**3GPP TSG RAN WG1#100bis-e R1-**

**e-Meeting, April 20th – 30th, 2020**

**Agenda Item: 7.2.2.1.2**

**Source: Moderator (Lenovo)**

**Title: Email discussion/approval to capture prior agreements (NR-U DL Signals and Channels)**

**Document for: Discussion, Decision**

# Scope and issues based on company submissions

According to the guidance by RAN1 (vice-)chairman, this email discussion is to be finalised by 23 April.

* Capture "For search space switching, limit the switching to USS and Type-3 CSS."
* Align the terminology on the RB set indicator/Available RB set Indicator in TS38.213 and TS38.212.
* Align RRC parameter list with TS38.213:
	+ Configurations of availableRB-SetPerCell-r16, CO-DurationPerCell-r16 and SearchSpaceSwitchTrigger-r16 should be added in SlotFormatCombinationsPerCell,
	+ Propose to RAN2 to discard the “groupId” parameter defined under searchSpaceSwitchTrigger-r16, and remove the CHOICE structure

# Prior Agreements and Discussion

## For search space switching, limit the switching to USS and Type-3 CSS.

Huawei includes the following in R1-2001532:

In RAN1#100-e [3] , the following agreement were achieved.

Agreement:

*For search space switching, limit the switching to USS and Type-3 CSS.*

And following text was added in section 10.4 in TS38.213 v16.1.0.

However, the description on the field of monitoring flag in DCI format 2\_0 in section 11.1.1 is not changed correspondingly. Meanwhile, the search space set group switch can be applied to type 3 common search space, which is not used for PDSCH scheduling. The corrections in TP#1 should be adopted in section 11.1.1 of TS38.213 v16.1.0

If a UE is provided *searchSpaceSwitchingGroupList-r16*, indicating one or more groups of serving cells, the following procedures apply to all serving cells within each group; otherwise, the following procedures apply only to a serving cell for which the UE is provided *searchSpaceGroupIdList-r16*.

***Proposal 2: the SS set group switch based on cell group and PDCCH monitoring in Type-3 CSS should be reflected in the description of monitoring flag field in DCI format 2\_0 in section 11.1.1 of TS38.213. The corresponding TP is in TP#1 in appendix.***

## TP for TS38.213 v16.1.0:

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| 11.1.1 UE procedure for determining slot format\*\*\* Unchanged text is omitted \*\*\*For each serving cell in the set of serving cells configured with *searchSpaceSwitchTrigger-r16*, the UE can be provided:* - an identity of the serving cell by *servingCellId*a location of a search space set group switching field in DCI format 2\_0, by *positionInDCI* in *SearchSpaceSwitchTrigger-r16*, that indicates a group from two groups of search space sets for PDCCH monitoring on the serving cell or a group of serving cells provided in *searchSpaceSwitchingGroupList-r16* as described in Clause 10.4.

\*\*\* Unchanged text is omitted \*\*\* |

**Q1: Do you agree with the TP provided by Huawei?**

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| FL Note: Please also check Q2 for other changes related to the agreement. |
| **Company** | **Comment** |
| Huawei, HiSilicon | Yes. Actually TP includes three parts. The part related to USS and type3 CSS is “that indicates a group from two groups of search space sets for PDCCH monitoring on the serving cell”. The first change of “For each serving cell in the set of serving cells configured with *searchSpaceSwitchTrigger-r16*, the UE can be provided:- an identity of the serving cell by *servingCellId*” is related to whether *searchSpaceSwitchTrigger-r16* is in *SlotFormatIndicator* or *SlotFormatCombinationsPerCell*. If it is in the *SlotFormatIndicator*, a separate *servingCellId* should be provided. Otherwise, the existing *servingCellId* in the *SlotFormatCombinationsPerCell* can be shared. We prefer the former. The change of “or a group of serving cells provided in *searchSpaceSwitchingGroupList-r16*” is trying to reflect SS set group switch on a cell group. |
| Nokia, NSB | RAN2 design is still a little bit unstable, maybe better to wait till they sort it out themselves. If we have some concerns about RAN2 developments, we would prefer to inform RAN2 about what is the issue, rather than updating parameter sheets. |
| Ericsson | We agree with Nokia that RAN2 is currently discussing implementation of serving cell and serving cell groups, we should wait for RAN2 to finish their design and then we update RAN1 specification accordingly |
| MediaTek | Share the view with Nokia & Ericsson |
| Intel | Share the view with Nokia & Ericsson |
| Qualcomm | Agree with Nokia |
| OPPO | Agree with Nokia |
| Sharp | Fine with the proposal. Although our R1-2002381 is proposing to move searchSpaceSwitchTrigger-r16 into SlotFormatCombinationsPerCell, I understand that a cell set for the switch trigger can be independent of a cell set for DCI 2\_0 links. |
| LG Electronics | Agree with Nokia and Ericsson. Would be better to wait for RAN2’s progress. |
| Samsung | Agree with Nokia and Ericsson. |

For the same agreement, an issue was identified by ZTE in R1-2001703:

In last RAN1 e-meeting, the following agreement was reached for the scope of SSS group switching. But we found the agreement has not been captured in the current spec TS 38.213. Therefore, we propose the following TP in TS 38.213 to fix this problem.

**Proposal 1: Adopt the TP#1 to capture a missing agreement on the scope of SSS group switching in TS 38.213.**

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| RAN1 #100 e-meetingAgreement:For search space switching, limit the switching to USS and Type-3 CSS. |

## TP for TS38.213 v16.1.0:

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| 10.4 Search space set switchingA UE can be provided a group index for a respective search space set by *searchSpaceGroupIdList-r16* for PDCCH monitoring on a serving cell. The search space set can only be a Type3-PDCCH CSS set or a USS set. If the UE is not provided *searchSpaceGroupIdList-r16* for a search space set, the following procedures are not applicable for PDCCH monitoring according to the search space set.If a UE is provided *searchSpaceSwitchingGroupList-r16*, indicating one or more groups of serving cells, the following procedures apply to all serving cells within each group; otherwise, the following procedures apply only to a serving cell for which the UE is provided *searchSpaceGroupIdList-r16*.A UE can be provided, by *searchSpaceSwitchingTimer-r16*, a timer value. The UE decrements the timer value by one after each slot in the active DL BWP of the serving cell where the UE monitors PDCCH for detection of DCI format 2\_0.If a UE is provided by *SearchSpaceSwitchTrigger-r16* a location of a search space set switching field for a serving cell in a DCI format 2\_0, as described in Clause 11.1.1, and detects the DCI format 2\_0 in a slot< Unchanged parts are omitted > |

**Q2: Do you agree with the TP provided by ZTE?**

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| FL Note: Please also check Q1 for other changes related to the agreement. |
| **Company** | **Comment** |
| **Huawei, HiSilicon** | The following changes may be more compact. “A UE can be provided a group index for a respective Type3-PDCCH common search space set or a UE specific search space set by *searchSpaceGroupIdList-r16* for PDCCH monitoring on a serving cell.” |
| Nokia, NSB | In principle, yes, but I would let wording design for specification editor, i.e. just agree that specification editor shall capture RAN1#100e agreement. |
| ZTE, Sanechips | Agree this TP due to it is proposed by our company. |
| Ericsson  | We generally agree with the TP, and we note that RAN2 is discussing the issue to fix it in 38.331, because the current version of 38.331 captures that the SSS group switching only applies to USS. |
| MediaTek | Agree to the TP modified by Huawei |
| Intel | Agree with the TP.  |
| Qualcomm | HW version seems to be good |
| OPPO | OK |
| Sharp | Fine with either ZTE or Huawai version. |
| LG Electronics | OK with TP proposed by Huawei |
| Samsung | Agree with the TP. |

## Align the terminology on the RB set indicator/Available RB set Indicator in TS38.213 and TS38.212.

Huawei includes the following in R1-2001532:

In TS 38.213 v16.1.0 section 11.1.1, the following text described the behavior of available RB set indication.

* a location of a RB set indicator field in DCI format 2\_0 that is a bitmap having a one-to-one mapping with the RB sets [6, TS 38.214] of the serving cell, where a value of '0' indicates that an RB set is available for receptions and a value of '1' indicates that an RB set is not available for receptions, by *availableRB-SetPerCell-r16*. The RB set indicator field includes $N\_{RB,sets}$ bits where $N\_{RB,sets}$ is the number of RB sets in the serving cell. An RB set remains available or unavailable until the end of the indicated channel occupancy duration

In TS 38.212 v16.1.0 section 7.3.1.3.1, the Available RB set Indicator was introduced in DCI format 2\_0 to indicate the availability of RB set(s) for a specific serving cell.

- If the higher layer parameter availableRB-SetPerCell-r16 is configured,

- Available RB set Indicator 1, Available RB set Indicator 2, …, Available RB set Indicator *N1*,

The “RB set indicator” should be replaced with a unified terminology as “Available RB set Indicator” in TS38.212 in order to keep the consistence between specifications. People is accustomed to use bit “1” to indicate the resource is “available” and bit “0” to indicate resource is not available, such as FDRA for resource allocation type 0. We suggest to keep the unified indication style across the specifications.

***Proposal 7: The terminology on the RB set indicator/Available RB set Indicator in TS38.213 and TS38.212 should be aligned. We propose to use bit “1” indicating RB set is available and bit “0” indicating RB set is not available. The corresponding text proposal is in TP#1 in the appendix.***

## TP#1 in TS38.213 v16.1.0

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| 11.1.1 UE procedure for determining slot format\*\*\* Unchanged text is omitted \*\*\*- a location of an available RB set indicator field in DCI format 2\_0 that is a bitmap having a one-to-one mapping with the RB sets [6, TS 38.214] of the serving cell, where a value of '1' indicates that an RB set is available for receptions and a value of '0' indicates that an RB set is not available for receptions, by *availableRB-SetPerCell-r16*. The RB set indicator field includes $N\_{RB,sets}$ bits where $N\_{RB,sets}$ is the number of RB sets in the serving cell. An RB set remains available or unavailable until the end of the indicated channel occupancy duration. \*\*\* Unchanged text is omitted \*\*\* |

**Q3: Do you agree on changing the interpretation of 0/1 for the RB set indicator?**

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| **Company** | **Comment** |
| **Huawei, HiSilicon** | **Yes** |
| **Nokia, NSB** | agree, it is more logical |
| **ZTE, Sanechips** | Agree |
| **Ericsson** | Yes |
| **MediaTek** | Agree |
| **Intel** | Yes |
| **Qualcomm** | Yes |
| **OPPO** | OK |
| **Sharp** | OK |
| **LG Electronics** | YES |
| **Samsung** | Yes |

**Q4: Do you agree on aligning the terminology in 38.212 to use "Available RB set Indicator"?**

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| **Company** | **Comment** |
| **Huawei, HiSilicon** | **Yes** |
| **Nokia, NSB** | Yes |
| ZTE, Sanechips | Agree |
| **Ericsson** | Yes |
| **MediaTek** | Okay |
| **Intel** | Yes |
| **Qualcomm** | Yes |
| **OPPO** | OK |
| **Sharp** | Agree |
| **LG Electronics** | YES |
| **Samsung** | Yes |

## Align RRC parameter list with TS38.213

Ericsson includes the following in R1-2002029:

In relation with the search space set switching, the following RRC parameters are defined:

* *searchSpaceSwitchTrigger-r16*
* *searchSpaceSwitchingGroup-r16*
* *searchSpaceSwitchingTimer-r16*
* *searchSpaceGroupIdList-r16*

A search space switching trigger in DCI 2\_0 allows the gNB to explicitly signal switching of search space monitoring between two groups of search space sets for one or more groups of serving cells. The parameter *SearchSpaceSwitchTrigger-r16* in the *SlotFormatIndicator* IE configures the position in DCI 2\_0 of the trigger bit (*positionInDCI* parameter). It should also indicate to which serving cell the trigger applies. In addition, serving cells can be grouped together so that the trigger applies to all cells in the group. Each serving cell group is configured with the higher layer parameter *searchSpaceSwitchingGroup-r16* containing up to 16 serving cells*.*

Furthermore, the parameter *searchSpaceGroupIdList-r16* configured within the *SearchSpace* IE assigns one or two group indexes, with possible values 0 or 1, to each search space set. This parameter indicates which search space set should be monitored according to the switching procedure in [clause 10.4. in 38.213]. The *searchSpaceGroupIdList-r16* configuration is only relevant within the *SearchSpace* IE. However, in the current version of 38.331, there is a CHOICE to configure either “servingCellId” or “groupId” within the *searchSpaceSwitchTrigger-r16* parameter which does not make sense.

Based on above discussion we propose to remove the parameter “groupId” defined under the *SearchSpaceSwitchTrigger-r16* parameter as follows:

 searchSpaceSwitchTrigger-r16 SEQUENCE {

 positionInDCI INTEGER(0..maxSFI-DCI-PayloadSize-1),

 ~~id CHOICE {~~

 servingCellId ServCellIndex~~,~~

 ~~groupId INTEGER (0..1)~~

 ~~}~~

 ~~}~~ OPTIONAL, -- Need N

1. Propose to RAN2 to discard the “groupId” parameter defined under *searchSpaceSwitchTrigger-r16, and remove the CHOICE structure.*

**Q5: Do you agree to discard the** *groupId* **parameter defined under** *searchSpaceSwitchTrigger-r16***, and to remove the** CHOICE **structure?**

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| FL Note: This would be reflected in an updated parameter sheet and/or LS to RAN2. |
| **Company** | **Comment** |
| Huawei, HiSilicon | Yes. We had following proposal in R1-2001532*Proposal 3: UE should be configured with {positionInDCI, servingCellId} in SearchSpaceSwitchTrigger-r16. If searchSpaceSwitchingGroup-r16 is configured, all serving cells in the same cell group as servingCellId will apply SS set group switch.* |
| Nokia, NSB | RAN2 design is still a little bit unstable, maybe better to wait till they sort it out themselves. If we have some concerns about RAN2 developments, we would prefer to inform RAN2 about what is the issue, rather than updating parameter sheets. |
| ZTE, Sanechips | Agree |
| Ericsson | Yes we agree 😊The current version of 38.331 is incorrect. RAN2 is waiting for guidance from RAN1 guidance before fixing this issue.  |
| MediaTek | Agree to this correction |
| Intel | Agree |
| Qualcomm | Agree |
| OPPO | Not agree for the moment, before stabilizing the UE behavior for SSG switching per cell group. We think that the group id is useful to indicate which cell group to apply the SSG switching (note that *searchSpaceSwitchingGroupList-r16* can define up to 2 cell groups). RAN1 can make use of this group ID and we think it can save a lot of RAN1 specification efforts.If the group id is discarded, then RAN1 has to spend time to further discuss what if SSG trigger bits in DCI 2\_0 indicate different values corresponding to two cells of the same cell group, then which trigger bit should be referred to. Moreover, can one serving cell be grouped into two cell groups? What if the trigger bit indicates to switch SSG for a serving cell that belongs to two different cell groups? These issues can be avoided by using this cell group ID. Therefore, keeping the group id is beneficial.  |
| Sharp | Agree |
| LG Electronics | Agree. From the procedure perspective, one way could be to agree Proposal 3 suggested by Huawei and send an LS to RAN2 to inform that agreement. |
| Samsung | Agree |

Sharp includes the following in R1-2002381:

According to the RRC parameter list for Rel-16 features [2], the configurations of availableRB-SetPerCell-r16, CO-DurationPerCell-r16 and SearchSpaceSwitchTrigger-r16 are to be included in slotformatindictor information element, and the current RAN2 running CR [3] is drafted based on that request from RAN1. However, they are not in line with TS38.213 in which those configurations are per serving cell of the set of serving cells. We believe that our intention was what is captured in TS38.213. Therefore, we should update the RRC parameter list accordingly.

**Proposal 4:**

* **Configurations of availableRB-SetPerCell-r16, CO-DurationPerCell-r16 and SearchSpaceSwitchTrigger-r16 should be added in SlotFormatCombinationsPerCell, not in SlotFormatIndicator.**

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| **WI code** | Sub-feature group | RAN1 specification | Section | RAN2 Parant IE | RAN2 ASN.1 name | Parameter name in the spec | New or existing? | Parameter name in the text | Description |
| NR\_unlic-Core | DL signals and channels | 　 | 　 | 　 | 　 | CO-DurationPerCell-r16 | New | 　 | Add in SlotFormatCombinationsPerCell. If configured, provides position in DCI of the bit field indicating Channal Occupancy duration for serving cell servingCellId.A list of CO-DurationPerCell-r16 objects is configured for one or more serving cells. This parameter is optionally configured. If not configured, the UE uses SFI indication to determine the channel occupancy duration (if SFI is available). |
| NR\_unlic-Core | DL signals and channels | 　 | 　 | 　 | 　 | SearchSpaceSwitchTrigger-r16 | New | 　 | Add in SlotFormatCombinationsPerCell. If configured, provides position in DCI of the bit field indicating search space switching flag for a group of serving cells in searchSpaceSwitchingGroup-r16. A list of SearchSpaceSwitchTrigger-r16 objects is configured for one or more groups of serving cells. |

Sharp has meanwhile clarified over the RAN WG1 email reflector that there is no issue on *availableRB-SetPerCell-r16*.

**Q6: Do you agree to add** *CO-DurationPerCell-r16* **and** *SearchSpaceSwitchTrigger-r16* **under** *SlotFormatCombinationsPerCell***, not under** *SlotFormatIndicator***?**

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| FL Note: This would be reflected in an updated parameter sheet and/or LS to RAN2. |
| **Company** | **Comment** |
| Huawei, HiSilicon | Considering *CO-DurationPerCell-r16* and *SearchSpaceSwitchTrigger-r16* might be configured independently from SFI, these fields should be outside of *SlotFormatCombinationsPerCell.* Moreover, the current ASN.1 code in 331 only allows to configure *CO-DurationPerCell-r16* and *SearchSpaceSwitchTrigger-r16* for one serving cell. It should be updated with *…ToAddModList* and …*ToRelease-r16.* |
| Nokia, NSB | Disagree with proposal. |
| ZTE, Sanechips | Disagree.We can know from TS 38.213 that “CO-DurationPerCell-r16 and SearchSpaceSwitchTrigger-r16” are per serving cell of the set of serving cells. Based on this, we can inform RAN2 to define these parameter list. Besides, this issue also has been proposed by some companies in RAN2 and they will discuss it in this meeting. |
| Ericsson | Disagree with this proposal. RAN2 is currently discussing defining this RRC parameters as lists within *SlotFormatIndicator* IE that spans multiple serving cells. |
| MediaTek | Not agree this proposal. Configurations between SFI and other fields in DCI 2\_0 are independent. |
| Intel | Disagree with the proposal. |
| Qualcomm | Do not agree. |
| Sharp | For SearchSpaceSwitchTrigger-r16, see our answer to Q1. Huawei’s TP on Q1 resolves the issue.For availableRB-SetPerCell-r16 and CO-DurationPerCell-r16, there are two possible directions.Option 1: The link between indicating/indicated cells for availableRB-SetPerCell-r16 and CO-DurationPerCell-r16 is the same as the one for SFI. If we take Option 1, RRC parameter sheet needs to be updated, and there is no need to update 38.213.Option 2: The links between indicating/indicated cells for availableRB-SetPerCell-r16, CO-DurationPerCell-r16 and SFI are all independent of one another, as many companies mentioned above. If we take Option 2, we should request RAN2 to have CO-DurationPerCell-r16 in 38.331 to be in list forms (i.e. *ToAddModList* and …*ToRelease*), no need to change availableRB-SetPerCell-r16 in 38.331. At the same time, descriptions in 38.213 have to be modified. For example, we can use the same structure as for SearchSpaceSwitchTrigger-r16 in Huawei’s TP on Q1.The current 38.213 is written with Option 1. Although we prefer Option 1, we are OK with Option 2 as well. We should note that Option 2 requires updates on 38.331 and 38.213. |
| LG Electronics | Would be better to wait for RAN2’s progress. Accordingly, we can discuss which parts are needed to be updated in RAN1 specification in the next meeting. |