3GPP TSG-RAN WG2#123-bis R2-23XXXXX

Xiamen, China, 9 – 13 October, 2023

Agenda Item: 7.3.1

Source: Huawei, HiSilicon

Title: Report of [POST123][312][NES] Running CR 38.331 (Huawei)

Document for: Discussion and decision

# 1 Introduction

This document is the report of the following discussion:

* [POST123][312][NES] Running CR 38.331 (Huawei)

Scope: Review running CR and discuss issue configuration per serving cell or MAC entity

Outcome: CR to be submitted to next meeting

Deadline: long

The intention of this discussion is to provide a running RRC CR for NES and discuss the issue of cell DTX/DRX configuration per serving cell or MAC entity.

 **Please provide your comments by: Friday September 22nd, 2023, 1000 UTC**

Companies providing input to this email discussion are requested to leave contact information below.

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# 2 Discussion on the per serving cell or MAC entity configuration issue

During the RAN2#123 meeting it was discussed whether Cell DTX/DRX configuration status is per MAC entity or per Serving Cell, which has implications on the 38.331 and 38.321 specifications [3]. The main impact of these configuration options is for UEs operating in CA, which have more than one serving cell. RAN1 has already agreed that the activation/deactivation is per serving cell, which was also confirmed by RAN2.The only remaining issue is what is the granularity of the configuration.

There was a following SI phase agreement:

5 Cell DTX/DRX can be configured per serving cell and can be applicable for different cells in CA. No additional RAN2 impacts or enhancements are foreseen.

And we also have a WI phase agreement:

1. Pattern configuration for cell DRX/DTX is common for Rel-18 UEs in the cell.

In the per MAC entity option, which is similar to how C-DRX is configured, all serving cells of a UE should have the same cell DTX/DRX parameters to align with the one C-DRX configuration. In this option the activation status, which is set on a per cell basis, would need signalling which conveys also information to which of the serving cells the activation/deactivation status applies. This mode is simpler from the UE implementation perspective but has limitations in the NW configuration and it may be difficult to apply separate activation status across serving cells.

For the per serving cell option, different serving cells can have different cell DTX/DRX parameters. This brings flexibility of NW implementation but complexity of UE implementation, which would need to maintain separate cell DTX/DRX configurations for each of its serving cells in CA. In this scenario it would be easier to convey the activation status as the configuration would be per cell and each serving cell could have a different cell DTX/DRX state.

In your answer please also highlight the issues that will arise if the other option is chosen, e.g. UE complexity for per cell configuration or difficult NW configuration for per MAC entity, etc.

**Question 1:** *Do you prefer Cell DTX/DRX configuration to be per MAC entity or per Serving Cell?*

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| **Company** | **Answer** | **Comments** |
| Vodafone | Not 100% sure | I feel (a bit different from my previous opinion) that it is more important that UE has an aligned configuration across the serving cells. What would be the motivation to have a possibility to provide the UE different configurations for different serving cells? On activation aspects, please see my comments below.  |
| Xiaomi  |  | This issue was discussed in last RAN2 meeting and no consensus at last. We prefer per MAC entity option. * + In RAN1 discussion, two cell can share the same bit location in DCI, i.e., the cell DRX/DTX configuration can be same/common for the two cell, e.g., cell ¾.

So, it is possible to configure cell DRX/DTX in a cell group. If it is hard to decide the cell DTX/DRX in UE side is per MAC entity or per serving cell. We can compromise to cell group-based cell DRX/DTX configuration in UE side for progress.  |
| Samsung | Per cell | We prefer per cell option for flexibility and to align with agreements made based on per cell configuration and activation. Also, considering non-collocated (inter-site) CA scenarios, it would be reasonable to have per cell configuration. |
| vivo | per MAC entity | Since legacy C-DRX is per MAC entity, and there are new NW/UE behaviors defined for cell DTX/DRX non-active period, making Cell DTX/DRX config. per MAC entity is much easier for UE implementation. We do not observe the need of providing flexibility for the NW to configure different cell DTX/DRX patterns for the serving cells, and thus prefer the configuration to be per MAC entity. |
| ZTE | Per cell | The cell DTX/DRX functionality controls the reception of PDCCH and SPS, and the transmission of SR and CG. And the resource configuration of SPS, SR and CG is per cell. If the cell DTX/DRX is per MAC entity, it is hard for gNB to coordinate those resource in each Scell and Pcell. Hence, in sake of the flexibility in gNB, we suggest Cell DTX/DRX configuration to be per cell. |
| Qualcomm | MAC Entity | Cell DTX/DRX from an implementation standpoint would be implemented on top of UE C-DRX (which is per-mac entity except for a few parameters that are per C-DRX configuration with a maximum of two configurations). Thus, per MAC entity would be the straightforward extension. Concerns with per-serving cell are as follows:* Completely changes PDCCH decoding from the previous releases into per-carrier PDCCH decoding, which is a very big change to current implementations, since the UE would need to track up to 8 different “effective ON durations” to track separate intersections & cycles of different cells with UE C-DRX ON duration. This complicates blind decoding a lot and opens up new issues regarding cross-carrier scheduling. This would also be very wasteful of UE power and complicates the feature needlessly.
* RAN1 has agreed that “UE monitor DCI format 2\_X in one serving cell”, so the configurations, we assume, would be already limited to having similar periodicity and start offsets, since it doesn’t make sense for one cell to (de)activate another cell in the middle of non-active cycle, so coordination and tight coupling is already needed. I
* Motivation: The target motivation of cell DTX/DRX is a cell with 10-30% utilization to save energy over time. It is not clear why a UE would connect to 2-8 cells each running their own Cell DTX/DRX algorithm, i.e., each having 10-30% utilization. To us, this is not a realistic deployment at all. One deployment that came up in the discussion is a capacity-boosting Scell that is not fully utilized with a fully utilized Pcell, at which case, the Cell DTX/DRX can be activated for this Scell alone. We do not see why Pcell and Scell or different Scells would run their own misaligned patterns.
* SI agreement was made with full alignment assumption, at which case, it was less messy since the ON duration itself was guaranteed a clean pattern of PDCCH occasions. Now RAN2 has moved from full alignment to partial alignment, thus, messy configuration options that don’t have technical benefits should be avoided.
 |
| CEWiT | Per Cell | We prefer per cell to align with the SI agreement. Also, the L1 signalling for activation/deactivation, agreed in RAN2, is per cell which will further support the feasibility of per cell configuration.Concerns for per MAC entity: The NES technique is applicable when the load is low or medium in a cell. Thus the per mac entity DTX/DRX configuration which is common for different cells cannot handle the varying load across cells, thereby reducing the effectiveness of the technique. |
| Apple | per MAC entity | First, we fully agree with raised 4 technique concerns from QC. Suggest Proponents of per serving cell address these concerns one by one. Secondly, according to current RRC spec, up to 16 serving cells can be configured for one cell group. **Thus, if per serving cell, the UE needs to run up to 32 parallel Cell DTX patterns and up to 32 parallel Cell DTX patterns (64 patterns and corresponding 64 state machines in total).** We will be curious which UE vendors can implement such a complex feature. At least, the max number of parallel Cell DTX/DRX pattern should be restricted.  |
| Nokia | Per Cell | Agree with Samsung and ZTE. |
| Fujitsu | Per Cell | Agree with Samsung and ZTE.For a compleixy, RAN2 has already agreed alignment between Cell DTX/DRX and C-DRX on-duration is ensured by network. Therefore, in CA, the network should also select CCs with similar Cell DTX/DRX pattern for avoiding UE impacts.  |
| Sharp | Per Cell | Agree with Samsung and ZTE. |
| Ericsson | Per Cell or at least one for PCell and one for SCells  | In terms of complexity, we understand that one pattern for Pcell and one for Scells is similar complexity as the UE has today for UE DRX when both MCG and SCG are configured, i.e. in both cases only 2 different patterns are configured. |
| OPPO | Per Cell | Although per-MAC entity cell DTX/DRX configuration may simplify the UE behaviour, e.g. the UE only needs to maintain one set of cell DTX/DRX configurations for all serving cells, it may not much reasonable, since 1) it is hard for the gNB to allocate resources and coordinate with others because individual UEs which have their own traffic characteristics would only have partially overlapped serving cells. 2) The UE anyway needs to maintain cell DTX/DRX per serving cell because there would be cases in which part of the UE’s serving cells are activated.  |
| InterDigital | Per MAC entity | PDCCH is monitored per C-DRX anyway, which is configured per MAC entity/DRX group. Agree with the points raised by QC.  |
| CATT | Per Cell | - DL-only SCells should only support Cell DTX, since Cell DRX is not applicable- In multi-layer deployment (the baseline usecase of NES), high capacity cells targeting eMBB could be UL/DL asymmetric and favor Cell DRX over Cell DTX- FR1 and FR2 cells could have different NES requirements, hence different Cell DTX/DRX configuration- C-DRX already implements 2 groups |
| Lenovo | Per Cell | It is easier for the UE implementation to go per MAC entity way since the UE does not have to maintain as many timer-sets as there are Cells with different cell-DTX/ DRX configuration. But we should design a feature that is useful in operation/ on field and brings value to the operator. Since different UEs will have different carrier/ cells in its CA configuration (under the same MAC-entity), then an additional constraint of the same cell DRX/ DTX would mean that eventually all cells/ carriers are sleeping and waking at the same time – this does not allow any load balancing and therefore will eventually not allow energy saving. The feature will remain on paper – i.e., not usable really. Of course in real deployment, network should configure only limited sets of different cell DTX/ DRX configurations. |
| LGE | per MAC entity | If the ‘per Serving Cell‘ option is chosen, cell DTX/DRX needs to be maintaned per Serving Cell while UE C-DRX is maintained per MAC entity. We think that it will increase complexity. For example, different sets of cell DTX/DRX timers are required per serving cell, and active durations of the MAC entity (i.e., overlaps betwen Active Time of UE C-DRX and active periods of cell DTX/DRX) for reception and transmisison need to be mainained per serving cell.An advantage of the ‘per Serving Cell‘ option may be flexibility providing each serving cell with different cell DTX/DRX pattern. But, it seems questionable that configuring and activating more serving cells with different cell DTX/DRX patterns is beneficial in terms of power saving considering that low utilization of each serving cell is assumed for cell DTX/DRX. |
| Huawei | per MAC entity | The simplest way to align C-DRX and cell DTX/DRX in the CA scenario is to configure the cell DTX/DRX per MAC entity, which mirrors the C-DRX configuration. In this scenario all cells would have a DTX pattern aligned with UE C-DRX, once the initial alignment is performed by the NW.If the cell DTX/DRX is configured by per serving cell, different cells may have different cell DTX/DRX patterns, which will make it difficult to coordinate between PCell and SCells to ensure tha alignment between C-DRX and cell DTX/DRX. As noted by companies above it would make the UE implementation challenging by mandating to follow several different cell DTX/DRX patterns (agree to the points raised by QC). |

**Summary:**

18 companies responded to Q1, with 10 supporting per cell configuration and 7 supporting per MAC entity, one company was not sure. The rapporteur would like to highlight some arguments from the provided responses:

**Per cell:**

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| --- | --- |
| **pros** | **cons** |
| Flexible per cell configuration on the NW side, load balancing of active time between cells possible | Significant increase of UE complexity, possibly several sets of cell DTX/DRX timers and active durations of the MAC entity for reception and transmission need to be maintained for each serving cell. |
| Implicit activation for the single configured cell | Difficult alignment of all cell DTX/DRX patterns with one C-DRX pattern |
| Resource configuration of SPS, SR and CG is per cell |  |

**Per MAC entity:**

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| --- | --- |
| **pros** | **cons** |
| Simplified UE implementation (on top of C-DRX, which is per MAC entity)  | All serving cells for this UE must have the same pattern (cannot handle variable load/configurations) |
| Similar as C-DRX configuration, which is maintained per MAC entity | Unclear activation status after RRC configuration (are all serving cells implicitly cell DTX/DRX activated) |
| PDCCH is monitored per C-DRX |  |

The following general points were also made:

* RAN1 has agreed that “UE monitor DCI format 2\_X in one serving cell”, so it is assumed the configurations would be already limited to having similar parameters.
* The issue with configuration type arises only in CA scenarios. It is not predicted to be a common scenario and reasonable configuration that a PCell and different SCells would run their own misaligned cell DTX/DRX patterns. The patterns should be fully aligned but can be activated/deactivated on a per cell basis still maintaining NW flexibility.
* If the UE has one serving cell, there is no difference in the configuration method.
* Regardless of the solution, the maximum number of parallel Cell DTX/DRX patterns a UE is required to follow should be restricted.

The rapporteur proposes the following way forward:

**Proposal 1** The Cell DTX/DRX configuration is provided per Serving Cell with the following restrictions:

* + - The UE will not be required to follow more than 2 active patterns of cell DTX/DRX, regardless of the number of servings cells.
		- The two configured active patterns should be aligned, i.e. one periodicity is an integer multiple of the other.

# 3 Running RRC CR for NES

The running RRC CR for NES is provided in the discussion folder. Small comments can be added as bubble comments in the draft CR, please don’t change the CR text. If more detailed suggestions on procedures or wording changes are proposed please use the table below to highlight them for clarity of the CR tdoc.

|  |  |  |
| --- | --- | --- |
| **Company** | **Detailed comments** | **Rapporteur response** |
| Vodafone | As per agreement we made before, it is already captured that:The IE *CellDTX-Config* is used to configure cell DTX related parameters. **Cell DTX is activated implicitly once configured by the network.**Now, once L1 activation is agreed as activation procedure, we need to define how these 2 ways of activations are interworking.According to the current stage, it seems to me that there is no room for L1 activation procedure as provided configuration is always activated once received. If we want to utilize L1 procedure, we need to have a bit in the configuration saying that it is configuration only and the activation will be triggered by L1. Following we would also need to discuss deactivation procedure. Please indicate if you agree with my statement.Minor comment: We agreed Activation/deactivation is per serving cell. FFS if the configuration is per cell or per MAC entity, but looking into:*MAC-CellGroupConfig*The IE *MAC-CellGroupConfig* is used to configure MAC parameters for a cell group, including DRX and cell DTX/DRX.Editor’s note: FFS whether the Cell DTX/DRX configuration and activation is per MAC entity or per serving cell. | **Issue 1:** RAN1 has sent a LS to us in R1-2308674 with higher layer parameter list, with the list in R1-2308672. There is a parameter *positionInDCI-cellDTRX* which will be implemented later in RRC. The presence of this parameter explicitly means that the NW supports and intends to use the L1 indication. If it is absent it is clear that L1 will not be used. If we add 1 bit in RRC to explicitly activate a configuration (or not) it is contrary to the current agreement on implicit activation. We think the feature currently works in a way that the NW configures and activates implicitly by RRC and then after the initial RRC configuration the NW can use L1 to deactivate and activate this configuration. I can add an open issue about the explicit activation bit in RRC so we can have a discussion on this point.**Issue 2:** Agree with this comment, “activation” will be removed. |
| Xiaomi  | – *MAC-CellGroupConfig*The IE *MAC-CellGroupConfig* is used to configure MAC parameters for a cell group, including DRX and cell DTX/DRX.Editor’s note: FFS whether the Cell DTX/DRX configuration and activation is per MAC entity or per serving cell.1. RAN2 agreed that cell DTX/DRX A/D is per serving cell, FFS for cell DRX/DTX configuration.
2. RAN2 did not conclude the case for dual UE C-DRX, maybe two cell DTX/DRX are configured for FR1 and FR2 respectively. We also need a FFS for it.
 | **Issue 1:** Agree, this will be removed.**Issue 2:** We can add an FFS but I think we will not optimize for the dual C-DRX case. |
| Samsung | (1) Description of ‘*cellBarred* under *MIB’*

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| *MIB* field descriptions |
| ***cellBarred***Value *barred* means that the cell is barred, as defined in TS 38.304 [20]. This field is ignored by IAB-MT. This field is ignored for connectivity to NTN. |

- We need to specify that NES capable UE shall ignore the below barring field in MIB, similar to IAB and NTN.Suggestion> to add ‘This field is ignored by NES capable UE, (if *cellBarredNES* is configured in SIB1)’(2) Description of ‘*cellBarred* under *SIB1*

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| *SIB1* field descriptions |
| ***cellBarredNES***Value *barred* means that the cell is barred for a NES-capable UE, as defined in TS 38.304 [20]. Value *notBarred* means that the cell is allowed for NES-capable UEs. If not present, the NES-capable UEs shall follow the MIB *cellBarred* indication. This field is ignored by non-NES-capable UEs. |

- it is obvious that a non-NES-capable UE would ignore this field. Also, we would like to avoid discussing the definition of ‘non-NES-capable UE’.Suggestion> to modify ‘This field is only applicable to NES-capable UEs’(3) Description of ‘*jointCellDTXDRXconfig* under *CellDTX-Config*

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| *CellDTX-Config* field descriptions |
| ***jointCellDTXDRXconfig***If set to true, the UE shall also apply a cell DRX configuration with the same parameters as in CellDTX-Config.  |

- May cause a confusion if a network configures different parameters for DTX and DRX, and also set this field true. We think it would be simpler just to have an indicator that indicates those two configurations are the same.Suggestion> to modify as an indicator which informs that the cell DTX and DRX patterns are the same.(4) MAC-CellGroupConfig– *MAC-CellGroupConfig*The IE *MAC-CellGroupConfig* is used to configure MAC parameters for a cell group, including DRX and cell DTX/DRX.Editor’s note: FFS whether the Cell DTX/DRX configuration and activation is per MAC entity or per serving cell.- Our understanding is that *cellDTX-Config* may be relocated to *ServingCellConfig*, depending on per cell vs per cell group configuration.However, if companies have the same understanding, it’s fine for now. | **Issue 1:** It is ignored only when *cellBarredNES* is configured, so with this condition it can be added. **Issue 2:** Agree to this change. **Issue 3:** Agree, the name can be changed to “same” since “joint” configurations can still be different in offset. **Issue 4:** Yes, *cellDTX-Config* may be relocated to *ServingCellConfigCommon*, depending on per cell vs per MAC entity configuration. |
| vivo | (1) FD of ***jointCellDTXDRXconfig:***According to R2#123 agreement: On-duration and Cycle parameters are common between cell DTX and DRX, when both are configuredWe understand this is mandatory, and thus the field should not be optional. Otherwise, the absence of it means On-duration and Cycle parameters between cell DTX and DRX can be different, which is **not** aligned with R2 agreement.1. For cell bar for NES-capable UE:

According to the current running 331 CR, the NES-capable UE only needs to read *cellBarredNES* in SIB1 when the *cellBarred* in the acquired *MIB* is set to *barred*. Then, the NES-capable UE needs to check in SIB1 whether it is allowed to camp. From our understanding, the easiest way is to use only one codepoint for *cellBarredNES* in SIB1, i.e., cellBarredNES-r18 ENUMERATED {true} OPTIONAL, -- Need RWhen *cellBarredNES* is not present in SIB1, the NES-capable UE will consider the cell as barred.  | **Issue 1:** The naming of this field is ambiguous and will be changed as in the reply for Samsung issue 3. My understanding is that the absence of this field can mean two things:* Cell DRX is not configured at all
* Cell DRX is configured but has different offset

Because of the agreement you highlighted the NW can’t configure cell DRX with completely different parameters as this is not allowed (apart from the offset). Of course, this field could also be changed to mandatory with two values but in our view it wouldn’t change the behavior. If this option is clearer to companies we can consider it.**Issue 2:** It is true that only one codepoint would work for the NES case but from the online discussion last meeting I recall some companies wanted to have a full configurability and keep the codepoints similar to legacy barring. Therefore I suggest to keep it this way. |
| ZTE | 1. The field description of celldrx-onDurationTimer,

According to the agreement “*On-duration and Cycle parameters are common between cell DTX and DRX, when both are configured. FFS if we have different start offset configuration for cell DTX and cell DRX*”, in order to save the signaling overhead, we suggest to configure only celldtx-onDurationTimer when both of CellDRX-Config and CellDTX-Config is configured. In a word, if celldrx-onDurationTimer is absent, the value of celldrx-onDurationTimer is same as the value of celldtx-onDurationTimer. Hence, we suggest to modify the description as below:***celldrx-onDurationTimer***Value in multiples of 1/32 ms (subMilliSeconds) or in ms (milliSecond). For the latter, value *ms1* corresponds to 1 ms, value *ms2* corresponds to 2 ms, and so on. If this field is absent, the value of celldrx-onDurationTimer is same as the value of celldtx-onDurationTimer when both of CellDRX-Config and CellDTX-Config are configured.1. The field description of *cellBarredNES* seems not consistent with our understanding, because NES-capable UE may support other features. e.g. If a NES-capable UE is also a redCap UE, even if cellBarredNES is not present, the UE should further follow the cellBarredRedCap1Rx, cellBarredRedCap2Rx etc.

For RedCap UE, the existing principle is that RedCap UE would consider the cell as barred if any of the cellbarred in MIB, cellBarredRedCap1Rx, cellBarredRedCap2Rx in SIB1 is set to barred.And we understand the same principle also applies when the *cellBarredNES* is introduced and the expected interpretation for the following setting would be as follows (this is a screenshot while the table is copied at the end of this document) :Which means, for NES-capable UE, only the *cellBarred* in MIB can be ignored, NES-capable UE still need to check other cell bar indication for other features, e.g. RedCap, if it is also a RedCap UE.To achieve the above understanding, we propose the following change in 331:

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| ***cellBarredNES***Value *barred* means that the cell is barred for a NES-capable UE, as defined in TS 38.304 [20]. Value *notBarred* means that the cell is allowed for NES-capable UEs. If ~~not~~ present, the NES-capable UEs shall ~~follow~~ ignore the MIB *cellBarred* indication. This field is ignored by non-NES-capable UEs. |

 | **Issue 1:** Agree to this change.**Issue 2:** The coexistence of features such as NES and RedCap was not discussed therefore we cannot take this table as a reference.We need to follow the agreement for NES which is:“The NES UE always follows the NES bit used for barring, if present. If not present the UE shall follow legacy barring.” The second part of the agreement is reflected in the current wording for *cellBarredNES.* |
| Qualcomm | We should modify Cell DTX as follows.***celldtx-CycleStartOffset****celldtx-Cycle* in ms and *celldrx-StartOffset* in multiples of 1 ms. *celldtx-Cycle* is an integer multiple of drx-longCycle or vice versa. We want to incorporate this last meeting agreement: “Understanding is that alignment means that the cell DTX/DRX and C-DRX periodicity should be multiple of each other” As clarified in alignment agreement, this is not a free value. It is tightly coupled to C-DRX cycle value. As we mentioned in the meeting, the importance of that is that UE implementation needs the assumption of consistent PDCCH occasions between cycle; this would be the difference between a straightforward implementation that obtains a clean ON duration with a constant “effective ON duration” (now derived as an intersection between C-DRX ON duration and Cell DTX active time”) and a cycle-by-cycle varying effective ON duration. The field values also must be defined as multiples of UE C-DRX long cycle values and not free “ms” values to avoid erroneous configurations that misalign cycles.  | **Issue 1:** I agree with the intention to add this description but the current agreements have an FFS on stage 3 alignment specification. I will add this as an open issue and we can discuss it during the meeting. The relevant agreements:The gNB should ensures that there is at least partial overlapping between UE C-DRX on-duration and cell DTX/DRX on-duration. It is up to network implementation to ensure the alignment. We will capture this in stage 2 specification. Understanding is that alignment means that the cell DTX/DRX and C-DRX periodicity should be multiple of each other. FFS if we anything needs to be specified in stage 3 (i.e. in IE description) |
| CEWiT | (1) MAC-CellGroupConfig– *MAC-CellGroupConfig*The IE *MAC-CellGroupConfig* is used to configure MAC parameters for a cell group, including DRX and cell DTX/DRX.Editor’s note: FFS whether the Cell DTX/DRX configuration and activation is per MAC entity or per serving cell.- We think that the *cellDTX-Config* can be relocated to *ServingCellConfig*, based on per cell configuration. | **Issue 1:** cellDTX-Config may be relocated to *ServingCellConfigCommon*, depending on per cell vs per MAC entity configuration. |
| Apple | 1) On field description of ‘*cellBarred* under *SIB1,* we agree with Samsung that it is better to avoiddiscussing the definition of ‘non-NES-capable UE’. Thus, we agree with their suggested change:*"*This field is ignored by non-NES-capable UEs." -> to modify ‘This field is only applicable to NES-capable UEs’.2) We see multiple suggestions/comments to simplify *cellDTX-Config* and *cellDRX-Config.* We share some sympathy and think the IE structure can be simplified in below way: * Introduce one separate IE (e.g. *cellDTXDRX-commonParameters*) for common parameters of Cell DTX and Cell DRX (at least including agreed On-duration and Cycle parameters, and potential offset if agreed in upcoming meeting).
* Introduce a top level IE *CellDTXDRX-Config* which includes the common parameter IE for On-duration and Cycle parameters and a ENUMERATED IE to select among jointDTX/DRX, or onlyDTX or only DRX (as agreed in last RAN2 meeting).

 For example:*CellDTXDRX-Config* information element-- ASN1START-- TAG-CELLDTXDRX-CONFIG-STARTCellDTXDRX-Config-r18 ::= SEQUENCE { cellDTXDRX-commonParameters-r18 cellDTXDRX-commonParameters-r18,  CellDTXDRX-mode-r18 ENUMERATED {jointCellDTXDRX, onlyCellDTX, onlyCellDRX} }CellDTXDRX-commonParameters-r18 ::= SEQUENCE { celldtxdrx-onDurationTimer-r18 CHOICE { subMilliSeconds INTEGER (1..31), milliSeconds ENUMERATED { ms1, ms2, ms3, ms4, ms5, ms6, ms8, ms10, ms20, ms30, ms40, ms50, ms60, ms80, ms100, ms200, ms300, ms400, ms500, ms600, ms800, ms1000, ms1200, ms1600, spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1 } } OPTIONAL, -- Need M  celldtxdrx-CycleStartOffset-r18 CHOICE { ms10 INTEGER(0..9), ms20 INTEGER(0..19), ms32 INTEGER(0..31), ms40 INTEGER(0..39), ms60 INTEGER(0..59), ms64 INTEGER(0..63), ms70 INTEGER(0..69), ms80 INTEGER(0..79), ms128 INTEGER(0..127), ms160 INTEGER(0..159), ms256 INTEGER(0..255), ms320 INTEGER(0..319), ms512 INTEGER(0..511), ms640 INTEGER(0..639), ms1024 INTEGER(0..1023), ms1280 INTEGER(0..1279), ms2048 INTEGER(0..2047), ms2560 INTEGER(0..2559), ms5120 INTEGER(0..5119), ms10240 INTEGER(0..10239) } OPTIONAL, -- Need M celldtxdrx-SlotOffset-r18 INTEGER (0..31) }-- TAG-CELLDTXDRX-CONFIG-STOP-- ASN1STOP | **Issue 1:** Agree to this change.**Issue 2:** I generally agree that in the current CR the signaling is suboptimal. But before making major changes I wanted RAN2 to conclude on the FFS issues like the need of a separate start offset for cell DTX and cell DRX, and a need of a standalone cell DRX configuration, which will be listed in the RRC CR open issues. We can make the signaling optimizations after those decisions are made.  |
| Nokia | “NES capable” is fine for this CR (also mentioned in 38.304 that we should have similar FFS as you have in this CR regarding “what NES-capable means”. I would guess we would just refer to appropriate UE capability once we have those.Regarding barring, you should add that NES-capable ignores legacy *cellBarred* if *cellBarredNES* is present. Otherwise legacy barring will bar the cell although intention is to allow NES capable UE to camp on that if new barring is present and indicating notBarred.Regarding NES CHO – I think we could already based on the agreements capture how to model the CHO even if we don’t have actual NES trigger yet. Simplest seems to have a extensions for existing events (see R2-2307766). If you have better idea how to configure feel free to capture those as a rapporteur. And then in CHO procedural text (5.3.5.13.4 Conditional reconfiguration evaluation) we would just have two separate bullets for “if the condEventId is associated with condEventA3, condEventA4 or condEventA5” – one with NES and one without NES (existing “legacy” one) i.e. new condition would be only fulfilled if also “NES CHO” indication is given to the UE. Agree to introduce explicit indication of activation or deactivation upon configuration of Cell DTX/DRX now that we have introduced L1 signalling on top. It could be leave to NW implementation to configure it as activated or deactivated upon configuration. | **Issue 1:** In which section do you see this change needed? What is your suggested solution?**Issue 2:** I believe other companies have different solutions in mind than extensions of the CondEvent A3 for NES (like adding a separate list of MeasIds for NES CHO) so I don’t see currently a good way to implement it openly enough. **Issue 3:** I have added this as an open issue and we can discuss the implicit indication of activation/deactivation during the meeting. |
| Sharp | For *cellBarredNES* in SIB1, open to further discuss NES+RedCap UE. But for the last row in the table, we think NES+RedCap UE should follow *cellBarred* in MIB as RedCap UE. Then seems the current description in running CR has covered this case. |  |
| Ericsson | 1. On cellBarredNES*:*
	1. We agree with Samsung’s suggestion on changing "This field is ignored by non-NES-capable UEs." to “This field is only applicable to NES-capable UEs”, since this would simplify the wording;
	2. Also agree with ZTE that field description should say “If not present, the NES-capable UEs shall ignore the MIB cellBarred indication”. In fact, we understand that the intention with barring is only to prevent legacy UEs from accessing the cell, so additionally, we should also change the cellBarred field to ENUMERATED {true} and only include it when the NW does want NES-capable UEs to access the cell while barring legacy ones.
2. On cellDTXDRX:
	1. All fields seem to be optional now for cell DTX/DRX configuration, while for UE C-DRX only short DRX is optional – we do not see a need to deviate from the previous structure, this is already wrapped in SetupRelease which allows delta configuration on the IE level; there is no need to have optional fields therein, we can just have them mandatory as for the UE C-DRX structure;
	2. We also agree with Apple’s suggestion to include a single IE that includes common fields. But we may not need ENUMERATED {jointCellDTXDRX, onlyCellDTX, onlyCellDRX}, and can rely on different offsets for DTX and DRX – e.g. if the offset for DTX is present, the configuration is applied to DTX, if the offset for DRX is present, the configuration is applied to DRX.
 | **Issue 1(a):** Agree.**Issue 1(b):** I am not sure that this wording captures our agreement correctly:“The NES UE always follows the NES bit used for barring, if present. If not present the UE shall follow legacy barring.” The second part of the agreement is reflected in the current wording for *cellBarredNES*.Do you mean to change the *cellBarredNES* to a bit that states that the NES-capable UE is allowed? We are open to discuss this matter.**Issue 2(a):** In making them optional we wanted to enable changing e.g. only one parameter without the need of signaling all of them. To clarify this scenario we can add a description to the parameter, e.g. ”if the parameter is not present, the UE should follow the previously stored one.”. We can also discuss this as an open issue.**Issue 2(b):** I generally agree that in the current CR the signaling is suboptimal. But before making major changes I wanted RAN2 to conclude on the FFS issues like the need of a separate start offset for cell DTX and cell DRX, and a need of a standalone cell DRX configuration, which will be listed in the RRC CR open issues. We can make the signaling optimizations after those decisions are made. |
| OPPO | 1. Similar view as the above companies, that 1) it is already agreed that the activation of cell DTX/DRX is per cell, the FFS part is only for the configuration of cell DTX/DRX. 2) if the per-cell configuration is eventually agreed, MAC-CellGroupConfig will not be a suitable father IE to include cell DTX/DRX config.

– MAC-CellGroupConfigThe IE MAC-CellGroupConfig is used to configure MAC parameters for a cell group, including DRX and cell DTX/DRX.Editor’s note: FFS whether the Cell DTX/DRX configuration and activation is per MAC entity or per serving cell.1. On “cellBarredNES”, we agree with companies to use "This field is only applicable to NES-capable UEs" instead of "This field is ignored by non-NES-capable UEs.", to avoid discussing the definition of ‘non-NES-capable UE’ as well as align with TS 38.304.

BTW, we do not agree with the addition of “NES-capable ignores legacy cellBarred if cellBarredNES is present”， since RAN2 has not achieved such an agreement till now.1. On whether to have an explicit indication to use the L1 signalling-based cell DTX/DRX activation/deactivation mechanism, we think further discussion is needed in RAN2, since the implicit indication can also be considered.
 | **Issue 1:** cellDTX-Config may be relocated to *ServingCellConfigCommon*, depending on per cell vs per MAC entity configuration.**Issue 2:** Agree.Regarding the BTW comment, the current agreement is that: “The NES UE always follows the NES bit used for barring, if present. If not present the UE shall follow legacy barring.”**Issue 3:** This will be added as an open issue. |
| CATT | (1) Regarding Vodafone and Nokia’s comments on the need for the activated/not-activated bit in RRC configuration: RAN1 agreed “Higher layer signaling configures whether the activation/deactivation of cell DTX and/or cell DRX is indicated in DCI format 2\_X for a serving cell”. So RAN2 should first discuss whether we introduce an RRC activating indicator on top of the RAN1’s higher layer signalling (saying that the activation/deactivation of cell DTX/DRX is indicated by DCI). In other words, do we need to support both RRC activation/deactivation and L1 activation/deactivation to be utilized simultaneously?(2) Regarding Cell DTX/DRX configuration, we have sympathy with Apple’s approach to define the common parameters only once, to avoid confusion. We could even go with a simpler approach as follows:–                      *CellDTX-DRX-Config*The IE *CellDTX-DRX-Config* is used to configure cell DTX/DRX related parameters. ~~Cell DTX is activated implicitly once configured by the network.~~Editor’s note: The focus was on the case where DTX/DRX in RRC can only be configured when C-DRX is configured, FFS whether it is captured in RRC.*CellDTX-DRX-Config* information element-- ASN1START-- TAG-CELLDTX-CONFIG-STARTCellDTX-DRX-Config-r18 ::=                  SEQUENCE {    cellDTX-DRX-onDurationTimer-r18             CHOICE {                                            subMilliSeconds INTEGER (1..31),                                            milliSeconds    ENUMERATED {                                                ms1, ms2, ms3, ms4, ms5, ms6, ms8, ms10, ms20, ms30, ms40, ms50, ms60,                                               ms80, ms100, ms200, ms300, ms400, ms500, ms600, ms800, ms1000, ms1200,                                                ms1600, spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1 }                                            }                                            OPTIONAL,  -- Need M    cellDTX-DRX-CycleStartOffset-r18        CHOICE {        ms10                                INTEGER(0..9),        ms20                                INTEGER(0..19),        ms32                                INTEGER(0..31),        ms40                                INTEGER(0..39),        ms60                                INTEGER(0..59),        ms64                                INTEGER(0..63),        ms70                                INTEGER(0..69),        ms80                                INTEGER(0..79),        ms128                               INTEGER(0..127),        ms160                               INTEGER(0..159),        ms256                               INTEGER(0..255),        ms320                               INTEGER(0..319),        ms512                               INTEGER(0..511),        ms640                               INTEGER(0..639),        ms1024                              INTEGER(0..1023),        ms1280                              INTEGER(0..1279),        ms2048                              INTEGER(0..2047),        ms2560                              INTEGER(0..2559),        ms5120                              INTEGER(0..5119),        ms10240                             INTEGER(0..10239)    }                                                                                    OPTIONAL,  -- Need M    cellDTX-DRX-SlotOffset-r18              INTEGER (0..31)                                  OPTIONAL,  -- Need M~~jointC~~cellDTX-DRXconfig-r18           ENUMERATED {~~true~~dtx, drx, both},                    ~~OPTIONAL   -- Need M~~(FFS)celldrx-FurtherOffset-r18         INTEGER (0..31)                                  OPTIONAL  -- Need M}1. Also agree with above concerns on cell barring. Specifically, with below text, if the cell is barred in MIB, the cell is always considered barred regardless of the outcome of SIB1 check for NES-capable UEs.

2> if the *cellBarred* in the acquired *MIB* is set to *barred*:3> if the UE is a RedCap UE, or a NES-capable UE, and *ssb-SubcarrierOffset* indicates *SIB1* is transmitted in the cell (TS 38.213 [13]):4> acquire the *SIB1,* which is scheduled as specified in TS 38.213 [13];3> consider the cell as barred in accordance with TS 38.304 [20]; | **Issue 1:** The explicit bit in RRC topic will be added to the open issues list. Also, as replied to Vodafone there is a parameter *positionInDCI-cellDTRX* from RAN1 which will be implemented later in RRC. The presence of this parameter explicitly means that the NW supports and intends to use the L1 indication. If it is absent it is clear that L1 will not be used.**Issue 2:** We are fine to simplify the configuration once all details are agreed. This topic will be added to the open issues list.**Issue 3:** I understand the issue. Do you have a suggested solution? |
| Lenovo | 1. About barring: We need to be clear if we want to “bypass” MIB barring and just be regulated using SIB1 (NES) barring like NTN or rather MIB barring remains as for non-NES UEs and the SIB1 barring is on-top. We prefer the latter.
2. About CHO: We are fine with Rapporteur’s current approach of just using future placeholder for NES CHO procedure. Though we can anticipate the normative specification will be similar to as Nokia has indicated above.
 | **Issue 1:** I believe the intention of the agreement was the latter option mentioned. “The NES UE always follows the NES bit used for barring, if present. If not present the UE shall follow legacy barring.” It is not completely ignoring the MIB *cellBarred*, as it should be used if *cellBarredNES* is not present. |
| LGE | 1) Regarding the field description of cellBarredNES under SIB1,We support the rewording from "This field is ignored by non-NES-capable UEs." to “This field is only applicable to NES-capable UEs”2) On the codepoint of cellBarredNES, we see the actual valid use case is to set cellBarred NES as notBarred while setting cellBarred in MIB as notBarred, and we do not see the opposite case (cellBarredNES=barred, while cellBarred in MIB = notBarred) as practical use case. If other companies agree with this, we can change it to have a single code point, i.e., ENUMERATE {notBarred} For RedCap+NES, we need to discuss this at RAN2#123bis. No need to discuss and conclude in the email discussion. | **Issue 1:** Agree.**Issue 2:** Single codepoint for *cellBarredNES* is added to the open issues list.  |
| Apple2 | The latest CR looks good. We have only one comment:I see Rapporteur changed IE name from jointCellDTXDRXconfig-r18 to sameCellDTXDRXconfig-r18. We think the change of name (esp. wording "same") may misunderstand people that NW can configure different parameters (e.g. on-duration) for Cell DTX and Cell DRX when both are configured. But we believe the real intention is to configure whether Cell DTX and Cell DRX are jointly configured or only Cell DTX (per RAN2#123 agreement). Thus, we prefer to keep previous name (jointCellDTXDRXconfig-r18)  | The change was made in response to Samsung issue 3 that this indicator means that those two configurations are the same, which was not clear with the name “joint”. As agreed the only parameter that can be different between cell DTX and DRX is startOffset (and slotOffset). From the field description it should be clear that the NW cannot configure different e.g. on-duration. We can leave the previous cell DRX onDuration description. We are fine to further simplify the configuration once all details are agreed. |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Cell barred in MIB | Cell barred for RedCap | Legacy UE (except RedCap UE ) | RedCap UE | Cell barred NES | NES UE | NES + RedCap UE |
| barred | barred | Access not allowed  | Access not allowed | barred | Access not allowed | Access not allowed |
| Not barred | Access allowed | Access not allowed |
| barred  | Not barred | Access not allowed | Access not allowed | barred | Access not allowed | Access not allowed |
| Not barred | Access allowed | Access allowed |

# 4 Conclusion

Based on the discussion in the previous sections we propose the following:

**Proposal 1** The Cell DTX/DRX configuration is provided per Serving Cell with the following restrictions:

* + - The UE will not be required to follow more than 2 active patterns of cell DTX/DRX, regardless of the number of servings cells.
		- The two configured active patterns should be aligned, i.e. one periodicity is an integer multiple of the other.

# 5 References

1. RP-223540, “New WID: Network energy savings for NR”, Huawei
2. 3GPP TR 38.864 V1.0.0, “Study on network energy savings for NR (Release 18)”
3. R2-2308963, “Report from Session on NES, UAV, Rel-15-17 UP, Rel-17 Small Data, IIoT/URLLC, and RACH partitioning”, Session Chair (InterDigital)