**3GPP TSG RAN WG1 Meeting #114 R1-230xxxx**

Toulouse, France, August 21 – 25, 2023

**Agenda item: 9.17**

**Source: Nokia, Nokia Shanghai Bell**

**Title: Summary on email discussion on NR\_XR\_enh-Core**

**Document for: Discussion and Decision**

# 1 Introduction

This document contains company observations on the draft CR to 38.214 for the Rel18 NR\_XR\_enh-Core.

First checkpoint for this discussion: **September 5th, 6:00 am UTC**!

# 2 Discussion – first round

The comments in this section are based on the version 0 of the draft CR.

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| Company | Comments | Editor reply/Notes |
| Qualcomm | Comment 1: we understand the actually multiplexing is provided by TS 38.212, but the changes in section 5.2.3 such as the following one seems to indicate that ACK is counted twice through and . This implies one of and is applicable in the formula. This may need to be clarified.

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| When the UE is scheduled to transmit a transport block on PUSCH not using repetition type B multiplexed with a CSI report(s), Part 2 CSI is omitted only when  is larger than , where parameters , , , , , , , , , and are defined in Clause 6.3.2.4 of [5, TS 38.212]. |

Comment 2: The TS 38.213 CR also discussed invalid CG PUSCH TO by the spec text “For unpaired spectrum operation, the subsequent CG-PUSCH TOs exclude invalid ones where a UE does not transmit a PUSCH based on the procedures in Clause 11.1” with the following note from the TS 38.213 editor that

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| For a set of symbols of a slot that are indicated to a UE as downlink by tdd-UL-DL-ConfigurationCommon, or tdd-UL-DL-ConfigurationDedicated, the UE does not transmit PUSCH, PUCCH, PRACH, or SRS when the PUSCH, PUCCH, PRACH, or SRS overlaps, even partially, with the set of symbols of the slot.…For operation on a single carrier in unpaired spectrum, for a set of symbols of a slot indicated to a UE for reception of SS/PBCH blocks by ssb-PositionsInBurst in SIB1 or by ssb-PositionsInBurst in ServingCellConfigCommon or, if the UE is not provided dl-OrJointTCI-StateList, by ssb-PositionsInBurst in SSB-MTCAdditionalPCI associated to physical cell ID with active TCI states for PDCCH or PDSCH, or for a set of symbols of a slot corresponding to SS/PBCH blocks configured for L1 beam measurement/reporting, the UE does not transmit PUSCH, PUCCH, PRACH in the slot if a transmission would overlap with any symbol from the set of symbols and the UE does not transmit SRS in the set of symbols of the slot. The UE does not expect the set of symbols of the slot to be indicated as uplink by tdd-UL-DL-ConfigurationCommon, or tdd-UL-DL-ConfigurationDedicated, when provided to the UE. |

This is slightly than the current TS 38.214 CR w.r.t. the SSB condition. Some alignment between 38.213 and 38.214 may be needed.

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| If *[nrofSlots\_InCGperiod]* is configured for Type 1 configured grant or Type 2 configured grant, HARQ process ID is determined as in clause [5.4.1] of [10, TS 38.321] for PUSCH transmission(s) not overlapping with a DL symbol indicated by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* if provided, or a symbol of an SS/PBCH block with index provided by *ssb-PositionsInBurst*. |

Comment 3: At “If *cg-nrofSlots* if configured”, the correct text seems “If *cg-nrofSlots* is not configured”.

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| A set of allowed periodicities *P* are defined in [12, TS 38.331]. The higher layer parameters *cg-nrofSlots* and *[nrofSlots\_InCGperiod]*, provide the number of consecutive slots allocated within a configured grant period. If *cg-nrofSlots* if configured, the higher layer parameter *cg-nrofPUSCH-InSlot* provides the number of consecutive PUSCH allocations within a slot, where the first PUSCH allocation follows … |

 | #1: To avoid ambiguity with two Q’\_ACK in some scenarios, divided these two formulas, where the second formula has Q’\_ACK/[UTO-UCI] and is used if the higher layer parameter *nrof\_UTO\_UCI* is configured (similar to draft CR for TS 38212, clause 6.3.2.4). #2: To avoid duplication, the reference to the clause 11.1 of TS38213 were added as per Samsung suggestion. In order to refer to the occasions after the 1st TO in CG period, as per Ericsson comment, text from TS 38321 running CR for XR enhancements were used.#3: Moved the introduction of higher layer parameter [*nrofSlots\_InCGperiod*] to the end of the paragraph to avoid ambiguity as per Ericsson suggestion and added a clarification “If a UE is configured with higher layer parameter *[nrofSlots\_InCGperiod]*, the UE does not expect to be configured with *cg-nrofSlots and cg-nrofPUSCH-InSlot*.” As per Samsung and Huawei suggestions. |
| Ericsson | Thanks Editor for the great efforts in preparing draft CRs.We agree with QC comments. Please find below some additional suggestions below for similar or other cases for your consideration.**Comment 1**: Agree with QC, however I also understand Editor’s attempt for reusing the procedures. Suggestion to fix is:* 1) Instead of adding UTO-UCI, replace the index of CG-UCI to something else for example “X-UCI” in the existing formulas.
* 2) Then, define condition when X-UCI should be interpreted as CG-UCI (that is when *cg-RetransmissionTimer* is configure) and wen X-UCI should be interpreted as UTO-UCI (that is when state that X-UCI is UTO-UCI when *nrof\_UTO\_UCI* is configured for a CG configuration).

**Comment 2**: Regarding HARQ process ID , we share same view as QC. We have the following suggestions:* 1) It is good the reference to 38.321 is done. TS38.321 running CR uses the term “valid “. Hence, it is good that similarly to description in clause 6.1 of 38.214, clearly use the word “valid” when conditions as met.
* 2) We should distinguish between 1st TO and remaining TOs in the period. For the 1st TO in the period, HP ID is determined in 38.321 running CR for the configured TO (valid or not). For the remaining TOs in the period, HP ID is determined only for “valid” ones. This distinction is important for alignment between specifications.

**Comment 3**: Similar to comment 3 from QC, although we understand Editor’s intention, it seems unintentionally we introduced new conditions. Adding “If *cg-nrofSlots* if configured”, implies configuration of *cg-nrofPUSCH-InSlot* is conditioned on *cg-nrofSlots* while both these parameters are optional and only configured if *cg-RetransmissionTimer* is configured.One suggestion is as the following (basically use the definition of *cg-nrofSlots* as the end with the corresponding new text as the following and perhaps use three paragraph:* A set of allowed periodicities *P* are defined in [12, TS 38.331].
* The higher layer parameter *cg-nrofSlots* provides the number of consecutive slots allocated within a configured grant period. The higher layer parameter *cg-nrofPUSCH-InSlot* provides the number of consecutive PUSCH allocations within a slot, where the first PUSCH allocation follows the higher layer parameter *timeDomainAllocation* for Type 1 PUSCH transmission or the higher layer configuration according to [10, TS 38.321], and UL grant received on the DCI for Type 2 PUSCH transmissions, and the remaining PUSCH allocations have the same length and PUSCH mapping type, and are appended following the previous allocations without any gaps. The same combination of start symbol and length and PUSCH mapping type repeats over the consecutively allocated slots.
* The higher layer parameter [*nrofSlots\_InCGperiod]*, provides the number of consecutive slots allocated within a configured grant period. If [*nrofSlots\_InCGperiod*] is configured, the PUSCH allocation in each consecutive slot follows the higher layer parameter *timeDomainAllocation* for Type 1 PUSCH transmission or the higher layer configuration according to [10, TS 38.321], and UL grant received in the DCI for Type 2 PUSCH transmissions.

**Comment 4**: The repetition is not supported. However, as the agreement shows, the UE behaviour should be to assume repletion factor of 1 (irrespective of configuration) if *nrofSlots\_InCGperiod]* is configured in *configuredGrantConfig.* One suggestion is to add the condition in clause 6.1.2.3.1 . The reason is to avoid any potential conflict when Type A configuration is used. Perhaps something like below:6.1.2.3.1 Transport Block repetition for uplink transmissions of PUSCH repetition Type A with a configured grantThe procedures described in this clause apply to PUSCH transmissions of PUSCH repetition Type A with a Type 1 or Type 2 configured grant. Repetition of a transport block is not applicable if *nrofSlots\_InCGperiod]* is configured in *configuredGrantConfig.*  | #1: To avoid ambiguity with two Q’\_ACK in some scenarios, divided these two formulas, where the second formula has Q’\_ACK/[UTO-UCI] and is used if the higher layer parameter *nrof\_UTO\_UCI* is configured (similar to draft CR for TS 38212, clause 6.3.2.4).#2: To avoid duplication, the reference to the clause 11.1 of TS38213 were added as per Samsung suggestion. In order to refer to the occasions after the 1st TO in CG period, as per Ericsson comment, text from TS 38321 running CR for XR enhancements were used.#3: Moved the introduction of higher layer parameter [*nrofSlots\_InCGperiod*] to the end of the paragraph to avoid ambiguity as per Ericsson suggestion and added a clarification “If a UE is configured with higher layer parameter *[nrofSlots\_InCGperiod]*, the UE does not expect to be configured with *cg-nrofSlots and cg-nrofPUSCH-InSlot*.” As per Samsung and Huawei suggestions.#4: Added the sentence covering that repetition is not supported if higher layer parameter [*nrofSlots\_InCGperiod*] is configured to Clause 6.1.2.3 as per Huawei suggestion. |
| Samsung | Comment 1 - Clause 5.2.3: For the formula considering UTO\_UCI, the [ ] can be removed (joint coding with HARQ-ACK is supported, no case for CG-UCI to be present) – that is also consistent with 38.212. Regarding the comment from Qualcomm, we think there is no issue as CG-UCI and UTO-UCI are not multiplexed in a same CG-PUSCH (the former does not exist in shared spectrum and the latter does not exist in non-shared spectrum). In any case, the current text is OK with us, the [ ] can be removed, and it is 38.212 that describes the details of UCI multiplexing in a PUSCH.Comment 2 - Clause 6.1: Similar to other comments, just saying “*ssb-PositionsInBurst*” can be ambiguous and incomplete. There are several conditions, described in 11.1 of 38.213, for a PUSCH to not be transmitted in unpaired spectrum. Also, *ssb-PositionsInBurst* can be provided in several configurations and it is unclear if all are applicable. It may be more accurate and simpler to say “… is determined as in clause [5.4.1] of [10, TS 38,321] excluding PUSCHs that are not transmitted as described in clause 11.1 of [6, TS 38.213]” or something to that effect.Comment 3 - Clause 6.1.2.3: As also mentioned by Qualcomm and Ericsson, it should be clear when “multi-PUSCH” CG is applicable. Now, it seems allowed with transmissions within a slot or with repetitions while none of that was agreed (and there are no open issues as the WI is complete - even if there were, specification text cannot be capturing open issues).A possible revision can be to capture that “a UE does not expect to be provided *cg-nrofSlots* and *cg-nrofPUSCH-Inslot* when the UE is provided *nrofSlots-InCGPeriod*”. That may also avoid unnecessary maintenance issues. | #1: To avoid ambiguity with two Q’\_ACK in some scenarios, divided these two formulas, where the second formula has Q’\_ACK/[UTO-UCI] and is used if the higher layer parameter *nrof\_UTO\_UCI* is configured (similar to draft CR for TS 38212, clause 6.3.2.4).We have [] to avoid using the name that will be changed later, e.g., across RAN1 specs or in RAN2 spec.#2: To avoid duplication, the reference to the clause 11.1 of TS38213 were added as per Samsung suggestion. In order to refer to the occasions after the 1st TO in CG period, as per Ericsson comment, text from TS 38321 running CR for XR enhancements were used.#3: Moved the introduction of higher layer parameter [*nrofSlots\_InCGperiod*] to the end of the paragraph to avoid ambiguity as per Ericsson suggestion and added a clarification “If a UE is configured with higher layer parameter *[nrofSlots\_InCGperiod]*, the UE does not expect to be configured with *cg-nrofSlots and cg-nrofPUSCH-InSlot*.” As per Samsung and Huawei suggestions.Also added the sentence covering that repetition is not supported if higher layer parameter [*nrofSlots\_InCGperiod*] is configured to Clause 6.1.2.3 as per Huawei suggestion. |
| DOCOMO | Fully agree with Ericsson’s all comments and suggestions. | Please, see the answers to Ericsson comments above. |
| ZTE, Sanechips | **Comment 1**: For the formula in Clause 5.2.3, we see no issue.**Comment 2**: Regarding HARQ process ID For invalid CG PUSCH TO, we think the editor’s version is OK, which follows the attached note in the agreement. Otherwise, additional discussion is necessary, in fact RAN2 has raised the issue of definition of invalid TO. For the wording “PUSCH transmission(s)” in this paragraph, maybe clarify whether it refers to Configured CG PUSCHs or transmitted CG PUSCHs ?**Comment 3**: Regarding[nrofSlots\_InCGperiod]Based on Ericsson’s version, we suggest to remove “consecutive” as follows, since consecutive slot also contains DL slot herein cause ambiguity.

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| The higher layer parameter [nrofSlots\_InCGperiod], provides the number of consecutive slots allocated within a configured grant period. If [nrofSlots\_InCGperiod] is configured, the PUSCH allocation in each ~~consecutive~~ slot follows the higher layer parameter timeDomainAllocation for Type 1 PUSCH transmission or the higher layer configuration according to [10, TS 38.321], and UL grant received in the DCI for Type 2 PUSCH transmissions. |

**Comment 4**: Regarding repetitionNo spec change is necessary, and we have no agreement but a conclusion for not supporting repetition of multi-PUSCHs CG. | #1: To avoid ambiguity with two Q’\_ACK in some scenarios, divided these two formulas, where the second formula has Q’\_ACK/[UTO-UCI] and is used if the higher layer parameter *nrof\_UTO\_UCI* is configured (similar to draft CR for TS 38212, clause 6.3.2.4).#2: To avoid duplication, the reference to the clause 11.1 of TS38213 were added as per Samsung suggestion. In order to refer to the occasions after the 1st TO in CG period, as per Ericsson comment, text from TS 38321 running CR for XR enhancements were used.#3: Moved the introduction of higher layer parameter [*nrofSlots\_InCGperiod*] to the end of the paragraph to avoid ambiguity as per Ericsson suggestion and added a clarification “If a UE is configured with higher layer parameter *[nrofSlots\_InCGperiod]*, the UE does not expect to be configured with *cg-nrofSlots and cg-nrofPUSCH-InSlot*.” As per Samsung and Huawei suggestions.The previous text from mutli-PUSCH CG in unlicensed also had “consecutive”, it is better to have the text aligned.#4: Added the sentence covering that repetition is not supported if higher layer parameter [*nrofSlots\_InCGperiod*] is configured to Clause 6.1.2.3 as per Huawei suggestion. The conclusion says that in Rel18 there will be no support of repetition for multi-PUSCH CG, we think it is fine to clarify this in Rel18 specs. |
| CATT | RAN1#113 agreementsN is configured independently from cg-nrofSlots-r16 and cg-nrofPUSCH-InSlot-r16, respectively.The paramters cg-nrofSlots and/or [nrofSlots\_InCGperiod] should be described separately

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| A set of allowed periodicities *P* are defined in [12, TS 38.331]. The higher layer parameters *cg-nrofSlots* and/or *[nrofSlots\_InCGperiod]*, provide the number of consecutive slots allocated within a configured grant period. If *cg-RetransmissionTimer* *~~cg-nrofPUSCH-InSlot~~* is configured, the higher layer parameter *cg-nrofPUSCH-InSlot* provides the number of consecutive PUSCH allocations within a slot, where the first PUSCH allocation follows the higher layer parameter *timeDomainAllocation* for Type 1 PUSCH transmission or the higher layer configuration according to [10, TS 38.321], and UL grant received on the DCI for Type 2 PUSCH transmissions, and the remaining PUSCH allocations have the same length and PUSCH mapping type, and are appended following the previous allocations without any gaps. The same combination of start symbol and length and PUSCH mapping type repeats over the consecutively allocated slots. If [*nrofSlots\_InCGperiod*] is configured, the PUSCH allocation in each consecutive slot follows the higher layer parameter *timeDomainAllocation* for Type 1 PUSCH transmission or the higher layer configuration according to [10, TS 38.321], and UL grant received in the DCI for Type 2 PUSCH transmissions. |

 | Moved the introduction of higher layer parameter [*nrofSlots\_InCGperiod*] to the end of the paragraph to avoid ambiguity as per Ericsson suggestion and added a clarification “If a UE is configured with higher layer parameter *[nrofSlots\_InCGperiod]*, the UE does not expect to be configured with *cg-nrofSlots and cg-nrofPUSCH-InSlot*.” As per Samsung and Huawei suggestions. |
| Huawei/HiSilicon | Comment#1: The modifications of formulas in Clause 5.2.3 seem inaccurate. If there is no UTO-UCI or CG-UCI, the ACK will be subtracted twice. Suggest to revise Clause 5.2.3 in a similar way of 38212 draft CR. E.g., can add a sentence as below in the Clause:If the higher layer parameter *nrof\_UTO\_UCI* is configured, the procedure in this clause 5.2.3 applies by replacing CG-UCI with UTO-UCI in all the notations and texts. Comment#2: * Suggest to add following red sentence to avoid confusion. It’s common understanding in RAN1 that R18 XR CG does not support multiple PUSCH in one slot.
	+ Note: the red sentence is given by following current 38214 style, e.g., following sentence already exists in 38214.
		- “*If a UE is configured with higher layer parameter pusch-TimeDomainAllocationListForMultiPUSCH, the UE does not expect to be configured with pusch-AggregationFactor.*”

==A set of allowed periodicities *P* are defined in [12, TS 38.331]. The higher layer parameters *cg-nrofSlots* and *[nrofSlots\_InCGperiod]*, provide the number of consecutive slots allocated within a configured grant period. If *cg-nrofSlots* if configured, the higher layer parameter *cg-nrofPUSCH-InSlot* provides the number of consecutive PUSCH allocations within a slot, where the first PUSCH allocation follows the higher layer parameter *timeDomainAllocation* for Type 1 PUSCH transmission or the higher layer configuration according to [10, TS 38.321], and UL grant received on the DCI for Type 2 PUSCH transmissions, and the remaining PUSCH allocations have the same length and PUSCH mapping type, and are appended following the previous allocations without any gaps. The same combination of start symbol and length and PUSCH mapping type repeats over the consecutively allocated slots. If [*nrofSlots\_InCGperiod*] is configured, the PUSCH allocation in each consecutive slot follows the higher layer parameter *timeDomainAllocation* for Type 1 PUSCH transmission or the higher layer configuration according to [10, TS 38.321], and UL grant received in the DCI for Type 2 PUSCH transmissions. If a UE is configured with higher layer parameter *[nrofSlots\_InCGperiod]*, the UE does not expect to be configured with *cg-nrofSlots and cg-nrofPUSCH-InSlot*.Comment#3: Repetition is not supported according to the current agreements. Suggest to add following red sentence to clause 6.1.2.3 to clarify this.==6.1.2.3 Resource allocation for uplink transmission with configured grant…For PUSCH transmissions with a Type 1 or Type 2 configured grant, the number of (nominal) repetitions *K* to be applied to the transmitted transport block is provided by the indexed row in the time domain resource allocation table if *numberOfRepetitions* is present in the table; otherwise *K* is provided by the higher layer configured parameters *repK.*If a UE is configured with higher layer parameter *[nrofSlots\_InCGperiod]*, repetition of the transmitted transport block is not supported. | #1: To avoid ambiguity with two Q’\_ACK in some scenarios, divided these two formulas, where the second formula has Q’\_ACK/[UTO-UCI] and is used if the higher layer parameter *nrof\_UTO\_UCI* is configured (similar to draft CR for TS 38212, clause 6.3.2.4). Since the formulas and additional text is not large we added it explicitly.#2: Moved the introduction of higher layer parameter [*nrofSlots\_InCGperiod*] to the end of the paragraph to avoid ambiguity as per Ericsson suggestion and added a clarification “If a UE is configured with higher layer parameter *[nrofSlots\_InCGperiod]*, the UE does not expect to be configured with *cg-nrofSlots and cg-nrofPUSCH-InSlot*.” As per Samsung and Huawei suggestions.#3: Added the sentence covering that repetition is not supported if higher layer parameter [*nrofSlots\_InCGperiod*] is configured to Clause 6.1.2.3 as per Huawei suggestion. |
| LG | Comment 1: We are fine to have separated term for the number of ACK for the case of UTO-UCI. However, it should be clarified that ACK shall be subtracted only once. It may depend on how 38.212 describe the term. Comment 2: We think it is inaccurate description for HARQ-ID determination. Based on following reasons. * HARQ ID for CG is always determined as in clause [5.4.1] of [10, TS 38.321], regardless of whether *[nrofSlots\_InCGperiod]* is configured or not.
* The definition of valid/invalid should be aligned among 321, 213, 214.

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| If *[nrofSlots\_InCGperiod]* is configured for Type 1 configured grant or Type 2 configured grant, HARQ process ID is determined as in clause [5.4.1] of [10, TS 38.321] for PUSCH transmission(s) not overlapping with a DL symbol indicated by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* if provided, or a symbol of an SS/PBCH block with index provided by *ssb-PositionsInBurst*. |

To avoid duplicated description, we think it may be fine to remove the text. Comment 3: It seems typos; “If *cg-nrofSlots* if configured,” 🡺 If *cg-nrofSlots* is configured,

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| The higher layer parameters *cg-nrofSlots* and *[nrofSlots\_InCGperiod]*, provide the number of consecutive slots allocated within a configured grant period. If *cg-nrofSlots* if configured, |

 | #1: To avoid ambiguity with two Q’\_ACK in some scenarios, divided these two formulas, where the second formula has Q’\_ACK/[UTO-UCI] and is used if the higher layer parameter *nrof\_UTO\_UCI* is configured (similar to draft CR for TS 38212, clause 6.3.2.4).#2: To avoid duplication, the reference to the clause 11.1 of TS38213 were added as per Samsung suggestion. In order to refer to the occasions after the 1st TO in CG period, as per Ericsson comment, text from TS 38321 running CR for XR enhancements were used.#3: Moved the introduction of higher layer parameter [*nrofSlots\_InCGperiod*] to the end of the paragraph to avoid ambiguity as per Ericsson suggestion and added a clarification “If a UE is configured with higher layer parameter *[nrofSlots\_InCGperiod]*, the UE does not expect to be configured with *cg-nrofSlots and cg-nrofPUSCH-InSlot*.” As per Samsung and Huawei suggestions. |
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# 3 Discussion – second round

The comments in this section are based on version 1 of the draft CR available in the **Post RAN1#114 discussion.**

Second checkpoint for this discussion:  **is September 6, 9.00 am UTC!**

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| Company | Comments | Editor reply/Notes |
| Huawei, HiSilicon | Thank Editor for the updates.Comment#1: * Suggest to add following red sentence to avoid confusion. It’s common understanding in RAN1 that R18 XR CG does not support transmitting 1 TB over multiple slots.
	+ “If a UE is configured with higher layer parameter [*nrofSlots\_InCGperiod*], repetition of the transmitted transport block is not supported, and TB processing over multiple slots is not supported.”

==For PUSCH transmissions with a Type 1 or Type 2 configured grant, the number of (nominal) repetitions *K* to be applied to the transmitted transport block is provided by the indexed row in the time domain resource allocation table if *numberOfRepetitions* is present in the table; otherwise *K* is provided by the higher layer configured parameters *repK.* If a UE is configured with higher layer parameter [*nrofSlots\_InCGperiod*], repetition of the transmitted transport block is not supported, and TB processing over multiple slots is not supported. | It is ok to add it if everyone else is fine with the addition. Please, find the updated version in the revised draft CR. |
| **Editor 06.09** | **Made some small update according to the above suggestion, in v01r01** |  |
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