3GPP RAN WG2 Meeting #117-e R2-22xxxxx

eMeeting February 21st – March 3rd, 2022

Agenda Item: 8.10.3.1.1

Source: ZTE corporation,Sanechips

Title: Report of [POST117-e] [102] [NTN] 38.304 CR (ZTE)

Document for: Discussion, Decision

# Introduction

This document is intended to further discuss the barring aspects:

* [POST117-e][102][NTN] 38.304 CR (ZTE)

Scope: Update the 38.304 CR, also trying to resolve the barring aspects and incorporating any available RAN1 feedback

Intended outcome: Agreed 38.304 CR in R2-2203548

Deadline: **Thursday March 10, 1000 UTC**

# Discussion

The following options have been raised during RAN2#117e [1]:

* Option 1: Introduce cellBarredNTN
* Option 2: Use the presence of tracking area list

Firstly, the rapporteur would like to clarify the expected UE behavior in both options.

## 2.1. UE interpretation on the existing bar bit and new NTN bar bit for option 1

R17 NTN capable UE is able to decode the cellBarred-NTN and the existing cellBarred while the legacy UE and R17 non-NTN capable UE is not able to decode the cellBarred-NTN.

The rapporteur understand UE intepretation of the bar bit can be summarized in the following tabe:

**Table 1: UE interpretation on the bar bit**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Cell type | Presence and Setting of the cellBarred and cellBarred-NTN | legacy UE and R17 non-NTN capable UE intepretation on the bar bit | R17 NTN capable UE interpretation on the bar bit | Use case for such setting |
| TN cell | cellBarred = “barred”;  cellBarred-NTN absent | The cell is barred | The cell is barred | TN cell would like to bar all the UEs |
| cellBarred = “not barred”;  cellBarred-NTN absent | The cell is not barred | The cell is not barred | TN cell would like to allow all the UEs to camp |
| NTN cell | cellBarred = “barred”;  cellBarred-NTN = “barred” | The cell is barred | The cell is barred | NTN cell would like to bar all the UEs |
| cellBarred = “not barred”;  cellBarred-NTN = “barred” | The cell is not barred | Ignore the cellBarred and consider the cell as barred according to cellBarred-NTN | NTN cell would like to bar R17 NTN capable UE but allow legacy UE and R17 non-NTN capable UE  =>Corner case since legacy UE and R17 non-NTN capable UE would not be able to get access to NTN cell but having such setting at least allows UE to camp on a NTN cell without losing coverage. |
| cellBarred = “barred”;  cellBarred-NTN = “not barred” | The cell is barred | Ignore the cellBarred and consider the cell as not barred according to cellBarred-NTN | NTN cell would like to bar the legacy UE and R17 non-NTN capable UEs but allow NTN capable UEs to camp |
| cellBarred = “not barred”;  cellBarred-NTN = “not barred” | The cell is not barred | The cell is not barred | NTN cell would like to allow all kinds of UE to camp.  =>Corner case since legacy UE and R17 non-NTN capable UE would not be able to get access to NTN cell but having such setting at least allows UE to camp on a NTN cell without losing coverage. |

The following rules can be summaried based on the above table:

Legacy UE and R17 non-NTN capable UE follow the setting of the existing cellBarred.

R17 NTN capable UE follows the setting of the existing cellBarred, if cellBarredNTN is not present.

R17 NTN capable UE ignores the setting of the existing cellBarred and follows the setting of the cellBarredNTN, if cellBarredNTN is configured.

**Question 1) For option 1, do companies agree with the understanding that:**

**--legacy UE and R17 non-NTN capable UE follow the setting of the** **existing cellBarred;**

**--R17 NTN capable UE follows the setting of the existing cellBarred, if cellBarredNTN is not present;**

**--R17 NTN capable UE ignores the setting of the existing cellBarred and follows the setting of the cellBarredNTN, if cellBarredNTN is configured?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Xiaomi | Yes |  |
| OPPO | Yes for (1) and (3);  (2) may need further clarification | For (2),  **--R17 NTN capable UE follows the setting of the existing cellBarred, if cellBarredNTN is not present;**  This may be true for those UEs capable of both NTN and TN. However, we are not sure whether we consider some UEs that are only capable of NTN but not capable of TN, e.g. NTN-only UEs. For these UEs, it seems reasonable to consider the cell as barred if cellBarredNTN is not present. |
| Huawei, HiSilicon | Yes |  |
| Qualcomm | No | We think this is unnecessarily adding overhead in SIB1. This means adding 2 bits overhead of cellBarredNTN (1 bit for “barred” and “not barred” and additional 1 bit for configure/notconfigure) in SIB1, while 0 bits could have worked fine.  We do not agree with cellBarred = “not barred”; cellBarred-NTN = “not barred”. Why NTN cell will allow TN only capable UE to select the cell?  In the first place, how does a UE know the cellBarred-NTN = “not barred” is present in SIB1? It cannot just do so reading MIB, which is the current behavior. So this does not make sense as the UE anyway needs to read SIB1 to find out barring bit.  It would be simple NTN capable UE ignores existing cellBarred and follows 1 bit indication cellBarredNTN in SIB1 (i.e., present = “NOT barred” and absent = “barred”). |
| Samsung | Yes |  |
| CATT | Yes | For (2),  **--R17 NTN capable UE follows the setting of the existing cellBarred, if cellBarredNTN is not present;**  Have the same view with OPPO. |
| ZTE | Yes |  |

**Rapporteur’s summary:**

7 companies commented on Q1, 6 the companies agree with the following understanding while 1 company objects.

--legacy UE and R17 non-NTN capable UE follow the setting of the existing cellBarred;

--R17 NTN capable UE ignores the setting of the existing cellBarred and follows the setting of the cellBarredNTN, if cellBarredNTN is configured.

For the following bullet, OPPO and CATT understand it applies to UE capable of both NTN and TN while for NTN only UE should consider the cell as barred if cellBarredNTN is not present.

--R17 NTN capable UE follows the setting of the existing cellBarred, if cellBarredNTN is not present;

Based on the comments received, the following proposal is given based on the majority’s preference:

**Proposal: For the case when cellBarredNTN is introduced:**

**--legacy UE and R17 non-NTN capable UE follow the setting of the existing cellBarred;**

**--R17 UE capable of both NTN and TN follow the setting of the existing cellBarred, if cellBarredNTN is not present;**

**--R17 NTN-only UE consider the cell as barred if cellBarredNTN is not present;**

**--R17 NTN capable UE ignores the setting of the existing cellBarred and follows the setting of the cellBarredNTN, if cellBarredNTN is configured.**

## 2.2. UE interpretation on the existing bar bit and tracking area list for option 2

**Table 2: UE interpretation on the legacy bar bit and tracking area list**

|  |  |  |
| --- | --- | --- |
| Cell type | legacy UE and R17 non-NTN capable UE intepretation on the bar bit | R17 NTN capable UE interpretation on the bar bit |
| TN cell | No change. Follow existing procedure. Follow cellBarred in MIB and trackingAreaCode in SIB1:  --cellBarred = “not barred” + TAC present: not barred  --cellBarred = “barred” : barred  --TAC not present: barred | Follow cellBarred in MIB and trackingAreaList-17 in SIB1  Even if cellBarred = “not barred” in MIB, the cell is still barred as trackingAreaList-r17 = “not present”:  --cellBarred = “not barred” + trackingAreaList-17 present: not barred  --cellBarred = “barred” : barred  -- trackingAreaList-17 not present: barred |
| NTN cell | No change. Follow existing procedure. Follow cellBarred in MIB and trackingAreaCode in SIB1  Even if cellBarred = “not barred” in MIB, the cell is still barred as trackingAreaCode = “not present”  --cellBarred = “not barred” + TAC present: not barred  --cellBarred = “barred” : barred  --TAC not present: barred | Follow cellBarred in MIB and trackingAreaList-17 in SIB1  --cellBarred = “not barred” + trackingAreaList-17 present: not barred  --cellBarred = “barred” : barred  -- trackingAreaList-17 not present: barred |

The following rules can be summarized based on the above table:

Legacy UE and R17 non-NTN capable UE follow the setting of the existing cellBarred in MIB and trackingAreaCode in SIB1, i.e. the cell is barred to UE if cellBarred = “not barred” or the trackingAreaCode is not present.

R17 NTN capable UE follows the setting of the existing cellBarred in MIB and the trackingAreaList-r17 in SIB1, i.e. the cell is barred to UE if cellBarred = “not barred” or the trackingAreaList-r17 is not present.

**Question 2) For option 2, do companies agree with the understanding that:**

**--** **Legacy UE and R17 non-NTN capable UE follow the setting of the existing cellBarred in MIB and trackingAreaCode in SIB1, i.e. the cell is barred to UE if cellBarred = “not barred” or the trackingAreaCode is not present;**

**-- R17 NTN capable UE follows the setting of the existing cellBarred in MIB and the trackingAreaList-r17 in SIB1, i.e. the cell is barred to UE if cellBarred = “not barred” or the trackingAreaList-r17 is not present?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Xiaomi | No | In the current TS 38.331 CR, it said that:  3> if *trackingAreaCode* and *trackingAreaList* is not provided for the selected PLMN nor the registered PLMN nor PLMN of the equivalent PLMN list:  4> consider the cell as barred in accordance with TS 38.304 [20];  We understand that the cell will be considered as barred if neither *trackingAreaCode* nor *trackingAreaList* are provided by network. And we also think NTN network can only use trackingAreaCode based on network implementation. So we think the ‘**R17 NTN capable UE follows the setting of the existing cellBarred in MIB and the trackingAreaList-r17 in SIB1, i.e. the cell is barred to UE if cellBarred = “not barred” or the trackingAreaList-r17 is not present?**’ may be not correct since NTN network can only use **trackingAreaCode**. |
| OPPO | No |  |
| Huawei, HiSIlicon | No | No for the second bullet:  **-- R17 NTN capable UE follows the setting of the existing cellBarred in MIB and the trackingAreaList-r17 in SIB1, i.e. the cell is barred to UE if cellBarred = “not barred” or the trackingAreaList-r17 is not present?**  We think trackingAreaList-r17 should be mandatorily present for NTN cells. In TN, the absence of TAC is to indicate the cell can only serve as PSCell/SCell, but CA/DC is not supported for NTN so there’s no use case where an NTN cell does not broadcast trackingAreaList-r17. It’s enough to use “absence of trackingAreaCode” to prevent legacy UEs and use cellBarred in MIB to indicate the barring status for NTN UEs.  The second bullet can be modified as:  -- R17 NTN capable UE follows the setting of the existing cellBarred in MIB ~~and the trackingAreaList-r17 in SIB1~~, i.e. the cell is barred to UE if cellBarred = “not barred” ~~or the trackingAreaList-r17 is not present~~? |
| Qualcomm | Yes | We think only a minor change we need is legacy trackingAreaCode is not used by NTN cell. For HARD TAC update, the NTN cell can still use trackingAreaList-r17 in SIB1 that includes only one trackingAreaCode. This means 2 bits overhead in SIB1 from option 1 is not necessary.  This is for IDLE mode so there should be no issue. CA/DC is for connected mode which is under network control.  Correction in second bullet, and it is current behavior, what is the problem if current behavior can work?  **-- R17 NTN capable UE follows the setting of the existing cellBarred in MIB and the trackingAreaList-r17 in SIB1, i.e. the cell is barred to UE if cellBarred = “~~not~~ barred” or the trackingAreaList-r17 is not present?** |
| Samsung | No | -- Legacy UE and R17 non-NTN capable UE follow the setting of the existing cellBarred in MIB and trackingAreaCode in SIB1, i.e. the cell is barred to UE if cellBarred = “~~not~~ barred” or the trackingAreaCode is not present;  -- R17 NTN capable UE follows the setting of the existing cellBarred in MIB and the trackingAreaList-r17 in SIB1, i.e. the cell is barred to UE if cellBarred = “~~not~~ barred” or the trackingAreaList-r17 are not present |
| CATT | No |  |
| SoftBank | No | Same view with Xiaomi. NTN network may have a possibility to use *trackingAreaCode* based on network implementation. |
| ZTE | No |  |
|  |  |  |

**Rapporteur’s summary:**

8 companies commented on Q2, 7 companies disagree with the understanding on using the presence of tracking area list to bar UEs. Thus no proposal is given.

## 2.3. Down select from option 1, option 2 or any other options

**Question 3) On the barring aspects, which option do companies prefer? Option 1/2/other? If companies want other options, please elaborate the detailed solution in the “comments” row.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option 1/2/other option?** | **Comments** |
| Xiaomi | Option 1 |  |
| OPPO | Option 1 | After clarification is done for Q1. |
| Huawei, HiSilicon | Option 1 |  |
| **Qualcomm** | **Option 2** | **Option 1 has 2 bits overhead in SIB1 that is unnecessary.** |
| Samsung | Option 1 |  |
| CATT | Other option | We think the current existing *cellBarred* in MIB and *freqBandIndicatorNR* in SIB1 can work well together. Because even for the band overlap scenario, the same band will have different band number for TN and NTN cell (e.g. NTN n255 is overlapping with IMT band n24, NTN n256 is partially overlapping with IMT band 65/66). So:   * For TN cell, which will not broadcast NTN band number:   + *cellBarred* in MIB = “barred”     - all the UE will be barred   + *cellBarred* in MIB = “not barred”     - Legacy UE and R17 non-NTN capable UE: follow the current TN UE procedure     - NTN UE with also TN access capability: follow the current TN UE procedure     - NTN only UE: will be barred because there is no NTN band number broadcast * For NTN cell, which will not broadcast TN band number:   + *cellBarred* in MIB = “barred”     - all the UE will be barred   + *cellBarred* in MIB = “not barred”     - Legacy UE and R17 non-NTN capable UE: will be barred because there is no TN band number broadcast     - NTN UE with also TN access capability: follow the current TN UE procedure     - NTN only UE: follow the current TN UE procedure |
| SoftBank |  | We prefer Option 1 but we are open to discuss other options.  @CATT  NTN cells do not always broadcast only NTN band number. (For example, HAPS using TN band number as RAN4 defined) |
| ZTE | Option 1 |  |

**Rapporteur’s summary:**

8 companies commented on Q3, 6 companies prefer option 1 by introducing cellBarredNTN, one company prefers option 2 while one company proposes another option by using the *freqBandIndicatorNR* in SIB1.

Thus, the following proposal is given:

**Proposal: Confirm the working assumption that new bit, e.g. cellBarred-NTN, is introduced in SIB1 for NR-NTN.**

# Conclusion

**Proposal 1: Confirm the working assumption that new bit, e.g. cellBarred-NTN, is introduced in SIB1 for NR-NTN.**

**Proposal 2: For the case when cellBarredNTN is introduced:**

**--legacy UE and R17 non-NTN capable UE follow the setting of the existing cellBarred;**

**--R17 UE capable of both NTN and TN follow the setting of the existing cellBarred, if cellBarredNTN is not present;**

**--R17 NTN-only UE consider the cell as barred if cellBarredNTN is not present;**

**--R17 NTN capable UE ignores the setting of the existing cellBarred and follows the setting of the cellBarredNTN, if cellBarredNTN is configured.**

# References

[1] [R2-2204032](file:///C:\Data\3GPP\RAN2\Inbox\R2-2204032.zip) [offline-102] Idle mode open issues - final round ZTE corporation