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

[R2-2102838](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2102838.zip) Discussion on SA2 LS and multicast session activation Intel Corporation discussion Rel-17 NR\_MBS-Core

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.

|  |  |  |
| --- | --- | --- |
| Company | Name | Email Address |
| Nokia (Rapporteur) | Jarkko Koskela | Jarkko.t.koskela@nokia.com |
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| CATT | Rui Zhou | zhourui@catt.cn |
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| Futurewei | Jialin Zou | Jialinzou88@yahoo.com |
| BT | Salva Diaz |  salva.diazsendra@bt.com |
| OPPO | Shukun Wang | wangshukun@oppo.com |
| Intel | Ziyi Li | Ziyi.li@intel.com |
| Sony | Vivek Sharma | Vivek.sharma@sony.com |
| Apple | Fangli XU | fangli\_xu@apple.com |
| LGE | SangWon Kim | sangwon7.kim@lge.com |
| Sharp | Fangying Xiao | Fangying.xiao@cn.sharp-world.com |
| ITRI | Lin, Jung Mao | moumou3@itri.org.tw |
| vivo | Yitao Mo (Stephen) | yitao.mo@vivo.com |
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| Samsung | Vinay Shrivastava | shrivastava@samsung.com |
| Xiaomi | Yumin Wu | wuyumin@xiaomi.com |
| TD Tech, Chengdu TD Tech | Limei WEI | limei.wei@td-tech.com |
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# 3 Group Session Activation for delivery mode 1 (multicast)

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. |
| BT | Yes | Agree with observation 1 |
| OPPO | Yes  |  |
| Intel | Yes | For services in delivery mode 1, the legacy unicast paging can only support sending paging messages (with multicast session activation) to a max number of 32 in one paging occasion. The rest of UEs within the same paging occasion, who are interested in the same multicast service, need to wait for the next PO for the multicast session activation reception, which may lead to delay or packet loss for those UEs.As observed in SA2 LS that “for broadcast, only session start/stop are applicable.” The session activation notification is not applicable for broadcast services. In this case, we do not need to consider session activation for broadcast services in DM2. Moreover, as we agreed in last MBS session, we may revisit multicast support for RRC Inactive if time allows or solutions has become more mature. In this scenario, UEs may not need to be paged, other group notification mechanism can be considered.  |
| Sony | Yes |  |
| Apple | Yes |  |
| LGE | Yes | Agree with the observation and support the group paging based on the MBS session ID. |
| Sharp | Yes | Considering the paging message is used to notify a group of UEs about the activation of the session, group notification is a straightforward way. In addition, as said by other companies, group paging can reduce signalling overhead than unicast paging. |
| ITRI | Yes | Agree with the observation 1. |
| vivo | Yes | There might be an increase of paging false if using unicast paging at the MBS supporting node.  |
| Spreadtrum | Yes | Unicast paging method will increase the signalling overhead in wide area where the MBS service is provided.The legacy UEs may be impacted when the paging message is full due to the group notification. |
| ZTE | Yes |  |
| Samsung | Yes | We share same view that unicast paging is quite in-efficient way to address UEs belonging to multicast group and there is a need for efficient approach with group notification. |
| Xiaomi | Yes |  |
| TD Tech, Chengdu TD Tech | See our comments  | If no enough resource can be used for a multicast session upon the activation of the multicast session from CN or no enough resource can be used during the multicast session delivery with DM1, we suggest the following method is used instead of introducing the group paging notification on the new control channel.1. DM2 is applied to the mutlcast session for the above scenarios.
2. UE stays in RRC\_INACTIVE/RRC\_IDLE to receive the multicast session with DM2.
3. gNB ensures that no BWP switch is needed for UE. UE can receive the multicast session and the SI/Paging information on the intial BWP without the BWP switch.
4. For each multicast session with DM2, each UE receiving the multicast session needs to monitor MCCH for the updated PTM bearer configuration information and the notification of re-entering into RRC\_CONNECTEED state.

In detail, for each multicast sessin with DM2, a new IE named PagingIndicator is used to send the notification of re-entering into RRC\_CONNECTEED state to a group of UEs. This IE is within the PTM bearer configuration information of the multicast session with DM2. If PagingIndicator=TRUE, UE receiving the multicast session needs to enter into RRC\_CONNECTED state to receive the session with DM1. If PagingIndicator=False, UE receiving the multicast session stays in the current state to receive the session with DM2.UE monitors MCCH to obtain the updated PTM bearer configuration information and re-enter into RRC\_CONNECTED state if the IE “PagingIndicator” =TRUE.We have the following concerns on the group paging method.Before the NG-RAN becomes into the heavy load state, UE receives the multicast session with DM1 using the PTM bearer and the PTP bearer configured on the active unicast BWP of UE.When the NG-RAN becomes into the heavy load state, if the original PTM bearer is continuously used, maybe UE can’t receive the multicast session and the SI/paging on the initial BWP without the BWP switch. Because the original active BWP of UE may be not contain the intial BWP.If a new PTM bearer is configured to make UE receive the multicast session and the SI/Paging on the intial BWP without BWP switch, what is the differences between such configuration and DM2?Based on the above discussion, we think two options can be used to solve the problem of how to provide the multicast session under the network heavy load state. We hope two options can be discussed at the same time to make the solution can be derived more quickly.Option 1: Use the PTM bearer to provide the multicast session with UE into RRC\_INACTIVE state from RRC\_CONNECTED state FFS: how to avoid the BWP switch for UE in RRC\_INACTIVE state? FFS: how to update the PTM bearer? or not support the PTM bearer update?When the network heavy load state dispears, use the group paging to make UE re-enter into RRC\_CONNCECTED state, with the group paging on a new control channel. Option 2: DM2 is directly used to provide the multicast session in the network heavy load state and MCCH is used to send the notification of re-entering into RRC\_CONNECTED state to a group of UEs for each multicast session with DM2.With option 2, the following benefits can be obtained.1. The PTM bearer can be updated with the updated PTM bearer configuration intormation sent to UE on MCCH.
2. MCCH is used to send the notification of re-entering into RRC\_CONNECTED state to a group of UEs. The notification is just indicated with a new IE “PagingIndicator” for each multicast sessin with DM2 on MCCH.

No extra RNTI and no extra RNTI monitoring is needed. |
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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. |
| BT  | Not sure | As pointed by Nokia and CATT, there are services that require shorter delays and keep UEs in RRC\_CONNECTED is not efficient. |
| OPPO | No  |  |
| Intel | No | Considering power consumption at UE side, we think same PO (paging DRX) can be shared between unicast and multicast. That is, UE will only be configured with one paging DRX and monitor the same paging occasion (i.e. multicast reuse unicast PO) accordingly. Hence, there’s no need for a shorter latency for multicast services. |
| Sony | No |  |
| Apple | No | The notification should not introduce additional UE power consumption in IDLE/INACTIVE state. Therefore, the notification latency should not be shorter than legacy paging latency. For the MBS service with short latency requirement, NW can select to keep UE in CONNECTED mode.  |
| LGE | No | No reason to have shorter latency than unicast. |
| Sharp | No |  |
| ITRI | No |  |
| vivo | No | Agree with Nokia and Ericsson. |
| Spreadtrum | No | It seems no reason to introduce shorter latency than unicast. |
| ZTE | No | Multicast needs no special treatment. |
| Samsung | No | We think notification is for multicast session activation which is catering UEs in Idle/Inactive state, so it does not seem there is need for shorter latency than regular unicast paging. |
| Xiaomi | Not sure | This may depends on the service latency requirements and the traffic pattern (e.g. periodicity). |
| TD Tech, Chengdu TD Tech | Maybe | If the uicast service has the same service types as an MBS session, there‘s no need to configure a smaller paging period. Because the usual paging is used for all unicast service types. If an MBS session can have the different service types than the unicast service, maybe a smaller paging period than 32 radio frames needs to be introduced for a delay sensitive MBS service type.Based on the current paging, the paging period can be configured per UE.If the group paging is used, the group paging period can be configured per MBS session (or per MBS service type, if the different group paging periods for the different MBS service types are taken, indicate to UEs the group paging period used by each MBS session.) |
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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. |
| BT | Yes | PRACH congestion |
| Xiaomi | Yes | Due to the limited size of paging message, includomg the MBS service activation indication in unicast paging message may cause unicast paging congestion. |
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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. |
| BT | Depends | The answer depens on the meaning of special effort. In any case, the total effort is subject to the final solution: MCCH or PCCH. |
| OPPO | No  |  |
| Intel | No | Using the same PO as unicast, although not all UEs interested in one MBS session can receive the activation notification at the same time, it still allows all UEs within the same PO to go to RRC\_CONNECTED if TMGI indicated as paging UE identity is their interested MBS session. The activation notification can be repeated in other POs which contains interested UE as well. Compared with legacy unicast paging, it does not have the limitation of UE number to be informed within the same paging occasion. This helps to reduce the latency of notification in certain degree.It is hard to define a common group notification occasion collocated with unicast paging occasion for all UEs, as interested UEs may vary in different POs. It seems the only possible way to achieve this common group notification occasion is to define a separate paging occasion for multicast. However, as discussed in Q3.2, UE power consumption is increased by monitoring two POs, which is not desirable. |
| Sony | No | It is good for UE power consumption to align the POs but understand it may not always be possible. Ran2 should not spend any effort ensuring overlapping POs in our opinion. |
| Apple | No | From UE power saving perspective, it’s better that UE keep the legacy PO to monitor and receive both the unicast and multicast paging.  |
| LGE |  | UE should not be required to monitor the additional paging occasion to receive the group paging. UE monitors its original PO only and the network should guarantee that the paging record indicating the MBS session is included in the paging message. If additional monitoring is required for UE, it would be better to use legacy unicast paging. |
| Sharp | No | Agree with CATT that MCCH is much easier than design a new group paging mechanism. |
| ITRI | No | We share the same views as CATT that using MCCH is an easier solution for the group notification purpose. |
| vivo | No | In the existing NR, monitoring/decoding multiple PDCCH occasions for DL scheduling within one slot are already supported with optional capability. In this sense, we see no need to strictly avoid overlapping between unicast and group notification in the time domain.  |
| Spreadtrum | No | Agree with CATT that MCCH is much easier than design a new group paging mechanism for the group notifcation. |
| ZTE | No | No strong view of PCCH or MCCH, since neither brings much spec impacts. However we have one concern that for RAN nodes/cell which does not have MCCH (e.g., no Broadcast service being delivered) transmission, do we still need to have MCCH for Multicast session activation notification in that cell? From this perspective, PCCH might be a better choice as long as the impacts to legacy system are minimized, power consumption might be one of the greatest concern. |
| Samsung | No | In our understanding, there seems a possibility for some UEs to have simultaneous occurrence of group paging and unicast paging and some efforts or design is needed to address that. Contrary to that, utilising MCCH based approach for group notification naturally resolves this and there is no additional design and specification effort as it is existing approach for DM2. Further, MCCH approach is proven in legacy LTE MBMS (though for broadcast scenarios), we do not expect heavy efforts, unlike addressing any potential new issues with group paging. |
| Xiaomi | No | Different UE would have different POs for unicast paging. Aligning the paging for unicast and multicast should be up to the gNB implememtation in a way of best effort. |
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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. |
| BT | Maybe not | In principle, we agree with Nokia and Huawei. |
| OPPO | No  |  |
| Intel | No | For RRC\_CONNECTED UEs (delivery mode 1), *RRCReconfiguration* message, which may also contain MBS configurations, can be treated as the multicast session activation notification.  |
| Sony | No |  |
| Apple | No | For CONNECTED UE, NW can directly rely on the RRC reconfiguration to configure or release the MBS configuration according to the MBS session activation/deactivation state.  |
| LGE | No |  |
| Sharp | Maybe No | As commented by Huawei, as SA2 has agreed session start is no more used for multicast, if we consider session activation as session start, based on the previous agreement UE in RRC\_Connected does not need to monitor group notification channel.  |
| ITRI | depends | We share the same views as CATT that this may depend on whether the MCCH is chosen for group notification channel. If MCCH is chosen to be the group notification channel, the answer will be yes. |
| vivo | No | For CONNECTED UE in delivery mode 1, no explicit notification is needed. The RRC reconfiguration with MBS multicast resource modification can be considered as a kind of implicit notification. |
| Spreadtrum | Maybe | Dedicated RRC signaling is not efficient. |
| ZTE | It depends | It depends on the design of SA2/RAN3 on N2 signaling.- whether a configured but not activated Multicast session has its context in RAN node where a RRC\_CONNCETED UE camps on.If no, then UE shall monitor such group paging once it has successfully applied the Multicast session in NAS layer even it is in RRC\_CONNECTED.Let us confirm to SA2 that group paging is beneficial first, and we wait for SA2/RAN3 normative work to be finalized. |
| Samsung | depends | If group notification is based on MCCH, then there is a potentially efficient approach available for group notification in RRC\_CONNECTED state as compared to dedicated signalling. |
| Xiaomi | Depends | If the MBS service activation is activated after the configuration of the MBS service, the CONNECTED UE may also need to monitor the indication. |

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. |
| BT | Yes | This situation happens with very large groups. Although we agree with Ericsson’s scenario, we’re not sure that very large groups can remain in connected mode all the time. Therefore, we consider RAN2 needs to work on this. |
| OPPO | Maybe  | For MO access and MT access, the case that many ue start initial access at almost same time is existing and it can not be avioded. |
| Intel | No | We think current RACH overload control using backoff timer can be used to resolve the contention caused by many UEs.  |
| Sony | No | We think existing mechanism should be sufficient for the first release. |
| Apple | Maybe | It depdends on how many UEs who join in one MBS session will be released into INACTIVE or IDLE.  |
| LGE | No |  |
| Sharp | Maybe | We share CATT’s view. |
| ITRI | No |  |
| vivo | Yes | The PRACH capacity issue is essential in some cases, such as the live concert. |
| Spreadtrum | Maybe |  It depends on the number of UEs which will change RRC state at the same time which could be influenced by the specific group notification method. |
| ZTE | No | Agree with Sony that existing mechanism should be sufficient for the first release. |
| Samsung | Maybe | In some situation, when many UEs are notified together, there may be PRACH congestion issue. We think network can be aware and accordingly, can determine when it is needed and can provide some indication on the access timings along with group notification e.g. indicating need for random delay to UEs.In our view, it is inefficient to keep very large deactivated groups in connected mode. |
| Xiaomi | Yes |  |

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.  |
| OPPO | Group ID ,Group PO, group searchspace, MBS P-RNTI…. | Group ID is agreed in SA2, it should be discussed again in RAN2.For others, we think RAN2 should disucss. |
| ZTE | Group paging ID | Group paging ID will be of stage 3 design from both RAN2 and SA2, e.g., RAN2 has to consider the IE length, i.e., paging capacity issues, UE RRC states. RAN2 might need to consider this issue further rather than simply following SA2 suggestion that the group paging ID shall be MBS session ID.Even SA2 has not nailed down what the MBS session ID is yet:- MBS Session ID may have the following types: TMGI (MBS broadcast and multicast Session), source specific IP multicast address (MBS multicast Session). (23757-H00) |
| Samsung | Robustness and power efficiency | RAN2 should also discuss and address certain scenarios, where Idle/Inactive UEs may miss group notification (e.g. due to temporary coverage loss or other reasons). Further, power efficiency is important aspect for group notification design and RAN2 should discuss. |
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Based on input we would welcome comments on following question on SA2 agreement (indicated in the LS) that MBS session ID is the group identifier.

**Question 3.8**: Do you agree with SA2 agreement to use MBS session Id as group identifier in the group notification (for MBS supporting node case)?

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| Answers to Question 3.8 |
| Company | Yes/No | Details of the topic |
| Nokia | Yes | We see no reason to revert SA2 decision. Regarding non supporting node please see response in the next section. |
| OPPO | Yes  |  |
| Intel | Yes |  |
| Ericsson | No | There is the same problem with unicast paging on supporting and non-supporting nodes, i.e. we cannot use unicast paging for non-supporting nodes. We need to have a scalable solution for non-supporting nodes and a "group" 5G S-TMSI solves that problem. An MBS Session ID is not transparent to a non-supporting gNB, i.e. cannot be used. Please also have a look at our response on question 4.1, i.e. there seems to be some mis-understanding about the use of this "group" 5G S-TMSI. This "group" 5G S-TMSI is allocated to the UE during the NAS join procedure. Also note that simultaneous monitoring of "group" PO and unicast PO during a DRX is exactly the same whether the MBS Session ID or group 5G S-TMSI in the paging identify is used.  |
| Apple | Yes |  |
| LGE | Yes |  |
| CATT | Yes | We should follow the SA2 decision. |
| vivo | Yes | We can consider the SA2 agreement for further design. |
| Spreadtrum | Yes |  |
| ZTE | No | See Q3.7. By the way, what Ericsson suggests seems a good idea. It brings the benefit of group paging to non supporting RAN nodes. Simple solution but quite useful.As what we have suggested in Q3.7, the idea of simply using the MBS session ID as the group paging ID needs refinements. |
| Samsung | Yes |  |
| Xiaomi | Yes |  |
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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. |
| BT | Postpone | This discussion can take place once MBS nodes are concluded. |
| OPPO | No  |  |
| Intel | No | For a non-MBS supporting RAN node, individual traffic delivery mode is used and NG-RAN will not create MBS session. Under this scenario, MBS session ID (i.e. TMGI) is not visible to RAN. Thus, RAN cannot group paging UEs with MBS session ID. 5GC is required to fallback to regular paging for those UEs that have not connected during MBS session activation. |
| Sony | No | In non-MBS node, legacy mechanism should apply for notification as MBS delivery will be via legacy mechanisms. Agree with Intel that 5GC will be aware as UE shall be in RRC\_Connected to receive multicast. |
| Apple | No | In the non-MBS cell, UE just monitor the unicast PO for the unicast paging as legacy. Therefore, the notification should rely on the legacy mechanism.  |
| LGE | No | It woule be reasonable to assume that if a RAN node doesn’t support the MBS, it doesn’t support the group paging also. The unicast paging can be used, if needed. |
| CATT | No | For non-MBS node,it should not be required to support any MBS related feature,so we may do not need to discuss this topic in RAN2. |
| ITRI | No | The UE’s behaviour should be the same as legacy when it camps on a non-MBS supporting RAN node. Therefore, we think that 5GC should use regular paging for this notification. |
| vivo | No | From the UE perspective, it is unacceptable to monitor multiple POs based on multiple 5G-S-TMSIs for multicast sessions and UE ID 5G-STMSI, which causes huge power consumption in IDLE/INACTIVE. |
| Spreadtrum | No |  |
| ZTE | Maybe or even yes. | Simple but useful. Or elegant we can say: we just implement it in UE and 5GC, and skip RAN (especially legacy RAN), what an end-to-end solution!Worth considering in RAN2/SA2. SA2 might need to think twice about the so called MBS Session ID. |
| Samsung | No | We think there will be a lot of impact of introducing Group 5G-S-TMSI to CT1, SA2 and RAN3. Moreover, unicast 5G-S-TMSI is temporary identifier and is subject to frequent reasignment due to security concerns and PO/PF computation is linked to this. We concern how these aspects will be addressed for group 5G-S-TMSI. In case non MBS node is supported, legacy paging approach should be used. |
| Xiaomi | No |  |

# 5 Conclusion

**TO BE UPDATED**