3GPP TSG-RAN WG2 Meeting #116 electronic R2-XXXXXXX  
Online, January 17 – January 25, 2021

**Agenda Item: 8.1.3.1**

**Source: CMCC**

**Title:** **Report of [AT116bis-e][021][MBS] MBS Interest Indication Open Issues(CMCC)**

**Document for: Discussion**

# Introduction

This document aims for gathering and summarizing companies’ views for the following offline discussion:

* [AT116bis-e][021][MBS] MBS Interest Indication Open Issues (CMCC)

Scope: Address green-marked Open issues related to MII in R2-2200022, and related tdoc input. Address MII indication handling at handover. Collect comments, identify easy agreements and discussion points.

Intended outcome: Report

Comment deadline: Wednesday W1, 1200 UTC (for collecting views)

Deadline: For CB on-line Thursday W1.

Contact table

|  |  |
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# Discussion

**Open issue 1: MII reporting message**

As in present Rel-17 MBS RRC running CR, whether the MII is reported via *UEAssistanceInformation* or a new RRC message and whether MII information is using a separate IE or included directly in the RRC message structure is FFS. The contributions [1][4][5][7] suggested a new RRC message for MII reporting considering the flexibility and extendibility, also the trigger condition difference between MII reporting and *UEAssistanceInformation* reporting, while in contributions [6][8], *UEAssistanceInformation* was proposed. In [10], it arises the question whether the UE should provide an MBMS interest indication as part of the on-demand SI request procedure to acquire an MBS SIB in order to reduce latency, i.e., requesting MBS SIB is an indication of MBS interest from the UE.

**Q1: Which message is used for MII reporting?**

**Option1: A new RRC message**

**Option2: *UEAssistanceInformation***

**Option3: Consider DedicatedSIBRequest of MBS-related SIBs as an MBS interest indication**

|  |  |  |
| --- | --- | --- |
| Company | Which option do you prefer | comments |
| OPPO | Option 2 | Option 2 should be baseline for both RRC\_IDLE and RRC\_INACTIVE mode UE.  For RRC\_INACTIVE mode UE, it should be discussed further because the MSG4(RRCResume) can configure dedicated BWP and it is too late to report MII in UAI. |
| TD Tech, Chengdu TD Tech | Option 1 | Option 1 can make the MII reporting is independent from other procedures. We have no need to think the impact of the MII reporting on the existing procedures or messages. |
| vivo | Option 1 | For Option 1 and Option 2, basically, we think just a modeling issue, and either way is feasible. But, to save CR drafting time and standard efforts, we prefer to reuse the LTE SC-PTM mechanism (i.e. Option 1) for NR MBS (e.g. the message structure/content and the triggering conditions can be directly reused).  For Option 3, we may need to discuss the new triggering condition when SIBx is already being broadcasted. What’s worse, the detailed interesting info cannot be reported, compared with Option 1/2. |
| Huawei | Option 2 | We think it is simpler to reuse an existing message. The UE Assistance Information procedure is used already by the RRC CONNECTED UE to inform the network about various events/conditions at the UE or some configuration preferences. The NR MBS services which UEs are receiving/ interested in can be regarded as UE configuration preference and hence UE Assistance Information message fits well the purpose of MII. |
| Sony | Option 1/3 | We think new message is a clean solution.  MBS SIB request can be interpreted by the network as an interest indication and network may refrain the UE from sending further details in MII |
| CATT | **Option1** | It is flexible to use a new message from triggering and content perspective, and it should not be a big effort to define a new message. |
| Samsung | Option 1 | A new RRC message (MbsInterestIndication) is more suitable for MII reporting from triggering and reporting perspective, alike LTE eMBMS/SC-PTM. |
| Lenovo, Motorola Mobility | Option 1 | Both option 1 and option 2 can work, but a new message is more clean. |
| Ericsson | Option 1 | We prefer a new message as this would be straightforward and make the addition independent from existing signaling and triggers. |
| Qualcomm | Option 1 | We also prefer new message which is flexible and use trigger for this message are different from UE Asssistance Information. |

**Open issue 2: Triggers and contents of MII**

Previous agreements in RAN2#116-e meeting:

* Confirm that the UE may initiate MII procedure upon successful connection establishment, upon entering or leaving the broadcast service area, upon MBS broadcast session start or stop, upon change of interest, upon change of priority between MBS broadcast reception and unicast reception, upon change to a PCell broadcasting SIBx1. FFS other triggers. FFS network control.

Some contributions [5][7] identified the different cases for MBS interest indication reporting as following:

**Case1: UE completely loses the interest in MBS services**

**Case2: UE’s interest changes due to change of configuration for serving cells**

**Case3:** **A change in the order of interest in MBS services**

**Case4: BWP switching**

**Q2.1: Do you agree that some other triggers are needed for MBS interest indication? If yes, please provide your view on different cases.**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments on different cases |
| OPPO | No | I am not sure whether the BWP switching can impact the MII reporting. I think the broadcast MBS is only provided in initial BWP and network will endure the broadcast reception when performing the BWP switching. So the MII is per cell reporting not per BWP. |
| TD Tech, Chengdu TD Tech |  | **Case1: We think this case is included in “**upon change of interest”  **Case2: We think this case is included in “**upon change of interest”  **Case3: this case can be included in “**upon change of interest” with “upon change of interest” explained as upon change of interest content or MII content”, where a change in the order of interest in MBS services means the change of interest content or MII content.  **Case4: If BWP switching doesn’t lead to the change of interest content, UE has no need to report MII.**  **We suggest the triggers for MII can be summarized as below.**   * upon successful connection establishment, upon entering or leaving the broadcast service area, upon MBS broadcast session start or stop, upon change of MII content |
| vivo | No | In our understanding, the legacy LTE triggers mentioned in the current agreement can also cover Case 1/2/3. For Case 4, we think the NW should anyway guarantee the service continuity with proper CFR configuration (to its best effort). In this sense, we don’t think this is necessary. Moreover, we fail to see any new essential triggers. |
| Huawei, HiSilicon | No | Cases 1, 2 and 3 are already covered by the description. For case 4, it is unclear why the change of UE’s BWP would lead to change in the services the UE is interested in. |
| Sony | Yes | We think Case 4 for BWP switching should be considered. |
| CATT | No | We believe case 1~3 have already been covered by the existing agreement. And case 4 is a separate issue(i.e. open issue 3 below in this document). |
| Samsung | No (Case 3)  Yes (Case 4) | Case 3: If MBS services are sorted in order of interest in MII, then any change in order of interest may cause a new trigger. However, we would prefer to have same behaviour as in SC-PTM with no sorting of MBS services in order of interest in MII. If so, no triggering of MII will happen.  Case 4: If BWP switching hinders the broadcast reception or if active BWP is not configured with common search space for MCCH, UE should be allowed to inform NW. Though we consider support for broadcast from NW perspective as the best effort basis only. |
| Lenovo, Motorola Mobility | No | We also think case 1,2, and 3 have already been covered by the existing BL CR.  It is not clear whether case 4 is valid or not. |
| Ericsson | No |  |
| Qualcomm | Yes : Case 4 only | Due to BWP switching, if UE is unable to receive broadcast MBS, UE can trigger MII. |

In [9], it lists the two options of network control on MII reporting:

**Option 1: MII reporting is enabled/disabled just by the presence of SIBx implicitly;**

**Option 2: whether MII reporting is enabled/disabled by explicitly indication from gNB.**

**Q2.2: Which Option do you prefer？**

|  |  |  |
| --- | --- | --- |
| Company | Which option do you prefer | Comments |
| OPPO | Option 1 | It is same as LTE. |
| TD Tech, Chengdu TD Tech |  | We think UE supporting MBS shall have the capability of reporting MII to gNB. But only RRC\_CONNECTED UE needs to report MII if the MII reporting is triggered.  We suggest that MII reporting can’t be disabled by gNB for the cell providing MBS session.  Furthermore, we think the MII reporting has no necessary relationship with SIBx1. Even if SIB x1 is absent, the RRC\_CONNECTED UE can report the MII according to the MBS session information on MCCH. |
| vivo | Option 1 | Option 1 is simple and feasible. |
| Huawei, HiSilicon | Option 1 | We think implicit indication via SIBx1 presence is sufficient. Even if an explicit indicator is used, SIBX1 has to be broadcasted anyway considering that the UE is only allowed to indicate the frequency that is broadcasted in SIBX1 via MII. |
| Sony | Option 2 | Option 2 is needed if network allows two step MII reporting i.e. first step and generic based on DedicatedSIBrequest and second detailed one based on MII |
| CATT | Option 2 | It is beneficial to enable gNB to control the MII reporting. |
| Samsung |  | Existing procedure suffice as there is already a check for having a valid version of SIBx1 for the PCell. No new optimization on MII control is needed. |
| Lenovo, Motorola Mobility | Option 1 | Option 1 seems sufficient. Not sure why an explicit indication is needed and the benefits. |
| Ericsson | Option 1 | Presence o SIBx should be sufficient. |
| Qualcomm | Option 1 | As in LTE MBMS |

Besides, there’s an FFS on the precondition of MII reporting in the running CR that ***It should be confirmed whether the UE should include mbs-Services in MII only in case SIBx is scheduled by the UE’s PCell,*** which was discussed in contributions [1][5][7].

**Q2.3: Does UE only include mbs-Services in MII only in case SIBx is scheduled by the UE’s PCell?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| OPPO |  | No strong opinion. |
| TD Tech, Chengdu TD Tech | No | Even if SIB x is absent, UE can report the MII according to the session information on MCCH. |
| vivo | Comments | In our understanding, it is still possible that an MBS-capable UE receives MBS services on Scell and/or non-serving cell based on its own UE capability. Hence, currently, the limitation on reported mbs-Services in MII should be as less as possible, which is good for gNB operation/scheduling. |
| Huawei, HiSilicon | Yes | Only when the PCell provides MBS service, the UE shall report the MII to inform the network that the UE is receiving or is interested to receive MBMS service(s).  We can clarify that “SIBx is scheduled” is intended to mean that SIBx is available, but can be in not broadcasting “mode”. |
| Sony | Yes |  |
| CATT | Yes | Since mbs-Services is used for service continuity, there is no need to report if there is no broadcast services provided(i.e. SIBx is not scheduled) as gNB cannot understand it. |
| Samsung | See comments | As per last meeting agreement, *from RAN2 point of view, the connected UE may if supported receive MBS broadcast service from non-serving cell in intra-PLMN case, under the condition this does not have any impact to operation on serving cell(s)*. However, as the UE includes the *mbs-services* in the MBS interest indication only if PCell broadcasts or schedules the SIBx, it seems network will not be aware about UE’s reception of MBS broadcast services from non-serving cell. The question arises as to how no impact of MBS broadcast service reception from non-serving cell to the operation on serving cell(s) is achieved. RAN2 should discuss this case further. |
| Lenovo, Motorola Mobility |  | Not sure. We may need to wait for the discussion on if UE can receives MBS service in SCell. |
| Ericsson | Yes | This is logical if a sevice is not indicated (SIBx) |
| Qualcomm | Yes |  |

Previous agreements on MII content in RAN2#116-e meeting:

* During MII, the UE should only report the set of MBS frequencies of interest the UE is capable to simultaneously receive, i.e. the UE supports at least one band combination allowing it to receive the indicated set of frequencies.

In contribution [7], it was suggested that, except for MBS frequencies of interest, UE could report additional information like CFR or Cell ID of interest.

**Q2.4: Do you agree that additional information could be reported in MBS interest indication?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| OPPO | No |  |
| TD Tech, Chengdu TD Tech |  | The scenarios for reporting the additional information shall be studied further. |
| vivo | No | From gNB perspective, mbs-service and frequency in MII can be used to derive information about CFR and cell ID. |
| Huawei, HiSilicon | No | The gNB can deduce proper configuration based on the reported frequencies and services. Additional information does not seem useful. |
| Sony | Yes | CFR report |
| CATT | No | The current agreed information of MII is already sufficient. |
| Samsung | No | No explicit CFR or cell id information is needed. |
| Lenovo, Motorola Mobility | No |  |
| Ericsson | No |  |
| Qualcomm | No |  |

**Open issue 3: Optimization for BWP Switching**

An illustration of CFR and BWP is shown in the following figure.



Figure 1: Configured BWP for CFR Case E [11]

In [9], it mentioned that in case E, the broadcast CFR of case E is different than initial BWP. Besides, a CFR should be within a BWP, according to the CFR definition in RAN1 MBS CR. And in contribution [2][3][6][7][9], it suggested that UE should provide interest to receive broadcast service(s) prior it is possible to reconfigure BWP for the UE to avoid service interruption in case of the dedicated BWP is different or cannot comply with the broadcast CFR.

On the other hand, in [1][4][5], it was proposed no optimization needed for BWP switching, MII could only be reported after security activation.

**Q3.1: Could MBS interest indication be reported before dedicated BWP configuration?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| OPPO | Yes |  |
| TD Tech, Chengdu TD Tech | Yes | It’s better to report the MII before a dedicated DL BWP is configured if UE is receiving at least one broadcast session. |
| vivo | No | According to SA3 LS, MII should not be reported unless security activation has been done. Thus, we think no reporting should be performed as SA3 suggestions. Take one step back, it can be left to gNB implementation or UE implementation to guarantee the broadcast service continuity during the time gap between MII reporting and BWP reconfiguration (no specification effort). |
| Huawei, HiSilicon | Yes | The question is a bit confusing. We think a full-blown MII should only be reported after security activation, so cannot be used to handle the described scenario. However, we think it is useful for the UE to provide an early indication of its interest to receive MBS broadcast with a single bit in msg5 to ensure the network provides a dedicated BWP configuration which covers broadcast CFR. This allows to prevent subsequent RRC Reconfiguration and service interruption time for the UE.  This issue exists irrespective of supported CFR cases. |
| Sony | No | We are ok for rel-17 to report after security activation |
| CATT | Yes | It is beneficial to avoid the service interruption caused by BWP switching |
| Samsung | No | Rather than MII, an indication for broadcast service reception by an MBS establishment cause / MBS resume cause seem useful for NW to suitably configure the BWP for the UE transiting to Connected |
| Lenovo, Motorola Mobility | Yes | It’s better to report the MII as early as possible to solve the following issues:  Issue 1: the dedicated BWP is possibly configured in RRCSetup message that will cause broadcast service interruption until the network reconfigures the dedicated BWP.  Issue 2: when performs RRC Reconfiguration procedure, the network does not know whether MII is expected or not which may cause extra signaling and larger broadcast service interruptio |
| Ericsson | No | We do not think the scanrio is unique in introducing possible short interruptions as many other transition may lead to this and think this will anyway be handled by UE/NW implementation |
| Qualcomm |  | As per SA3, MII can be sent only after security activation. If UE provides one bit indication in Msg 5 or Msg 3, without indicating which TMGI, how does NW know which service is beining monitored by UE ? If NW provides dedicated BWP in RRCSetup message then what is benefit of providing one bit indication in Msg 5 ?  We are not sure how this can resolve dedicated BWP configuration issue ? |

Contribution [2][6] proposed to use one-bit indication in msg3/msgA to the UE is receiving or interested in broadcast service or to indicate MII is required to be reported, and in contribution [7], msg5 was also mentioned for the similar purpose, which could convey more information like CFR or Cell ID of interest without size limitation.

**Q3.2: If the answer of Q3.1is Yes, which option do you prefer for early indication of MBS interest?**

**Option 1: One-bit indication in msg3/msgA**

**Option 2: Early indication in Msg5 together with other information like CFR or Cell ID of interest**

**Option 3: One-bit indication in msg5**

**Option 4: MBS Establishment cause and MBS Resume cause**

|  |  |  |
| --- | --- | --- |
| Company | Which option do you prefer? | Comments |
| OPPO | Option 1 | For RRC\_INACTIVE mode UE, the MSG4(RRCResume) can configure the dedicated BWP. MSG3/MSGA can be used to indicate one bit and the detailed MII can be reported in dedicated RRC signalling, e.g. UAI. |
| TD Tech, Chengdu TD Tech | Option 1 | Msg 3 is better if needed. |
| Huawei, HiSiIicon | Option 3 | We do not think information like CFR or cell ID is needed, but we also do not think msg3/msgA should be used as it has very limited size. Therefore one-bit indication in msg5 is preferred. |
| CATT | Option 1 | Agree with OPPO, indication in MSG3 is better as a dedicated BWP may be configured in MSG4 |
| Samsung | Option 4 | UE establishing or resuming a RRC connection can indicate to network a MBS establishment cause or a MBS Resume casue to indicate early indication of MBS interest and avail suitable BWP configuration. |
| Lenovo, Motorola Mobility | Option 1/3 | Both Option 1&3 are acceptatble, but Option 1 is preferred since the dedicated BWP can be configured in msg 4. |

**Open issue 4: MBS interest information in handover**

The contribution [5] have proposed that MBS Interest Indication information for broadcast services conveyed by UE is not exchanged between source gNB and target gNB, considering that broadcast service could be serviced as best-effort, and no special effort is needed to ensure broadcast service continuity, while in contribution [6], it was suggested that The MBS interesting indication is forwarded to target gNB during handover if received, since may be taken into account when configure the dedicated BWP by the target gNB.

**Q4: Whether MBS Interest Indication information is exchanged between source gNB and target gNB?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| OPPO | Yes | In LTE, mbmsInterestIndication is forwarded from source eNB to target eNB during handover. It is reasonable to let target gNB know the ongoing MBS of UE, then the target gNB will take it into account when configure the dedicated BWP and choose next target gNB in next handover. |
| TD Tech, Chengdu TD Tech | Yes |  |
| vivo | Yes | MII from source gNB to target gNB will be beneficial for better configuration decisions in the target. |
| Huawei, HiSiIicon | Yes | MII should be included in inter-node message HandoverPreparationInformation, similarly as in LTE. In case MII is carried by UE Assistance Information, then this has no specifications impact as it can already be included in HandoverPreparationInformation message during handover. |
| Sony | No, if MII is only for broadcast |  |
| CATT | Yes | It is helpful to avoid MII reporting from UE after handover |
| Samsung | Yes for multicast  No for broadcast | No special efforts are needed for broadcast service continuity |
| Lenovo, Motorola Mobility | Yes | Same with LTE. |
| Ericsson | No | Since this is for BC, this is not needed. |
| Qualcomm | Yes for Broadcast |  |

**Open issues 5: MBS interest indication for RRC\_Idle/Inactive UE**

It was agreed in RAN2#113-e meeting that ***MBS Interest Indication is NOT supported for UEs in idle/inactive mode for NR MBS delivery mode 2***. And based on the agreements of last meeting that ***MBS Interest indication will be sent after security activation*** and ***the UE may initiate MII procedure upon successful connection establishment.*** Based on the agreements, it’s rational for a UE in RRC\_Idle/Inactive to change its state to RRC\_Connected once it wants to report its MBS interests.

**Q5: Dose UE enter RRC\_Connected states from RRC\_Idle/Inactive when it wants to report its MBS interests?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| OPPO | No | For the MBS interesting indication related agreements are not clear. Some companies think the agreements mean that the UEs in idle/inactive mode can report MBS interesting indication. However, the correct understanding is that the report of MBS interesting indication is not used for UEs in idle/inactive mode. If the MBS interesting indication reporting for connected mode UEs, it does not matter MBS interesting indication is reported in which RRC state/mode. |
| TD Tech, Chengdu TD Tech | No | So far only one CFR is configured for broadcast sessions.  Why does UE in RRC\_IDLE/RRC\_INACTIVE need to report the MII to gNB? |
| vivo | No | Based on the agreements mentioned above, we think there is no use case where MII reporting has to trigger an RRC state change. |
| Huawei, HiSiIicon | No | UEs in RRC IDLE/INACTIVE follow frequency prioritization rules to be able to receive the service of interest. There is no need for MII in this case. |
| Sony | No | We think there should be no state transition for sending MII |
| CATT | No | MII reporting should not be the reason to enter connected mode |
| Samsung | No | It is costly affair when UEs enter Connected state just to report MII, while UEs can already receive broadcast services in Idle/Inactive state. |
| Lenovo, Motorola Mobility | No | Same view with Huawei. |
| Ericsson | No |  |
| Qualcomm | No | Same view as Huawei |

**Open issue 6: MII for multicast session**

In RAN2#115-e meeting, it was agreed that ***The UE reports the following MBS interest information (as LTE SC-PTM): MBS frequency list, priority between the reception of all listed MBMS frequencies and the reception of any unicast bearer, TMGI list***. It is still not decided whether the reported MBS frequency is for broadcast only, or for both broadcast and multicast.

Some contributions [3][4][7][8] see the unclearness of using MBS interest indication in multicast, contributions [3][4][7] have suggested a common design of MII message for multicast and broadcast, and contribution [8] mentioned that MII for multicast session is needed if gNB can’t acquire the multicast interest of UE from core network, which needs further check.

**Q6: Could common design of MII message be used for both broadcast session and multicast session?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| OPPO | No | Multicast is configured by network via dedicated RRC signalling and the network know everything. We do not understand why MII is useful for multicast. |
| TD Tech, Chengdu TD Tech |  | We think the scenarios for reporting MII with multicast session information included shall be further studied. In general, gNB know the multicast sessions received by a UE. |
| vivo | Yes | A common design is preferable since some extra information other than CN indication can be provided in MII, e.g. priority. |
| Huawei, HiSiIicon | No need for MII for multicast | Agree with OPPO. |
| Sony | Yes |  |
| CATT | No | Untill now,we only agreed to support MII for broadcast, not for multicast. |
| Samsung | Yes | Up-to-date multicast interest information, priority between unicast and multicast, multicast frequency information may not be known to the gNB if it is only informed by Core Network about session join |
| Lenovo, Motorola Mobility | No |  |
| Ericsson | No | We should stick to the agreed context for MII and not spend time on possible optimizations. In this case the connected UE and NW already exchange information and we do not see this useful or required. |
| Qualcomm | No | Multicast context is available in RAN, which is received from 5GC. We don’t see strong need of having using MII for Multicast. |

# Summary

# References

1. [R2-2200858](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116bis-e\Docs\R2-2200858.zip) Discussion on MII issues CMCC discussion Rel-17 NR\_MBS-Core
2. [R2-2200759](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116bis-e\Docs\R2-2200759.zip) MII and BWP related configuration Lenovo, Motorola Mobility discussion Rel-17
3. [R2-2200880](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116bis-e\Docs\R2-2200880.zip) Broadcast Service Continuity Nokia, Nokia Shanghai Bell discussion Rel-17 NR\_MBS-Core
4. [R2-2201176](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116bis-e\Docs\R2-2201176.zip) Broadcast service continuity Intel Corporation discussion Rel-17 NR\_MBS-Core
5. [R2-2200398](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116bis-e\Docs\R2-2200398.zip) Broadcast Service Continuity Samsung discussion
6. [R2-2200382](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116bis-e\Docs\R2-2200382.zip) Discussion on MBS interesting indication for delivery mode 2 OPPO discussion Rel-17 NR\_MBS-Core
7. [R2-2201244](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116bis-e\Docs\R2-2201244.zip) Remaining issues of MBS Interest Indication Kyocera discussion Rel-17
8. [R2-2201370](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116bis-e\Docs\R2-2201370.zip) Remaining issues for MII LG Electronics France discussion Rel-17
9. R2-2200234 Open Issues on Broadcast Service Continuity CATT, CBN discussion Rel-17 NR\_MBS-Core
10. R2-2200728 Miscellaneous Aspects of MBS Provisioning Nokia, Nokia Shanghai Bell
11. R2-2201260 Supporting CFR Case E for RRC IDLE and INACTIVE UE vivo