3GPP RAN WG2 Meeting #130 R2-25xxxxx

Malta, Malta May 19th – 23rd, 2023

Agenda Item: 8.8.1

Source: ZTE Corporation, Sanechips

Title: Remaining 304 open issues for NR NTN

Document for: Discussion, Decision

# Introduction

The following document includes a list of open issues according to the following email discussion:

* [Post129bis][307][R19 NR NTN] 38.304 CR (ZTE)

 Scope: discuss the running 38.304 CR

 Intended outcome: Endorsed CR

 Deadline: long

Companies are invited to provide feedback on open issue list by: **1st May 2025 UTC 10:00.**

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# Remaining open issues for specification 38.304

### Open issues relevant to DL CE

**Open issue idle/inactive-1: access control for DL CE**

**Issue description:**

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| **RAN2#129bis Agreements**1.From SSB extension point of view, RAN2 assumes there is no need to introduce new barring bits2.We wait for further progress in RAN1 on link level enhancements before further discussing the possible impacts on access barring |

Above agreements have been reached in RAN2#129bis for access control due to DL CE. The only ffs issue cannot be discussed in RAN2 unless RAN1 achieves more progress on link level enhancements for DL CE. Therefore no contribution on this topic is expected in next meeting.

**Proposed resolution:**

**Can wait until further RAN1 progress, no need for contribution next meeting. Current agreement is sufficient, no proposal is needed.**

**Companies are invited to provide feedback regarding the above open issue and possible proposed resolution:**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree to proposal?** | **Other comments** |
| Apple | Agree |  |
| vivo | Agree | No new bar bit is required for DL CE. |
| Xiaomi | Agree | wait for RAN1 conclusion, if the solution developed by RAN1 is backward compatible, then there is no need to introduce new bar bit. |
| Huawei, HiSilicon | Agree |  |
| Fujitsu | Agree | We can wait for RAN1 conclusion and the SMTC design for backward compatible to make final decision. |
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**Open issue idle/inactive-2: cell reselection enhancements**

**Issue description:**

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| **RAN2#127bis Agreements**1. (also depending on the details of the RAN1 solution) we can further consider methods to allow UEs not supporting DL CE to down-prioritize or prevent re-selection to cells operating with DL CE.
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RAN2 has agreed to consider possible enhancements to allow UEs not supporting DL CE to down-prioritize or prevent re-selection to cells operating with DL CE with the intention that save UE power when UE incapable of DL CE is not able to reselect or perform measurements on neighbor cells with DL CE.

RAN2 has not yet have time to discuss this topic so far. One reason is because the discussion is also relevant to open issue idle/inactive-1, therefore link to RAN1 discussion. The discussion is also relevant to on-going discussion on SMTC enhancements for DL CE, e.g., whether the SMTC enhancements signalling shall be backward compatible for legacy UEs or not. If the answer is not, then enhancements to allow UEs not supporting DL CE to down-prioritize or prevent re-selection to cells operating with DL CE could be beneficial for UE power saving. Considering limited time, no optimization is also one possibility.

Since RAN2 has not properly discussed this topic it is suggested to discuss this based on contribution next meeting. Nevertheless, if any enhancement is pursued, it is expected that the RRC specs will be impacted. To avoid duplicated open issues, **Open issue idle/inactive-2** is only included if it is not included in RRC open issue list.

**Proposed resolution:**

**The issue is discussed as part of open issues for 304 running CR if it is not included in RRC open issue list.**

**Companies are invited to provide feedback regarding the above open issue and possible proposed resolution:**

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| --- | --- | --- |
| **Company** | **Agree to proposal?** | **Other comments** |
| Apple | See comments | Looks good. No matter which open issue list covers it, we think this issue deserves a proper discussion and conclusion. |
| vivo | Comments | This topic can be dfurther discussed based on the inputed contributions. From our perspective, the rationales behind using the NBC-style SMTC configuration, implementing barring for legacy UEs, or making enhancements to the cell-ranking mechanism remain unclear. |
| Xiaomi | comments | we think we can generally say to enhance cell selection and reselection procedure. |
| Huawei, HiSilicon | ok | It can be discussed based on company contribution. |
| Fujitsu | See comments | If we don’t consider prohibiting the legacy UE to access the cell, we may also don’t need to prevent the reselection to such cell.  |
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### Open issues relevant to support of broadcast service

**Open issue idle/inactive-3: MBS service continuity enhancements:**

**Issue description:**

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| **Agreements*** UE may prioritize the frequency(ies) for an interested service when UE can only receive the service on the frequency(ies) and the UE is in intended service area associated with the service provided in the frequency(ies). Otherwise, UE may de- prioritize the frequency.
* FFS whether and how the association between intended service area and frequencies is acquired.
 |

RAN2 has discussed frequency (de)prioritization based on intended service area (ISA) for MBS service continuity during cell reselection and reached above agreements. It is ffs how to whether and how the association between intended service area and frequencies is acquired. The discussed options include:

* Opt1: Included service area id in SIB21 to allow associated the FSAI with intended service areas
* Opt2: No additional information is needed. UE can obtain the association between ISA and MBS service, and MBS service and FSAI to perform
* Opt3: Others, if any, please include it in below table together with possible specs impacts.

If opt1 is agreed, Apart from capturing UE behavior in 304 specs, RRC specs will also need to be updated to discuss the ASN.1 design to allow proper association between ISA and FSAI.

If opt 2 is agreed, there will be no RRC specs impact. RAN2 can further discuss further clarification in 304 CR to make UE behavior more clear.

Based on above, it is proposed companies to bring contribution next meeting to resolve the open issues. Similarly, the open issue is treated as open issue for 304 running CR only if it is not included in RRC open issue list, to avoid duplicated discussions.

**Proposed resolution:**

**Companies are welcomed to provide contribution on open issue idle/inactive-3. The issue is discussed as part of open issues for 304 running CR if it is not included in RRC open issue list.**

**Companies are invited to provide feedback regarding the above open issue and proposed resolution:**

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| **Company** | **Agree to proposal?** | **Other comments** |
| Apple | Agree | We will bring a contribution. |
| vivo | Agree | Agree with the rapporteur.  |
| Xiaomi | Agree | We will bring a contribution to discuss option 1 and option 2. |
| Huawei, HiSilicon | Agree |  |
| Fujitsu | Agree |  |
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**Open issue idle/inactive-4: how UE decides it is inside the ISA(s) or not:**

**Issue description:**

Based on RAN2 agreements so far, UE needs to know whether it is inside or outside of ISA(s) of MBS broadcast service, in order to support MBS broadcast service enhancements based on ISA. RAN2 has discussed whether to leave it to UE implementation to determine whether it is inside the ISA(s) or not in RAN2#126, and agreed to comeback to this in later meeting. But no discussion is made since then.

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| **RAN2#126 Agreements*** Come back next meeting to check whether a UE may not (or should not) establish MRB(s) associated with a service limited to an intended service area when it is not located within the area (up to UE implementation how the UE detects it’s not in the intended service area)
* Come back next meeting to check whether a UE may (or should) release its established MRB(s) associated with a service limited to an intended service area when exiting the area (up to UE implementation how the UE detects it’s not in the intended service area)
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From Rapporteur’s perspective, it is reasonable to leave it to UE implementation on how to determine it is in the ISA(s) of MBS broadcast service or not. And this can be captured in a note in 304 running CR.

**Proposed resolution:**

**For open issue idle/inactive-4, RAN2 agrees to capture in a note in 38.304 that it is up to UE implementation on how to determine it is in the ISA(s) of MBS broadcast service or not.**

**Companies are invited to provide feedback regarding the above open issue and proposed resolution:**

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| **Company** | **Agree to proposal?** | **Other comments** |
| Apple | Agree |  |
| vivo | Agree | Agree with the rapporteur.  |
| Xiaomi | Agree  | We understand that the concern of the above agreements is ‘may/should’ and how to determine inside/outside the ISA should be up to UE implementation.  |
| Huawei, HiSilicon | Agree |  |
| Fujitsu | Agree |  |
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# Other identified open issues

Companies are invited to describe any other identified open issues not currently included within this document

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| **Company** | **Other identified open issues? (please describe)** |
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# Conclusions

The following proposals have been provided based on feedback to the above document:

*To be updated based comments received*

# References

1. [R2-2502983](file:///C%3A%5CUsers%5Cpanidx%5COneDrive%20-%20InterDigital%20Communications%2C%20Inc%5CDocuments%5C3GPP%20RAN%5CTSGR2_129b%5CDocs%5CR2-2502983.zip) Report from session on NR NTN and IoT NTN Session chair (ZTE) report
2. R2-25xxxxx Stage-3 running 304 CR for NR NTN ZTE Corporation, Sanechips draftCR

**Annex – Relevant Agreements in NR NTN**

Agreements implemented in the 304 specs are highlighted in green

FFS issues captured in editor’ notes for further discussion are highlighted in yellow

DL Coverage Enhancements

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| **RAN2#125bis Agreements**1.With regard to link level enhancement, RAN2 waits for RAN1 agreement on the DL channels to enhance before starting any RAN2 work.2.We will continue the discussion on RAN2 aspects of DL coverage enhancements (e.g. cell level / beam level DTX/DRX mechanism, etc.) in the next meetings, trying to identify questions to RAN1 for aspects where we need their input |
| **RAN2#126 Agreements**1.Based on the solution being investigated in RAN1, RAN2 will further discuss whether/how legacy UEs might operate in a cell supporting DL coverage enhancements. 2.RAN2 assumes that both EFC and EMC are supported* Ask RAN1 to keep us informed on their progress on whether the existing SSB pattern for an NR cell (e.g. SSB position in burst, SSB index number, etc.) is changed in Rel-19 NR NTN, and whether the SSB periodicity is extended compared with existing TN values.
* More in general, ask RAN1 whether/how the solution they are investigating is expected to impact common control signalling for UEs in RRC idle / RRC inactive
* Also remind RAN1 that satellite beams are currently not visible to UEs and any decision about different beam status will have to relate to beams visible to the UE (e.g. SSB beams)

Also ask RAN1 whether they are also working on UL beam hopping (and whether this is separate from DL beam hopping) |
| **RAN2#127 Agreements**1. From RAN2 point of view, if the SSB periodicity is no larger than 160ms, there is no RAN2 impact on SSB configuration (there might still be impacts on DTX aspects)2. From RAN2 point of view, If the SSB periodicity is larger than 160ms, for example ssb-PeriodicityServingCell, measurement gap periodicity, SMTC configuration, ssb-Periodicity-r17 for NonCellDefiningSSB-r17 may need to be extended. And the field description of nAndPagingFrameOffset may need to be enhanced to consider the SSB periodicity higher than 160ms.3. RAN2 can further consider SMTC impacts due to beam-hopping / larger SSB periodicity4. If there is a need to bar pre-Rel19 NTN UEs from accessing a cell operating with DL coverage enhancement (e.g. because of extreme SSB periodicity) the existing NTN bar bit can be used. FFS about the behaviour for Rel-19 UEs not supporting DL coverage enhancement when the existing NTN bar bit is set. |
| **RAN2#127bis Agreements**1. If it turns out that there is a need to bar UEs not supporting DL-CE, Rel-19 UEs not supporting DL-CE can be barred from accessing a cell operating with DL-CE using the existing NTN bar bit, in the same way as pre-Rel19 NTN UEs (this is an extension of the previous agreement to include also Rel-19 UE not supporting DL-CE)2. If it turns out that there is a need to bar UEs not supporting DL-CE, then we need to introduce a barring mechanism to control access of UEs supporting Rel19 NTN DL-CE. FFS on the details. (This also implies that UEs supporting Rel19 NTN DL-CE will not consider the existing NTN barring bit)3. (also depending on the details of the RAN1 solution) we can further consider methods to allow UEs not supporting DL CE to down-prioritize or prevent re-selection to cells operating with DL CE. |
| **RAN2#128 Agreements**1. If we need to bar UEs not supporting DL-CE (via legacy mechanism), we introduce a new barring in SIB1 to be able to selectively bar “UEs supporting DL-CE” (FFS if we will finally refer to “UEs supporting extended SSB periodicity” instead). FFS on the details (e.g. how many bits, etc.)2. As part of the work on DL-CE, RAN2 investigates related UE power consumption impact (including legacy UEs)3. RAN2 will consider whether to introduce separate signalling (e.g. new SMTC5 list) for DL CE cells SMTCs, e.g. if different periodicities need to be signalled or to prevent reselection to specific cells |
| **RAN2#129 Agreements*** From RAN2 perspective, we support option a (clustered cells illuminated) and option b (scattered cells illuminated) for further discussion on SMTC. No LS is sent to RAN1.
* RAN2 observes that if the cells active simultaneously are in clusters, existing SMTC mechanism (a maximum of 4 SMTCs per frequency) may be sufficient (FFS if any solution identified for option b applies to option a as well).
* RAN2 observes that if the cells active simultaneously are scattered, (for the case of intra-frequency neighbouring cells), the SSBs of surrounding neighbour cells may be transmitted at different times and existing SMTC mechanism may not be enough.

1.RAN2 assumes it will be possible to have different SSB periodicity among neighbour cells in the same frequency layer2.RAN2 assumes that in a NR NTN cell, SSB beam sweeping in different spatial directions is possible as in a NR TN cell: the whole cell is covered by the different SSB beams in half-frame3.RAN2 also assumes that, with the current status of RAN1 discussion, if one cell is defined by multiple “satellite beams”, the satellite beams are all simultaneously active or inactive (“beam hopping” applies equally to all the satellite beams of a given cell)4.The number of SMTC/gaps a UE needs to consider at any time will not be increased further |
| **RAN2#129bis Agreements**1. From SSB extension point of view, RAN2 assumes there is no need to introduce new barring bits2. We wait for further progress in RAN1 on link level enhancements before further discussing the possible impacts on access barring3. RAN2 considers to support configuring two different SMTC periodicities (with different offsets) for SMTCs in one frequency layer for idle, inactive and connected mode. We ask RAN4 whether it is feasible to support this in Rel-19 timeframe (also include previous agreement that at any time the UE will not use more SMTCs in parallel than in previous releases).4. We support configuring more than 4 SMTCs per frequency (e.g. 6) for idle/inactive UEs. It will be up to UE implementation to select which of the SMTCs to consider (send this RAN2 decision to RAN4 for checking)5. Network can provide assistance information (for Rel-19 UEs, not necessarily supporting DL CE) on the association between SMTC and location to help UE to perform SMTC selection for idle/inactive mode. FFS on the details of location information, e.g. serving cell SSB index, reference location, etc. In any case it is up to UE implementation on how to utilize the assistance information for SMTC selection in idle/inactive mode. |

Support of Broadcast service

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| **RAN2#125bis Agreements**1.For MBS broadcast service we don’t restrict the work to any satellite constellation type2.We prioritize working on a solution for MBS broadcast but we don’t preclude other broadcast services, namely ETWS3.We will cover at least the case where the indicated intended service area covers a portion of a NTN cell4.The intended service area can cover the area of more than one NTN cells (or portions thereof)5.Can discuss next time whether the broadcast transmission can be limited to the intended service area only (i.e. no transmission happens outside of the intended serive area)6.At least the following geographical area formats to model service area can be further considered (the signalling of other information than the geographical information can be considered): - Circles (like for TN coverage) - Geographical area information, e.g. via polygons, to better approximate the intended shape of service area |
| **RAN2#126 Agreements**1.For MBS broadcast service, both EFC and EMC are supported.2.RAN2 will not define means for the NW to prevent the reception of the content of the service outside of the intended service area.3.MBS broadcast intended service area is provided via system information4.For MBS broadcast RAN2 considers the following possibilities for including the service area information: SIB20/ SIB21/ MBSBroadcastConfiguration. FFS for ETWS5.When intended service area (e.g., geographical area/TN coverage) is provided for MBS broadcast service, it needs to be associated with MBS session (FFS on the details)* Come back next meeting to check whether a UE may not (or should not) establish MRB(s) associated with a service limited to an intended service area when it is not located within the area (up to UE implementation how the UE detects it’s not in the intended service area)
* Come back next meeting to check whether a UE may (or should) release its established MRB(s) associated with a service limited to an intended service area when exiting the area (up to UE implementation how the UE detects it’s not in the intended service area)
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| **RAN2#127 Agreements**1. The intended broadcast service area is defined by a geographical area represented by a (set of) referenceLocation and radius or by a (set of) polygon(s).2. RAN2 understands that the expected UE behavior is that when the UE is not in any intended service area of its interested broadcast services, the UE may not need to (re)acquire up-to-date MCCH. FFS on solutions3. For an MBS broadcast service intended for a certain area, a R19 UE supporting the feature should not establish MRB(s) for the MBS session associated to the intended area when it is outside the intended area (capture this in Stage 2)4. For an MBS broadcast service intended for a certain area, a R19 UE supporting the feature may initiate the broadcast MRB establishment procedure when UE is inside the intended area; the UE may initiate the broadcast MRB release procedure when UE leaves the intended area (capture this in stage 3) |
| **RAN2#127bis Agreements**1. For each MBS service we include one or more intended service area IDs into MCCH. FFS whether the list of the intended service areas (and related IDs) is also included in MCCH or if it is provided in a new or existing SIB. We will consider possible enhancements (including enhancements left up to UE implementation) to allow UE skipping MCCH re-acquisition when UE is not within intended service area of any interested broadcast service. |
| **RAN2#128 Agreements**1. The encoding of TN coverage introduced in Rel-18 in TS38.331, including tn-ReferenceLocation-r18 and tn-DistanceRadius-r18, is reused for the geographical area of the circle.2. The encoding of Polygon in TS37.355 is reused for the geographical area of the Polygon.3. The IntendedServiceArea is considered as the IE name of the geographical area (we can still update the name in the CR implementation if needed)4. A signalled intended service area for a MBS BC service may include geographic areas across the current serving cell and overlapping neighbor cell(s).5. RAN2 understands that the geographic area information for the intended service areas can be semi-static and not cause frequent updates. 6. Introduce a new SIB to include a list of intended service areas and related pointer (FFS if we point to the intended services areas via the index in the list or with an ID or another way)7. The legacy SIB modification procedure is applied to update the intended service area information in the new SIB. |
| **RAN2#129 Agreements**1.In the new SIB, explicit network-indicated area ID is used to label an intended service area in the list2.It shall be possible to signal multiple service area IDs to one MBS service (we Insert a list of service area IDs in MCCH)3.Introduce “warning area coordinates” in ETWS Primary Notification (SIB6) and in ETWS Secondary Notification (SIB7). FFS on the signalling details for “warning area coordinates” (SIB6 is not segmented) |
| **RAN2#129bis Agreements**1. We add a sentence saying that the UE can optionally support intended service area provision for MBS broadcast service via NTN.2. RAN2 understands the Intended service areas of all MBS broadcast services of the current serving cell that need to be geo-fenced will be included in the new SIBxx (no spec impacts)3. If UE knows it’s not in any intended service areas of any MBS services the UE is interested into, the UE may not need to acquire MCCH4. If no intended service area is explicitly indicated (e.g. in SIBxx) for a MBS service the UE is interested into, existing behavior applies.5. The field warningAreaCoordinates is included in SIB6 while the field warningAreaCoordinatesSegment is included in SIB7 for ETWS primary/secondary notification to indicate Warning Area Coordinates IE.* UE may prioritize the frequency(ies) for an interested service when UE can only receive the service on the frequency(ies) and the UE is in intended service area associated with the service provided in the frequency(ies). Otherwise, UE may de- prioritize the frequency.
* FFS whether and how the association between intended service area and frequencies is acquired.
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