3GPP TSG-RAN WG2 #111-e R2-200xxxx

Electronic, 17th – 28th Aug, 2020

Agenda Item: 6.5.2

Source: Ericsson

Title: Summary on [AT111e][031][IIOT] RRC Corrections (Ericsson)

Document for: Discussion, Decision

# 1 Introduction

This document summarizes the first phase of the following at-meeting email discussion:

**[AT111-e][031][IIOT] RRC Corrections (Ericsson)**

Scope: Treat R2-2006888, 6710/6711, 6828, 6727, 7142/7151, 7388. Determine agreeable parts in a first phase, PDCP duplication part that overlaps with stage-2 discussion should await conclusions first. Agree CRs in a second phase

Deadline: Aug 26 0900 UTC. Intermediate deadlines by Rapporteur if needed.

The paper R2-2006710 is withdrawn and not included in this email discussion. The papers R2-2006712, R2-2007527 and R2-2008055 [3][4][5] are also included in the discussion for SPS periodicities in section 2.2.

The technical part of the paper R2-2007388 [11] overlaps with the email discussion [AT111-e][043][IIOT] Stage 2, DC CA duplication clarifications (Nokia). The proposal in R2-2007388 will be considered afterwards in the second phase of the CR discussion of this email discussion.

# 2 Discussion

## 2.1 Miscellaneous Editorial Corrections

This session discusses the paper R2-2006888 [1].

In the legacy Rel-15 procedure text, *drb-ContinueROHC* is indicated to lower layer before PDCP reestablishment, as written in the sub-clause 5.3.5.6.5. In Rel-16, *drb-continueEHC-DL* and *drb-continueEHC-UL* can also be configured in *PDCP-config* and the same principle is applied. To be consistent with the legacy text, the proposal is to add these procedure text as below. This way, it is ensured that UE applies PDCP procedures according to *drb-continueEHC-DL* and *drb-continueEHC-UL* during the PDCP re-establishment according to the RRC configuration provided together with the PDCP re-establishment command. This ensures that network and UE have the assumptions on the PDCP procedures executed at PDCP re-establishment (which would not be the case if the UE applied the configuration only after PDCP re-establishment procedure).

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| 5.3.5.6.5 DRB addition/modification  other parts omitted  3> if *drb-ContinueROHC* is included in *pdcp-Config*:  4> indicate to lower layer that *drb-ContinueROHC* is configured;  3> if *drb-ContinueEHC-DL* is included in *pdcp-Config*:  4> indicate to lower layer that *drb-ContinueEHC-DL* is configured;  3> if *drb-ContinueEHC-UL* is included in *pdcp-Config*:  4> indicate to lower layer that *drb-ContinueEHC-UL* is configured;  3> re-establish the PDCP entity of this DRB as specified in TS 38.323 [5], clause 5.1.2; |

1. Add the procedure text that if *drb-continueEHC-DL* is included in *pdcp-Config*, then it indicates to the lower layer before PDCP re-establishment. The same change applies for *drb-continueEHC-UL.*

Question 1: Do you support proposal 1?

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| **Company** | **Support P-1 (y/n)** | **Additional comments** |
| LG | y |  |
| Samsung | y |  |
| vivo | y |  |
| Nokia | y |  |
| OPPO | y |  |
| ZTE | y |  |
| MediaTek | y |  |
| Huawei | y |  |
| DOCOMO | y |  |
| Sharp | y |  |
| CATT | y |  |
| Intel (Yujian Zhang; yujian.zhang@intel.com) | y |  |
| Sequans (Olivier) | y |  |

Multiple CG/SPS configurations are configured by ToAddModList/ToReleaseList in the respective BWP uplink/downlink dedicated IEs. The restriction related with the release command (i.e., the NW may release a CG/SPS configuration at any time) is, however, added in the field description of ToAddModList. The proposal is to move the description to the field description of ToReleaseList.

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| ***Sps-ConfigToAddModList***  Indicates a list of one or more DL SPS configurations to be added or modified in one BWP. Except for reconfiguration with sync, the NW does not reconfigure a SPS configuration when it is active (see TS 38.321 [3]). |
| ***Sps-ConfigToReleaseList***  Indicates a list of one or more DL SPS configurations to be released. The NW may release a SPS configuration at any time. |
| ***configuredGrantConfigToAddModList***  Indicates a list of one or more configured grant configurations to be added or modified for one BWP. Except for reconfiguration with sync, the NW does not reconfigure a Type 2 configured grant configuration when it is active (see TS 38.321 [3]). |
| ***configuredGrantConfigToReleaseList***  Indicates a list of one or more UL Configured Grant configurations to be released. The NW may release a configured grant configuration at any time. |

1. Move the field description that ”The NW may release a SPS configuration at any time.” from ToAddModList to ToReleaseList for SPS. The same change applies for configured grant configuration.

Question 2: Do you support proposal 2?

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| **Company** | **Support P-2 (y/n)** | **Additional comments** |
| LG | y |  |
| Samsung | y |  |
| vivo | y |  |
| Nokia | y |  |
| OPPO | y |  |
| ZTE | y |  |
| MediaTek | y |  |
| Huawei | y |  |
| DOCOMO | y |  |
| Sharp | y |  |
| CATT | y |  |
| Intel | y |  |
| Sequans | y |  |

In SPS-Config, if the field *pdsch-AggregationFactor* is absent, the UE applies PDSCH aggregation factor signalled in PDSCH-Config. However, pdsch-AggregationFactor may not be signaled in PDSCH-Config and in such case the value n1 is applied. The wording “signalled” is not precise. The proposal is to clarify in the field description that pdsch-AggregationFactor in SPS-Config, if absent, applies the value in PDSCH-Config.

Field description in PDSCH-Config

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| ***pdsch-AggregationFactor***  Number of repetitions for data (see TS 38.214 [19], clause 5.1.2.1). When the field is absent the UE applies the value 1. |

Field description in sps-Config

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| ***pdsch-AggregationFactor***  Number of repetitions for SPS PDSCH (see TS 38.214 [19], clause 5.1.2.1). When the field is absent, the UE applies PDSCH aggregation factor of PDSCH-Config. |

1. Clarify in the field description that ”If the field pdsch-AggregationFactor is absent in sps-Config, then UE applies PDSCH aggregation factor of PDSCH-Config.”

Question 3: Do you support proposal 3?

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| **Company** | **Support P-3 (y/n)** | **Additional comments** |
| LG | y |  |
| Samsung | y | Since it may not be signaled, it’s better to delete “signaled in” |
| vivo | y |  |
| Nokia | y |  |
| OPPO | y |  |
| ZTE | y |  |
| MediaTek | Y |  |
| Huawei | y |  |
| DOCOMO | y |  |
| Sharp | y |  |
| CATT | y |  |
| Intel | y |  |
| Sequans | y |  |

## 2.2 SPS periodicity

This session discusses the papers R2-2006711 [2], R2-2006712 [3], R2-2007527 [4] and R2-2008055 [5].

As described in [2], in Rel-15, the SPS periodicities in RRC are expressed by the unit of millisecond. In Rel-16, the SPS periodicities have been extended and can take any integer-multiple of one slot below a maximum value. In RRC spec, *periodicityExt* is defined for configuring SPS periodicity in number of slots. When the field *periodicityExt* is present, the field periodicity is ignored.

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| ***periodicityExt***  This field is used to calculate the periodicity for DL SPS (see TS 38.214 [19] and see TS 38.321 [3], clause 5,8.1). If this field is present, the field *periodicity* is ignored.  The following periodicities are supported depending on the configured subcarrier spacing [slots]:  15 kHz: *periodicityExt*, where *periodicityExt* has a value between 1 and 640.  30 kHz: *periodicityExt*, where *periodicityExt* has a value between 1 and 1280.  60 kHz with normal CP: *periodicityExt*, where *periodicityExt* has a value between 1 and 2560.  60 kHz with ECP: *periodicityExt*, where *periodicityExt* has a value between 1 and 2560.  120 kHz: *periodicityExt*, where *periodicityExt* has a value between 1 and 5120. |

In the MAC spec, two equations are defined, one for periodicity expressed in milliseconds and another one for periodicity expressed in slots.

Periodicity in milliseconds:

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| For configured downlink assignments without *harq-ProcID-Offset*, the HARQ Process ID associated with the slot where the DL transmission starts is derived from the following equation:  HARQ Process ID = [floor (CURRENT\_slot × 10 / (*numberOfSlotsPerFrame* × *periodicity*))] modulo *nrofHARQ-Processes*  where CURRENT\_slot = [(SFN × *numberOfSlotsPerFrame*) + slot number in the frame] and *numberOfSlotsPerFrame* refers to the number of consecutive slots per frame as specified in TS 38.211 [8]. |

Periodicity in slots:

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| For configured downlink assignments with *harq-ProcID-Offset*, the HARQ Process ID associated with the slot where the DL transmission starts is derived from the following equation:  HARQ Process ID = [floor (CURRENT\_slot / *periodicity*)] modulo *nrofHARQ-Processes* + *harq-ProcID-Offset*  where CURRENT\_slot = [(SFN × *numberOfSlotsPerFrame*) + slot number in the frame] and *numberOfSlotsPerFrame* refers to the number of consecutive slots per frame as specified in TS 38.211 [8]. |

Email discussion rapporteur first understands that in MAC spec *periodicity* here refers to both the legacy Rel-15 field *periodicity* and the extend field *periodicityExt* in Rel-16. The equation for periodicity in slots is added in Rel-16. The use of this equation relies on a simultaneous configuration of *harq-ProcID-Offset* and *periodicityExt*. This may not always be feasible, in particular due to that multiple SPS support (which motivates the support of process ID offset) and the extended periodicities support are two separate UE capabilities [12][13].

As proposed in [2][3] and hinted by [5], one solution is to change the unit of extended SPS periodicity to milliseconds in RRC [2] and re-use the Rel-15 HARQ process ID equation in MAC as proposed in [3]. The changes in paper [4] avoid RRC changes by keeping the unit of slots but has more MAC changes by listing all possible HARQ process ID calculation formula under different configurations. Both solutions are essentially editorial and are technically equivalent. From spec rapporteur point of view, a simpler solution of changing the unit of extended periodicities to milliseconds is preferred.

1. Change the unit of the extended SPS periodicity (i.e., RRC field *periodicityExt*) from slot to milliseconds.

Question 4: Do you support proposal 4?

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| **Company** | **Support P-4 (y/n)** | **Additional comments** |
| LG | y |  |
| Samsung | y |  |
| vivo | y |  |
| Nokia | y |  |
| OPPO | y |  |
| ZTE | n | We had already achieved the following agreements in RAN2#108:   * In Rel-16, SPS periodicities in RRC are expressed in number of slots.   I would like to suggest to insist on the achieved agreements. Considering the there is another option can be going for,if no critical issue, there is no need for us to reverse the previous agreement. |
| MediaTek | Y | As both options are technically equivalent, we prefer the rapporteur’s proposal as it result in simpler specifications that are easier to read. |
| Huawei | y |  |
| DOCOMO | y |  |
| Sharp | y |  |
| CATT | y |  |
| Intel | y |  |
| Sequans | n | We would prefer an alternative solution where periodicity is always in slot in MAC (which also aligns with UL).  E.g. add this in MAC and update the formulas  *periodicity*: periodicity of configured downlink assignment for SPS, in slots (if RRC periodicity was in ms, periodicity = RRC periodicity x numberOfSlotsPerFrame/10) |

## 2.3 A clarification of pdcp-Duplication field

As indicated in [9][10], in the pdcp-Duplication (an optional IE included in pdcp-Config) field descriptions, it states that for PDCP entity with more than two associated RLC entities, pdcp-Duplication is always present. However, RLC entities can be un-directional for downlink only, and so for a split bearer in Rel-15, four UM RLC entites can be configured with two for each direction. In such a case, pdcp-Duplication is not required to be mandatorily present. The proposal is to clarify in the field descripion that the pdcp-Duplication is always present if there are more than two RLC entities **for UL transmission**.

1. Clarify, in the field decription of pdcp-Duplication, that it is always present when PDCP entity is configured with more than two associated RLC entities for UL transmission.

Question 5: Do you support proposal 5?

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| **Company** | **Support P-5 (y/n)** | **Additional comments** |
| LG | y |  |
| Samsung | y |  |
| vivo | y |  |
| Nokia | y |  |
| OPPO | y |  |
| ZTE | y |  |
| MediaTek | y |  |
| Huawei | y |  |
| DOCOMO | y |  |
| Sharp | y |  |
| CATT | y |  |
| Intel | y |  |
| Sequans | y |  |

## 2.4 Field description of configuredGrantConfig and SPS-Config

This session discusses the paper R2-2006828 [6]. In [6], it is written that

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| In RAN2#109bis-e meeting, it was agreed that:   * **[026] ConfiguredGrantConfig and ConfiguredGrantConfigList in BWP-UplinkDedicated cannot be configured simultaneously at a given time.** * **[026] SPS-Config and SPS-ConfigList in BWP-DownlinkDedicated cannot be configured simultaneously at a given time.**   The intention is that *ConfiguredGrantConfig* and *ConfiguredGrantConfigList* shall not be configured simultaneously within the MAC entity. Such restriction has been added to the field description of *configuredGrantConfig* under *BWP-UplinkDedicated* IE. There may exist misinterpretation that *configuredGrantConfig* and *configuredGrantConfigList* shall not be configured simultaneously within an UL BWP, instead of within the MAC entity. For example, *configuredGrantConfig* is used in one UL BWP, while *configuredGrantConfigList* is used in another UL BWP. In order to clarify, the field description of c*onfiguredGrantConfig* under *BWP-UplinkDedicated* IE can be refined.  Similar ambiguities exist for SPS, i.e. *sps-Config* and *sps-ConfigToAddModList* shall not be configured simultaneously within a DL BWP, instead of within the MAC entity. |

First of all, from the proposal 4 in the paper [7] that leads to the above agreements, the intention (RRC rapporteur’s understanding) is that the CG/SPS-Config and the CG/SPS-ConfigList cannot be configured simulteanously at a given time **in one BWP**.

For the sake of discussion, we use SPS-Config in the below and the same applies for configuredGrantConfig. There are indeed issues if both SPS-Config and SPS-ConfigToAddModList/SPS-ConfigToReleaseList are used in one BWP. The problem is that SPS-ConfigIndex-r16 is mandatory present in the sps-ConfigToAddModList-r16, while absent otherwise. If both used in one BWP, it is not clear which SPS configurations the SPS-Config refers to.

sps-ConfigIndex-r16 SPS-ConfigIndex-r16 OPTIONAL, -- Cond SPS-List

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| ***sps-ConfigIndex***  Indicates the index of one of multiple SPS configurations. |

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| **Conditional Presence** | **Explanation** |
| *SPS-List* | The field is mandatory present when included in *sps-ConfigToAddModList-r16*, otherwise the field is absent. |

There is no confusion if the network uses the SPS-Config in one BWP while it uses SPS-ConfigToAddModList/SPS-ConfigToReleaseList in another BWP. In the BWP with SPS-Config, it is understood that there is only one SPS configuration in that BWP. In other words, the current RRC spec is not broken. One can argue that this mixure of different configuration methods in one MAC entity is not clean.

There may be other complications of adopting the CR [7]. RAN1 has defined the support of multiple SPS configurations as per band instead of per UE [12]. It can happen that in one cell, UE supports multiple SPS configurations while in the other cell, UE does not support multiple SPS configurations. The CR mandates that network uses the configuration by sps-ConfigToAddModList/-ToReleaseList for all cells. But, it is not clear if UE understands a configuration by sps-ConfigToAddModList/-ToReleaseList in one cell if it does not support multiple configurations in that cell. It is not clear either the value for sps-ConfigIndex-r16 (any value or a default value of 0) in such cell.

As both options have pros and cons and there are unclarities beyond rapportuer’s understanding, it would be good to check among the companies. There are two options:

1. Network does not configure *sps-Config* simultaneously with sps-ConfigToAddModList/-ToReleaseList **in one BWP**. The same restriction applies for configured grant configuration.
2. Network does not configure *sps-Config* simultaneously with sps-ConfigToAddModList/-ToReleaseList **in one MAC entity**. It is assumed that UE understands a configuration by ToAddModList/ToReleaseList in the BWP in which UE does not indicate the support of multiple configurations in that BWP. The same restriction applies for configured grant configuration.

Question 6: What is your preference, option 1 or option 2? Additional comments are appreciated.

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| **Company** | **Option 1 or option 2** | **Additional comments** |
| LG | Option 1 | We think option 2 is not correct because it imposes unnecessary restriction, i.e. all cells belonging to one MAC entity shall be configured either with only one CG/SPS or with multiple CG/SPS. |
| Samsung | Option 1 | SPS/CG is configured per BWP. Thus, the restriction on simultaneous configuration should be per BWP. It should be noted that it is possible to use SPS-Config in one BWP and SPS-ConfigToAddModList/SPS-ConfigToReleaseList in the other BWP. |
| vivo | Double check with RAN1 | We consider that if RAN1 supports the cross BWP/cell activation/deactivation of the SPC/CG configuration, we may need to have such restriction in one MAC entity, as the new multiple CG/SPS configuration may need the DCI to indicate the CG/SPS index which is not applicable for the legacy CG/SPS configuration. |
| Nokia | Option 1 | Our understanding is similar to LG and Samsung, different BWPs for one MAC entity could be configured differently. So “per-BWP restriction” makes more sense. |
| OPPO | Option 1 | We share the same view as LG, Samsung and Nokia. |
| ZTE | Option 1 |  |
| MediaTek | Option 2 | We prefer option 2 as it is the cleaner option. Having R15 and R16 SPS/CG configurations ongoing simultaneously in different cells is a recipe for inter-operability disaster, and likely to trigger extensive discussions in 3GPP.  At least in RAN2, we have the following question: which confirmation MAC CE is to be used when CGs are activated on multiple cells?  Similarly, R1 would need to check whether there are issues with regards to SPS activation/deactivation DCI and the corresponding HARQ codebook creation for release confirmation, when both R15 and R16 SPS co-exist in the same cell group. |
| Huawei | Option 2 | We can accept option 1 if issue in below section 2.5 is solved. |
| DOCOMO | Option 1 | Since SPS/CG is configured per BWP. |
| Sharp | Option 1 |  |
| CATT | Option 1 | The SPSs/CGs are configured in each BWP independently. |
| Intel | Option 1 | We share similar view as LG and Samsung. |

## Conditional presence of configuredGrantConfigIndexMAC-r16

This session discusses one minor issue identified during the preparation of this email discussion. In *ConfiguredGrantConfig*, the conditional presence for configuredGrantConfigIndex-r16 and configuredGrantConfigIndexMAC-r16 is *CG-List*

configuredGrantConfigIndex-r16 ConfiguredGrantConfigIndex-r16 OPTIONAL, -- Cond CG-List

configuredGrantConfigIndexMAC-r16 ConfiguredGrantConfigIndexMAC-r16 OPTIONAL, -- Cond CG-List

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| **Conditional Presence** | **Explanation** |
| *CG-List* | The field is mandatory present when included in *configuredGrantConfigToAddModList-r16*, otherwise the field is absent. |

The field configuredGrantConfigIndexMAC-r16 can be used in *allowedCG-List-r16* for LCP restriction. From [12][13], there are two separate UE capability bits, one for multiple CG configuration and another one for *lch-ToConfiguredGrantMapping-r16*. For a UE that does not support multiple configurations, network must use ToAddModList to configure *allowedCG-List* according to the current conditional presence. This is similar to the unclarity identified in section 2.4, in which it is not clear if UE can understand ToAddModList if it does not support multiple SPS/CG configurations. Regardless of what is support or not, from RRC rapporteur point of view, the easiest and the safest approach is to decouple this dependency. The other approach is that no change is needed with the assumption that UE understands the configuration by ToAddModList even if it does not support multiple Configured Grant configurations in that BWP.

1. Change the conditional presence for the field *configuredGrantConfigIndexMAC-r16* to that “The field is mandatory present when included in configuredGrantConfigToAddModList-r16, otherwise **the field is optionally present, need R.**”
2. No change is needed with the assumption that UE understands a configuration by ToAddModList in the BWP even if it does not support multiple Configured Grant configurations in that BWP.

Question 7: What is your preference, option 1 or option 2? Additional comments are appreciated.

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| **Company** | **Option 1 or option 2** | **Additional comments** |
| LG | Option 1 |  |
| Samsung | Option 1 | configuredGrantConfigIndexMAC-r16 needs to be configured for single configuration in a BWP. Decoupling is safer. |
| vivo | Option 1 |  |
| Nokia | Option 1 |  |
| OPPO | Option 1 |  |
| ZTE | Option 1 |  |
| MediaTek | Option 2 (no change to the spec as no issue to resolve) | If the UE does not support multiple CGs, why would LCH to CG mapping restrictions be needed? We can rely on R15 LCH restrictions to achieve the same end result (i.e. CG restriction, SCell restriction and so on).  We do not see an issue to resolve here. |
| Huawei | Option 1 | We propose the sentence “The field is mandatory present when included in configuredGrantConfigToAddModList-r16, otherwise the field is optionally present, need R.” can be “The field is mandatory present when configuredGrantConfigToAddModList-r16 is configured in at least one BWP in the same MAC entity ~~included in configuredGrantConfigToAddModList-r16~~, otherwise the field is optionally present, need R.” |
| DOCOMO | Option 1 |  |
| Sharp | Option 1 |  |
| CATT | Option 1 |  |
| Intel | Option 1 |  |

## 2.6 Field description of ethernetHeaderCompression

This session discussed the paper R2-2006727[8].

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| In RAN2#108, it was agreed that:   * **The EHC algorithm is not allowed to be configured for a uni-directional link.**   However, such restriction has not been reflected in the current specs. It is better to capture the above agreement in RRC spec.  The proposed change:  In the field description of *ethernetHeaderCompression*, the sentence “This field can only be configured for DRB.” Is changed to “This field can only be configured for a bi-directional DRB, i.e. an AM DRB or a UM DRB configured with UL RLC entity and DL RLC entity.” |

As there are PDCP control PDUs carrying the EHC feedback, EHC algorithm does not work with a uni-directional link. As written in the clause A.1 of TS 38.323, “The EHC compressor keeps transmitting the FH packets until the EHC feedback is received from the EHC decompressor”. This clarification for EHC seems to be related with a wrong network configuration and thus not necessary. The intention of the CR is not clear from the email discussion rapporteur point of view.

As there may be misunderstandings, it would be good to check among companies. There are two options:

1. Capture by RRC field descripton that “EHC algorithm is not allowed to be ajorities for a uni-directonal link.“
2. No need to capture **“**EHC algorithm is not allowed to be ajorities for a uni-directonal link.”

Question 8: What is your preference, option 1 or option 2?

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| **Company** | **Option 1 or option 2** | **Additional comments** |
| LG | Option 1 like | We want to make it clear with a simple change, e.g. “This field can only be configured for a bi-directional DRB”. |
| Samsung | Option 1 like | Agree with LG. We need to clarify somewhere, to avoid misconfiguration. |
| Vivo | Option 1 |  |
| Nokia |  | No strong view, some clarification is okay. |
| OPPO |  | No strong view, if majority wants to capture something like Option1, we are fine. |
| ZTE |  | Also no strong view, we can following the ajorities. |
| MediaTek | Option 1 | We prefer option 1 as it results in a clear specifications |
| Huawei | Option 1 | We are fine with LG version above. |
| DOCOMO | Option 1 |  |
| Sharp | Option 1 like | Agree with LG. |
| CATT | Option 1 | Some clarification is helpful. LG’s wording is OK. |
| Intel | Option 1 |  |

# 3 Conclusion

TBD

# 4 References

1. R2-2006888, Miscellaneous RRC corrections for NR IIoT, Ericsson, Samsung
2. R2-2006711, Correction on the unit of extended SPS periodicities, Huawei, HiSilicon
3. R2-2006712, Correction on the calculation of HARQ Process ID for SPS, Huawei, HiSilicon
4. R2-2007527, CR on 38.321 for SPS resources and HARQ process ID calculation, ZTE Corporation, Sanechips
5. R2-2008055, Miscellaneous corrections for IIOT MAC, Samsung
6. R2-2006828, Correction on field description of configuredGrantConfig and SPS-Config, Huawei, HiSilicon
7. R2-2002946, Configuration of Configured Grant and Semi-Persistent Scheduling, Samsung
8. R2-2006727, Correction on field description of ethernetHeaderCompression, Huawei, HiSilicon
9. R2-2007142, A clarification of pdcp-Duplication field, OPPO
10. R2-2007151, 38.331 Clarification on pdcp-Duplication IE, vivo
11. R2-2007388, Correction on configuration of PDCP duplication, Huawei, HiSilicon
12. R1-2005110, RAN1 UE features list for Rel-16 NR updated after RAN1#101-e, Moderators (AT&T, NTT DOCOMO, INC.)
13. TS 38.306, User Equipment (UE) radio access capabilities, v 16.1.0