.e. broadcast based manner.
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| MediaTek | depends | It depends what Group notification channel(MCCH or PCCH) will be chosen finally. If MCCH is adopted, the answer is yes. Agree the observation as made by CATT |
| Futurewei | Maybe | Dedicated signaling is doable but is not efficient. Maybe we should further study whether it is worth to have group notification for connected UEs. |
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In [R2-2103278](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103278.zip) it was noted that with group notication it could be that many UEs would start PRACH procedure simultaneously.

**Question 3.6**: Are you concerned about possible PRACH capacity due to group notification?

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| Answers to Question 3.6 |
| Company | Yes/No | Technical Arguments |
| Nokia | Yes | The PRACH resources configured in SIB1 are configured for a typical unicast load in a cell when PRACH transmissions are distributed over time evenly. If there are too few PRACH resources, then random-access procedures are likely to fail due to collisions. We think RAN2 should study if possible issue with PRACH capacity needs to be solved.  |
| Huawei, HiSilicon | No | It depends on the detailed notification mechanism. In case UE’s unicast POs are reused as we described above in Q3.4, then the notification for different UEs would already be distributed over time and RACH impact could be avoided. |
| Ericsson | Maybe | With very large groups there could be PRACH congestion / latency, but we are not sure if any PRACH enhancements can basically solve that problem. The larger the group, the larger the congestion/latency, and because the group size cannot be controlled, the congestion/latency can thus also not be controlled. Perhaps the answer to that question is that very large groups should remain in connected mode. @Huawei:It is true that unicast POs provide some distribution (and PRACH enhancements might achieve something similar), but we think there can still be problems with very large groups. Using unicast POs and adding MBS Session Id to Paging message also does not work with non-supporting MBS nodes.  |
| Qualcomm | Yes | It is valid concern. One possible way to alleviate RACH and signaling overload is to specify random delay mechanism for page response. This needs some discussion in RAN2 and solution can be either RRC or NAS based.Note that if we use unicast POs to send group paging, this can cause paging overload due to beam sweeping of multicast page in every unicast PO.  |
| CATT | Maybe | Theoretically PRACH resources could be a problem if there are large number of UEsHowever,the notification we are discussing is used to notify the multicast session activation to UE in idle/inactive mode,which is not case that often happens.so maybe it is not worth to consider special PRACH design for this. |
| MediaTek | Yes  | PRACH resources could be a concern.  |
| Futurewei | Maybe | For large group of UE notified at the same time to wake-up and performing access, a mechanism to redistribute the access time for different UEs maybe needed. The existing mechanism should work with large delay expected. |
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And if you have any other aspects you would like to be discussed regarding group notification principles

**Question 3.7**: Please list here any other aspects you think are important to solve to make group notification design efficient

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| Answers to Question 3.7 |
| Company | Topic | Details of the topic |
| Huawei, HiSilicon | Group ID in the paging message | RAN2 should confirm that the group identifier in the group paging message is MBS session ID as agreed by SA2, at least for the MBS supporting node. |
| Qualcomm | Group ID ,Group PO, common ID for both IDLE and INACTIVE state. | In addition to group paging ID (which will be specified by SA2), we need to discuss about group PO and RAN2 has to agree that same Group Paging ID is commonly used by NW for both RRC\_IDLE and INACTIVE state UEs.  |
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# 4 Support for non-MBS node

In few papers e.g. [R2-2103179](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103179.zip), [R2-2103278](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103278.zip) and [R2-2103118](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103118.zip) it was noted that paging with MBS session ID in non-MBS supporting node would cause quite a bit of changes to such a node.

In [R2-2103776](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103776.zip) a it was proposed to use 5G-S-TMSI instead of MBS session ID. In this solution a 5G S-TMSI is assigned to the UE by upper layers when the UE joins the multicast group. This would be different 5G-S-TMSI opposed to one used for unicast paging.

When the UE is in Idle or Inactive mode, the UE will monitor the group 5G S-TMSI for session activation as well as unicast paging

When the non-supporting gNB receives a Paging message from the CN including a group 5G S-TMSI, the gNB handles the Paging as with any other 5G S-TMSI, i.e. this solution is transparent to the gNB.

**Question 4.1:** Should it be possible to support group notification in non MBS node by paging UEs with 5G-S-TMSI that is different from unicast 5G-S-TMSI?

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| Answers to Question 3.6 |
| Company | Yes/No | Technical Arguments |
| Nokia | No | SA2 already indicated paging is performed with MBS session ID/TMGI. In non supporting node to avoid changes to the node we cannot add new identity to the paging message. Therefore, there must be a mapping between 5G-S-TMSI and MBS session ID/TMGI. Additionally if we considering mapping of TMGI to 5G-S-TMSI it does not seem to have sufficient amount of space to do it without reserving some space from AMF Set ID and AMF Pointer. In 5G-TMSI (the part of 5G-S-TMSI that is allocatable) we have 32 bits but TMGI is 44 bits. As said SA2 has not agreed to use 5G-S-TMSI for paging and we should not open this discussion in RAN2. Also if we have group notification mechanism in the non supporting node it would need to to assign extra capacity for the PRACH to take into account group of UEs accessing system simultaneously. |
| Huawei, HiSilicon | Can be 2nd priority | We think the support of group notification for non MBS node can be the 2nd priority and we can first focus on MBS nodes. In the non-MBS node, the MBS traffic needs to be delivered in the unicast manner, so it may not be so necessary to enhance paging channel only. |
| Ericsson | Yes | RAN3 asked if notification should be supported on non-supporting node ([R3-211296](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu//TSGR3_111-e/Docs/R3-211296.zip)) and SA2 confirmed positively (S2-2102077):*SA2 would like to confirm that it is necessary for UE to receive the MBS Session activation notification (e.g., legacy paging) when it is served by a non-supporting NG-RAN node.* In case unicast paging is used for notification on non-supporting nodes, the same problems are experienced as with unicast paging on supporting nodes, i.e. a group paging solution for non-supporting nodes is needed. @Nokia:The UE receives the "group" 5G S-TMSI during the NAS join procedure. The UE then monitors paging for this "group" 5G S-TMSI for session start, and the normal 5G S-TMSI for normal paging. The "group" 5G S-TMSI is used as the UE identity in the Paging message without any impact on the non-supporting node (i.e. the MBS session ID is not included in the Paging message). There is thus no TMGI to 5G S-TMSI mapping issue. We agree that RAN2 cannot decide on using a "group" 5G S-TMSI, but RAN2 can check the feasibility with SA2, RAN3 and CT1 (NAS join procedure) if RAN2 thinks this approach can be used for both supporting and non-supporting nodes.  |
| Qualcomm | No | From UE side, it has to monitor both unicast PO (associated with unicast 5G S-TMSI) and multiast PO (as function of “group” 5G S-TMSI), not much benefit from UE perspective. This will have impact to CT1, SA2, RAN3 as well.  |
| MediaTek | Not sure | If non-MBS mode is supported, legacy mechanism should be adopted.  |
| Futurewei | No | Not in this release. Need to further evaluate the need of doing so. A non-MBS node is configured not support PTM is more likely due to no enough UEs to use the MBS service under its coverage. Therefore, the need of group notification in such a scenario is moot given the complexity involved. |
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# 5 Conclusion

**TO BE UPDATED**