**3GPP TSG-RAN WG2 Meeting #113e R2-20xxxxx**

**Electronic Meeting, 25th Jan – 5th Feb 2021**

**Source: ZTE Corporation**

**Title: Email discussion 061 – Configuration of First Active BWP**

**Agenda item:**  **x.x.x**

**Document for:** **Discussion and Decision**

# Background

After RAN2\_112e meeting, the following email discussion was agreed to progress the discussion on configuration of First Active BWP:

* **[Post112-e][061][NR15] Configuration of First Active BWP (ZTE)**

 Scope: Continue discussion related to R2-2009580/81 and CR1748. Determine way forward for whether firstActiveUplinkBWP-Id should be mandatory or optional present upon reconfigurationWithSync to the same SpCell. If optional, whether to / how to handle potential related issues.

 Intended outcome: Report, Agreeable CRs if possible.

 Deadline: Long

Rapporteur would like to have following schedule for this email discussion to have enough time for preparing the summary report and draft CRs.

* Phase 1 (2020-12-20): Companies are invited to provide inputs and comments to questions.
* Phase 2 (2021-01-10): Rapporteur will provide draft summary and draft CRs, companies are invited to provide comments to the summary report and CRs.

# Contact information

|  |  |
| --- | --- |
| Company  | Email address |
| Samsung | jack.jang@samsung.com |
| MediaTek | Chun-fan.tsai@mediatek.com |
| Ericsson | antonino.orsino@ericsson.com |
| CATT | erlin.zeng@catt.cn |
| vivo | wenjuan. pu@vivo.com |
| ZTE | liu.jing30@zte.com.cn |
| Huawei | caozhenzhen@huawei.com |
| LG | seungjune.yi@lge.com |

# Background

Based on TS 38.331, two fields *firstActiveDownlinkBWP-Id* and *firstActiveUplinkBWP-Id* are defined in *ServingCellConfig*, to indicate the first active BWP upon PCell change, PSCell addition/change, or SCell addition. In addition, the fields can also be used to trigger RRC-based BWP switching. And condition “SyncAndCellAdd” is defined to capture the presence/absence condition for the two fields.

***ServingCellConfig* information element**

-- ASN1START

-- TAG-SERVINGCELLCONFIG-START

ServingCellConfig ::= SEQUENCE {

 tdd-UL-DL-ConfigurationDedicated TDD-UL-DL-ConfigDedicated OPTIONAL, -- Cond TDD

 initialDownlinkBWP BWP-DownlinkDedicated OPTIONAL, -- Need M

 downlinkBWP-ToReleaseList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Id OPTIONAL, -- Need N

 downlinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Downlink OPTIONAL, -- Need N

 firstActiveDownlinkBWP-Id BWP-Id OPTIONAL, -- Cond SyncAndCellAdd

 bwp-InactivityTimer ENUMERATED {ms2, ms3, ms4, ms5, ms6, ms8, ms10, ms20, ms30,

 ms40,ms50, ms60, ms80,ms100, ms200,ms300, ms500,

 ms750, ms1280, ms1920, ms2560, spare10, spare9, spare8,

 spare7, spare6, spare5, spare4, spare3, spare2, spare1 } OPTIONAL, --Need R

 defaultDownlinkBWP-Id BWP-Id OPTIONAL, -- Need S

 uplinkConfig UplinkConfig OPTIONAL, -- Need M

 supplementaryUplink UplinkConfig OPTIONAL, -- Need M

\*\*\*\*omit\*\*\*\*

}

UplinkConfig ::= SEQUENCE {

 initialUplinkBWP BWP-UplinkDedicated OPTIONAL, -- Need M

 uplinkBWP-ToReleaseList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Id OPTIONAL, -- Need N

 uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink OPTIONAL, -- Need N

 firstActiveUplinkBWP-Id BWP-Id OPTIONAL, -- Cond SyncAndCellAdd

 pusch-ServingCellConfig SetupRelease { PUSCH-ServingCellConfig }OPTIONAL, -- Need M

 carrierSwitching SetupRelease { SRS-CarrierSwitching } OPTIONAL, -- Need M

 ...,

\*\*\*\*omit\*\*\*\*

}

After RAN2\_111e meeting, RAN2 has agreed CRs [1][2], mainly clarify that network can optional provide “firstActiveDownlinkBWP-Id” and “firstActiveUplinkBWP-Id” when triggers RRCReconfiguration with reconfigurationWithSync to the same SpCell (i.e. intra-cell handover). Corresponding correction is shown as below:

|  |  |
| --- | --- |
| **Conditional Presence** | **Explanation** |
| *SyncAndCellAdd* | This field is mandatory present for a SpCell upon PCell change and PSCell addition/change and upon *RRCSetup*/*RRCResume*.The field is mandatory present for an SCell upon addition.For SpCell, the field is optionally present, Need N, upon reconfiguration without *reconfigurationWithSync*,and upon reconfiguration with *reconfigurationWithSync* to the same SpCell.In all other cases the field is absent. |

Note: The term “PCell change” does not involves “intra-cell handover”, so without above change, the missing scenario (i.e. intra-cell handover) was covered by the last sentence ”In all other cases the field is absent”, thus it implies that network cannot include firstActiveDownlinkBWP-Id and firstActiveUplinkBWP-Id upon intra-cell handover.

Based on above clarification, during RAN2\_112e meeting, [3][4] were submitted to clarify the field description of *rach-ConfigDedicated* in *reconfigurationWithSync*, because the original sentence (shown in red) would cause ambiguity issue when *firstActiveUplinkBWP-Id* is not present in current RRCReconfiguration message. The proposed change is shown as below:

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| --- |
| ***ReconfigurationWithSync* field descriptions** |
| ***rach-ConfigDedicated***Random access configuration to be used for the reconfiguration with sync (e.g. handover). The UE performs the RA according to these parameters in the *firstActiveUplinkBWP* (see *UplinkConfig*) if *firstActiveUplinkBWP-Id* is present in the current *RRCReconfiguration* message, otherwise according to the parameters in the UE’s current active UL BWP. |

However, during offline discussion on CRs [3][4] in RAN2\_112e, some companies expressed concern on the previous agreed CRs[1][2], and suggested to mandatory configure firstActiveDownlinkBWP-Id and firstActiveUplinkBWP-Id upon reconfiguationWithSync to the same SpCell. Thus this document is provided to further discuss this issue and to collect companies’ views.

# Who generates reconfigurationWithSync?

When discussing CRs[1][2], one motivation to support optional configure “firstActiveBWP Id” upon reconfigurationWithSync to the same SpCell, is to avoid undesirable BWP switching. Because RRC layer may be unaware of the current active BWP due to DCI-based BWP switching. So if network wants to trigger RRCReconfiguration for updating some L1/L2 parameters, network may not want to change current BWP, thus it would be good to not include “firstActiveBWP Id” in RRCReconfiguration message, so it won’t result in additional RRC-based BWP switching.

However, before discussing specific questions, rapporteur has checked RAN3 specs, for gNB CU-DU split scenario, according to TS 38.473, the entire “CellGroupConfig” configuration will be generated by gNB-DU (see below, included in “DU to CU RRC Information”), and then be forwarded to gNB-CU for compiling RRCReconfiguration message.



(Note: The *CellGroupConfig* included in “CU to DU RRC Information” is used to facilitate delta configuration.)

Since reconfigurationWithSync and ServingCellConfig are included in CellGroupConfig, so at least for gNB CU-DU split scenario, gNB-DU is responsible for generating reconfigurationWithSync as well as firstActiveDownlinkBWP-Id and firstActiveUplinkBWP-Id.

Regarding gNB-CU (e.g. RRC layer), it may also decide to trigger reconfigurationWithSync (e.g. key refresh), and this can be done by send “SpCell ID” in UE CONTEXT MODIFICATION REQUEST message from gNB-CU to gNB-DU.

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| --- |
| TS 38.473, clause 8.3.4.2If the *SpCell ID* IE is included in the UE CONTEXT MODIFICATION REQUEST message, the gNB-DU shall replace any previously received value and regard it as a reconfiguration with sync as defined in TS 38.331 [8].  |

However, even if gNB-CU sets “SpCell ID” field to trigger reconfigurationWithSync, based on current TS 38.473, gNB-CU cannot provide additional fields to gNB-DU the final reconfigurationWithSync configuration as well as firstActiveDownlinkBWP-Id/firstActiveUplinkBWP-Id fields are still generated by gNB-DU. And this is transparent to the gNB-CU.

**Observation 1: Based on RAN3 spec, for gNB CU-DU split scenario, gNB-DU is responsible for generating *reconfigurationWithSync* configuration, as well as *firstActiveDownlinkBWP-Id* and *firstActiveUplinkBWP-Id* configuration in RRCReconfiguration message, not gNB-CU.**

**Q1: Do companies agree with above Observation 1? (If no, please provide comments)**

|  |  |  |
| --- | --- | --- |
| Company  | Agree/ Disagree | Comments |
| Samsung | Agree | - |
| MediaTek | Agree |  |
| Ericsson | Agree |  |
| CATT | Agree |  |
| vivo | Agree |  |
| ZTE | Agree |  |
| Huawei, HiSilicon | Agree |  |
| LG | Agree |  |

# Discussion

Then back to the question of “whether firstActiveUplinkBWP-Id should be mandatory or optional present upon reconfigurationWithSync to the same SpCell”. Based on current spec, for SpCell, these fields can be optional configured when network triggers RRCReconfiguration **without** reconfigurationWithSync, which means network can trigger RRC-based BWP switching without doing reconfigurationWithSync, the corresponding interruption requirement is defined in TS 38.133.

**Observation 2: Upon RRCReconfiguration without reconfigurationWithSync, *firstActiveDownlinkBWP-Id* and *firstActiveUplinkBWP-Id* can be OPTIONAL configured .**

However, in case of RRCReconfiguration **with** reconfigurationWithSync, since RACH procedure will be triggered when receiving the message, based on the discussion last meeting, companies showed concern if network does not provide firstActiveDownlinkBWP-Id/firstActiveUplinkBWP-Id in the same RRCReconfiguration message.

In general, the alternatives are summarized as below:

(For simplicity, to use “firstActiveBWP-IDs” instead of “firstActiveDownlinkBWP-Id and firstActiveUplinkBWP-Id”)

* Alt1: Mandatory present (revert previous agreed CRs[1][2])
	+ Network always provides firstActiveBWP-IDs upon reconfigurationWithSync;
	+ UE performs RACH procedure in the indicated UL/DL BWP;
* Alt2: Optional present
	+ Network can optional provide firstActiveBWP-IDs upon reconfigurationWithSync;
	+ If firstActiveBWP-IDs are provided, UE performs RACH procedure in the indicated UL/DL BWP; Otherwise, UE performs RACH procedure in current active BWP.

For Alt1, it looks simple, and based on observation 1, the configuration of firstActiveBWP-IDs is controlled by gNB-DU, so if network wants to avoid redundant BWP switching, network can indicate the ID of current active BWP if the BWP is already configured with RACH resource. Similarly, for Alt2, for the BWP where RACH will be performed, it is up to network implementation to ensure there is RACH resource in the BWP. For instance, if current BWP is already configured with RACH resource, gNB-DU can decide to trigger reconfigurationWithSync without providing firstActiveBWP-IDs, thus UE will perform RACH directly in current active BWP. Since gNB-DU is aware of this procedure, it is straightforward that MAC will avoid performing DCI-based BWP switching before completion of this procedure.

Therefore, rapporteur understands both alternatives can work. But companies are invited to show your preference. Since this relates to interoperation between network and UEs, please companies pay attention to your current implementation to make sure there is no NBC issue.

**Q2: Please provide you preference on whether firstActiveDownlinkBWP-Id/firstActiveUplinkBWP-Id should be mandatory or optional present upon reconfigurationWithSync to the same SpCell (i.e. intra-cell handover).**

(If there is NBC concern about either way, please highlight in your comments)

|  |  |  |
| --- | --- | --- |
| Company  | Mandatory/Optional | Comments |
| Samsung | Mandatory | As commented during RAN2#112-e, we think it should be mandatory present, and thought 'upon PCell change' in the old text includes the case for the intra-cell handover as well (i.e. change to itself).We do not see any NBC issue with this change. |
| MediaTek | Mandatory | As commented in RAN2#111-e, the original wording of the “PCell change” is “PCell handover”. Changing to “PCell change” is just to avoid the “handover” terminology. So, we see no problem to have this in mandatory for intra-cell handover case. We also think that it would be much better if the parameter is always present in case of *reconfigurationwithsync* to avoid any potential IOT issue between UE and NW.However, it would be acceptable for us if NW vendors think it is difficult to always provide firstActiveBWP-IDs for intra-cell handover case. We do not see NBC issue on either of the alternative. |
| Ericsson | Mandatory | Agree basically with Samsung and MadiaTek comments. It makes life much easier to have these two parameters mandatory in case of *reconfigurationWithSync* without differentiating between same or different cell. |
| CATT | Mandatory | We agree with the above comments. Network has anyway the choice to indicate IDs so that BWP is not switched, which means not including the IDs gives limited benefits. |
| vivo | Mandatory | Mandatory present is simplest and has no NBC issue. NW can avoid unnecessary BWP switching by configuring the firstActiveBWP-IDs as the current BWP.  |
| ZTE | Mandatory | Since firstActiveBWP-IDs are always set by gNB-DU, the concern raised in our old CRs[1][2] is not valid any more. And in this case we agree network (DU) should be able to configure appropriate firstActiveBWP-IDs if it wants to avoid unnecessary BWP switching.However, we are a bit unsure about the statement: “the term ‘PCell change’ already includes ‘intra-cell handover’ case”, because at least for “*smtc*” fields in *CellGroupConfig*, we think those fields are not applicable to intra-cell handover case. |
| Huawei, HiSilicon | Mandatory | Agree with comments from others. In this context, we think “PCell change” should have covered the intra-cell handover case, and we are fine to further clarify. |
| LG | Mandatory | The 'PCell change' includes the case of the intra-cell handover as well. This is common understanding from LTE Rel-10 CA. Thus, the firstActiveBWP-ID should be mandatorily present. |

If answers “mandatory” to Q2, we need to further discuss how to revise the condition explanation in TS 38.331. The latest version is given as below (take into account the newly agreed CR[5], corrections are shown in blue). As mentioned in section 3, simply removing “and upon reconfiguration with reconfigurationWithSync to the same SpCell” is insufficient, because “PCell change” does not include “intra-cell handover” case, then it will drop into “other cases”. So for “mandatory” approach, rapporteur would suggest to update the description as below:

|  |  |
| --- | --- |
| **Conditional Presence** | **Explanation** |
| *SyncAndCellAdd* | This field is mandatory present for a SpCell upon ~~PCell change and PSCell addition/change~~ reconfiguration with *reconfigurationWithSync* and upon *RRCSetup*/*RRCResume*.The field is mandatory present for an SCell upon addition, and absent for SCell in other cases, Need M.For SpCell, the field is optionally present, Need N, upon reconfiguration without *reconfigurationWithSync*~~,~~~~and upon reconfiguration with~~ *~~reconfigurationWithSync~~* ~~to the same SpCell.~~.In all other cases for SpCell the field is absent. |

**Q3: If answers “mandatory” to Q2, do you agree with above correction (shown in red)?**

|  |  |  |
| --- | --- | --- |
| Company  | Agree/Disagree | Comments |
| Samsung | - | We are fine with suggestion from the rapporteur.If RAN2 goes with Rapporteur's approach, the last sentence ('In all other cases for SpCell the field is absent.') can be removed, and SCell case ('The field is mandatory present for an SCell upon addition, and absent for SCell in other cases, Need M.') can be moved to bottom, merely to group SpCell case together for the readability. Then it would be something like below:

|  |
| --- |
| For SpCell, this field is mandatory present upon ~~PCell change and PSCell addition/change~~ reconfiguration with *reconfigurationWithSync* and upon *RRCSetup*/*RRCResume*.For SpCell, the field is optionally present, Need N, upon reconfiguration without *reconfigurationWithSync*~~,~~~~and upon reconfiguration with~~ *~~reconfigurationWithSync~~* ~~to the same SpCell.~~.The field is mandatory present for an SCell upon addition, and absent for SCell in other cases, Need M. |

 |
| MediaTek | Agree |  |
| Ericsson | Agree |  |
| CATT | Agree |  |
| vivo | Agree |  |
| ZTE | Agree with comment | Considering *CellGroupConfig* of SpCell can only be configured via *RRCReconfiguration*, *RRCSetup* and *RRCResume* messages, we tend to agree with Samsung that the last sentence “In all other cases for SpCell the field is absent” seems redundant now. For reordering the sentences, we have no strong view, but would be fine to have it for readability.  |
| Huawei, HiSilicon | Agree | Also agree with Samsung/ZTE’s comments to remove the redundancy. |
| LG | Neutral | As the 'PCell change' includes the case of the intra-cell handover as well, we don’t see any issue with the current text. However, if majority wants for further clarification, we are ok for that. In our view, Samsung’s text is better. |

If answers “optional” to Q2, then we need to further discuss the ambiguity issue identified in [3][4]. E.g. how to interpret rach-ConfigDedicated field if firstActiveUplinkBWP-Id field is not included in current RRC message?

Based on the discussion last meeting, following two options were raised by companies:

* Option 1[3][4]: Clarify that if firstActiveUplinkBWP-Id is included in current RRC message, then rach-ConfigDedicated is referring to configuration in indicated UL BWP; Otherwise, rach-ConfigDedicated is referring to the configuration in current active UL BWP.

|  |
| --- |
| ***ReconfigurationWithSync* field descriptions** |
| ***rach-ConfigDedicated***Random access configuration to be used for the reconfiguration with sync (e.g. handover). The UE performs the RA according to these parameters in the *firstActiveUplinkBWP* (see *UplinkConfig*) if *firstActiveUplinkBWP-Id* is present in the current *RRCReconfiguration* message, otherwise according to the parameters in the UE’s current active UL BWP. |

* Option 2: Clarify that network must provide firstActiveBWP-IDs when rach-ConfigDedicated is configured. (e.g. mandatory for CFRA, optional for CBRA)

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| --- |
| ***ReconfigurationWithSync* field descriptions** |
| ***rach-ConfigDedicated***Random access configuration to be used for the reconfiguration with sync (e.g. handover). The UE performs the RA according to these parameters in the *firstActiveUplinkBWP* (see *UplinkConfig*), network can only configure this field when *firstActiveUplinkBWP-Id* is included in the same RRCReconfiguration message. |

**Q4: If answers “optional” to Q2, which option do you prefer for clarifing the field description of rach-ConfigDedicated? Any further comments to the correction?**

|  |  |  |
| --- | --- | --- |
| Company  | Option1/Option2 | Comments |
| Samsung | - | We would like to clarify that Option 2 is the current behavior according to the existing text 'The UE performs the RA according to these parameters in the firstActiveUplinkBWP (see UplinkConfig).' in the description of rach-ConfigDedicated, and thus Option 1 is indeed NBC change. Having said that, we do not need to have additional text even for Option 2 either. |
| MediaTek | No strong view |  |
| Ericsson |  | We think that firstActiveUplinkBWP and firstActiveDownlinkBWP should be mandatory at *reconfigurationWithSync*. Therefore, we do not see the need to go for option 1 or option 2. |
| LG | Neither | As the 'PCell change' includes the case of the intra-cell handover as well, the firstActiveBWP-ID should not be optional. |
|  |  |  |

# Other

Besides the previous questions, do companies identify any fields that need clarification? or any issue that needs further discussion?

 **Q5: Besides previous questions, any other issue that needs discussion?**

|  |  |
| --- | --- |
| Company  | Comments |
|  |  |
|  |  |
|  |  |

# Summary

To be provided later…

# Reference

1. R2-2008471 CR on condition of SyncAndCellAdd ZTE Corporation, Sanechips CR Rel-15 38.331 15.10.0 1748 1 F NR\_newRAT-Core
2. R2-2008472 CR on condition of SyncAndCellAdd ZTE Corporation, Sanechips CR Rel-16 38.331 16.1.0 1749 1 A NR\_newRAT-Core
3. R2-2009580 Correction on rach-ConfigDedicated ZTE Corporation, Sanechips CR Rel-15 38.331 15.11.0 2092 - F NR\_newRAT-Core
4. R2-2009581 Correction on rach-ConfigDedicated ZTE Corporation, Sanechips CR Rel-16 38.331 16.2.0 2093 - A NR\_newRAT-Core
5. R2-2011131 Corrections on configuration of first active BWPs Huawei, HiSilicon CR Rel-15 38.331 15.11.0 2269 1 F NR\_newRAT-Core