3GPP TSG-RAN WG2 Meeting #116 Electronic R2-21xxxxx

**Online, November 1-12, 2021**

**Agenda item: 6.1.4.1.1**

**Source: vivo**

**Title: Draft-Summary of [AT116-e][010][NR16] Connection Control III (vivo)**

**Document for: Discussion and Decision**

# 1 Introduction

This document is a report on the following email discussion:

* [AT116-e][010][NR16] Connection Control III (vivo)

 Scope: Determine agreeable parts in a first phase, for agreeable parts agree on CRs. Treat [R2-2110523](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110523.zip), [R2-2110524](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110524.zip), [R2-2110525](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110525.zip), [R2-2110526](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110526.zip), [R2-2109346](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2109346.zip), [R2-2110685](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110685.zip), [R2-2110686](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110686.zip), [R2-2111037](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2111037.zip), [R2-2111200](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2111200.zip)

 Intended outcome: Report, Agreed CRs if applicable

 Deadline: Schedule 1

The deadline Schedule 1 for this email discussion is copied from Chair notes:

* A first round with Deadline for comments Thursday W1 Nov 4 1200 UTC to settle scope what is agreeable etc
* A Final round with Final deadline Thursday W2 Nov 11 1200 UTC to settle details / agree CRs etc.
* Additional deadlines check points etc if needed are defined by the Rapporteur. In case some parts of an email discussion need more time, doesn’t converge, need on-line treatment etc Rapporteur please contact chair.

# 2 Contact Points

Respondents to the email discussion are kindly asked to fill in the following table.

|  |  |  |
| --- | --- | --- |
| Company | Name | Email Address |
| vivo(rapporteur) | Xiaodong Yang | yangxiaodong5g@vivo.com |
| Nokia |  | amaanat.ali@nokia.com |
| Huawei, HiSilicon | Lili Zheng | zhenglili4@huawei.com |
| Ericsson | Pradeepa Ramachandra | pradeepa.ramachandra@ericsson.com |
| Qualcomm | Mouaffac | mambriss@qti.qualcomm.com  |
| ZTE | Yu Liu | liu.yu3@zte.com.cn |
| MediaTek | Felix Tsai | chun-fan.tsai@mediatek.com |
| CATT | Rui Zhou | zhourui@catt.cn |
| China Telecom | Jincan Xin | xinjc@chinatelecom.cn |
| Samsung | Sangyeob Jung | sy023.jung@samsung.com |
| Apple | Fangli XU | fangli\_xu@apple.com |
| OPPO | Zhongda Du | duzhongda@oppo.com |
| OPPO | Boyuan Zhang | zhangboyuan@oppo.com |
| Lenovo | Lianhai Wu | Wulh5@lenovo.com |
| NEC | Hisashi Futaki | hisashi.futaki@ nec.com |
| Intel | Sudeep Palat | Sudeep.k.palat@intel.com |

# 3 Discussion

## 3.1 NR SA to ENDC Handover

This topic is from the following four contributions.

[1] R2-2110523 Discussion on the Timing Reference of PSCell SMTC Configuration vivo discussion Rel-16 NR\_newRAT-Core

[2] R2-2110524 Clarification on the Timing Reference of PSCell SMTC Configuration vivo CR Rel-16 38.331 16.6.0 2836 - F NR\_newRAT-Core

[3] R2-2110525 Define the UE capability for PSCell SMTC configuration vivo CR Rel-16 38.306 16.6.0 0652 - F NR\_newRAT-Core

[4] R2-2110526 Clarification on the Timing Reference of PSCell SMTC Configuration vivo CR Rel-16 36.331 16.6.0 4735 - F NR\_newRAT-Core

In [1], the company identifies that it’s unclear whether the UE applies the PSCell SMTC configuration based on the timing reference of NR PCell or target EUTRA PCell for the case of NR SA to EN-DC HO with PSCell addition. According to the proposal in [1], there are basically the following options to address such an ambiguous UE behavior:

* **Option 1**: The target NR PSCell SMTC configuration is provided through *MobilityFromNRCommand* based on the timing reference of source NR PCell;
* **Option 2**: The target NR PSCell SMTC configuration is provided through*targetRAT-MessageContainer* based on the timing reference of target EUTRA PCell.

**Question 1: For the Timing Reference of PSCell SMTC Configuration in NR SA to ENDC Handover, which option(s) do you prefer?**

* Option 1: based on the timing reference of source NR PCell;
* Option 2: based on the timing reference of target EUTRA PCell;
* Both Option 1 and Option 2;
* Other Option(s), please specify.

|  |  |  |
| --- | --- | --- |
| Company | Option(s) | Comments |
| Nokia | Option 2 | This is clearly more aligned with reference to existing specifications. |
| Huawei, HiSilicon | Option 2 | Option 1 requires the UE to keep the timing of the source NR PCell even after HO is finished.[vivo]: Note that RAN4 is discussing whether sequential or parallel processing needs to be considered for NR-SA to EN-DC handover, and whether the timing needs to be kept or not is up-to RAN4 discussion. Option 1 is mainly for parallel processing which can shorten the processing timeline as Qualcomm mentioned |
| Ericsson | Option-2 |  As the target EUTRA cell is the one that decides on the SN addition, it is straight forward to configure the associated SMTC based on the timing of the target EUTRA PCell. |
| QCOM | Option-1 | Since it’s a one shot Handover, i.e. HO to PCell (LTE) and PSCell (NR) Target is expected to be executed simultenously, it makes sense to use the source Pcell timing. Option-2 is mandating that only sequential HO can be executed for the one shot HO from NR SA to EN-DC, i.e. UE has to wait till Target PCell is acquired before initiating the PSCell addition, **which is a suboptimal behavior** and not acceptable. |
| ZTE | Option 2 |  |
| MediaTek | Option 2 |  |
| CATT | Option 2 |  |
| China Telecom  | Option 2 | Since the target EUTRA PCell decides on SN addition, the target NR PSCell SMTC configuration should be based on the timing reference of target EUTRA PCell. |
| Samsung | Option 2 | Similar to NR-DC, it makes more sense to apply PSCell SMTC configuration based on the timing reference of target EUTRA Pcell. [vivo]: For NR-DC, the timing reference can also be the source PSCell if it is configured in reconfigurewithSync. RAN4 agrees to consider parallel processing for that case. |
| Apple | Option 2 |  It’s clearly indicated in 36.331 that “It is based on timing reference of EUTRA PCell.” |
| OPPO | Option 2 | But with the assumption that source NR PCell and target EUTRA PCell is SFN/subframe synchronized i.e. the same note for case between source and target EUTRA can be also applied here. |
| Lenovo | Option 2 |  |
| NEC | Option 2 | Our understanding is Option 2 is alreay assumed when PSCell timing cannot be ensured at HO execution. |
| Intel | Option 2 | For HO to LTE, we should follow the LTE specification and option 2 is more aligned with it. UE would normally have acquired the timing of the LTE Pcell and hence using it as a reference for the PSCell seems possible on the UE side.  |
| vivo | Both option 1 and option 2 | For option 1, the network has a way to determine the SMTC of the target NR PSCell based on the timing of the source NR PCell since the NR PCell can know the timing of the target NR PSCell (i.e., the target PSCell is the neighbor cell of the source NR PCell or the target PSCell is the source NR PCell). In this way, the UE can perform inter-RAT HO and PSCell addition simultaneously and it is beneficial for shortening the processing delay.For option 2, we share the same view with Ericsson, it’s a more intuitive way as the target EUTRA cell is the one that decides on the SN addition.Both options have their advantages, so we think both option 1 and option 2 should be supported. Furthermore, in case of the SMTC of target PSCell is provided by both source NR PCell and target EUTRA PCell, it is up to UE implementation which one to use. |

**Rapporteur’s summary:**

15 companies answered this question with the views below:

* Option 1 [1/15]
* 1company thinks HO to EUTRA PCell and NR PSCell addition is expected to be executed simultenously, it makes sense to use the source PCell timing.
* Option 2 [13/15]
* 4 companies think option 2 is more aligned with reference to existing specifications;
* 1 company thinks Option 1 requires the UE to keep the timing of the source NR PCell even after HO is finished.
* 2 companies thinks option 2 is a straight way since target EUTRA cell is the one that decides on the SN addition;
* 1 company thinks the current TS 36.331 is clear that “It is based on timing reference of EUTRA PCell.”
* 1 company thinks a note that “assumpt the source NR PCell and target EUTRA PCell is SFN/subframe synchronized” can be applied.
* Both option 1 and option 2: [1/15]
* 1 company thinks that both options have their advantages.

With the majority’s preference, the following proposal is given:

**Proposal 1: RAN2 confirms that UE applies the PSCell SMTC configuration based on the timing reference of target EUTRA PCell for the case of NR SA to EN-DC HO with PSCell addition (if explicit SMTC configuration is present in *RRCConnectionReconfiguration*).**

**Question 2-1: If Option 1 is preferred to Question 1, do companies agree with the intention of 38.331 CR in [2] i.e., clarify that the target NR PSCell SMTC configuration through *MobilityFromNRCommand* is based on the timing reference of source NR PCell?**

|  |  |  |
| --- | --- | --- |
| Company | Agree or not? | Comments |
| Nokia |  | See above |
| QCOM | Yes |  |
| vivo | Yes |  |
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**Rapporteur’s summary:**

3 companies answered this question and 2 companies agree with the intention of 38.331 CR. Based on the answer to Q1, no proposal is provided for this question.

**Question 2-2: If Option 1 is preferred to Question 1, do companies agree with the intention of 38.306 CR in [3] i.e., define a new UE capability for PSCell SMTC configuration?**

|  |  |  |
| --- | --- | --- |
| Company | Agree or not? | Comments |
| Nokia |  | See above |
| QCOM | Yes |  |
| vivo | Yes |  |
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**Rapporteur’s summary:**

3 companies answered this question and 2 companies agree with the intention of 38.306 CR. Based on the answer to Q1, no proposal is given for this question.

**Question 3: If option 2 is preferred to Question 1, do companies agree with the intention of 36.331 CR in [4] i.e., clarify that the target NR PSCell SMTC configuration through *targetRAT-MessageContainer* is based on the timing reference of target EUTRA PCell?**

|  |  |  |
| --- | --- | --- |
| Company | Agree or not? | Comments |
| Nokia | We think no clarification is required for Option 2 being the correct understanding | Going with the description of smtc in TS 36.331. smtc. Entry into EN-DC and NR PSCell addition is clearly stated in this description.The SSB periodicity/offset/duration configuration of target cell for NR PSCell addition and SN change. It is based on timing reference of EUTRA PCell. NOTE 2.If the field is absent, the UE uses the SMTC in the measObjectNR having the same SSB frequency and subcarrier spacing, as configured before the reception of the RRC message. |
| Huawei, HiSilicon | See comment | We think this scenario has not been specifically discussed in the past, but we tend to agree with Nokia that the current text in the spec can cover this scenario. So no additional modification is needed. |
| Ericsson | See comments |  Currently, the specification does not mention anything regarding whether to use the source EUTRA cell or the target EUTRA cell as the timing reference for the NR PSCell at the time of E-UTRA PCell handover and PSCell/SN change. So, in such scenarios, the SMTC is not configured and the UE uses the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing, as configured before the reception of the RRC message.We believe the same is applicable in this scenario also and we do not need to do anything unless we want to also clarify the UE behaviour (along the lines of option-2) for the case of EUTRA PCell change with simultaneous PSCell addition/change.  |
| ZTE | Agree but | We think the clarification is necessary for the case of NR SA to EN-DC handover, and we are open on how to modify the spec. |
| MediaTek | See comments | Tend to agree with Nokia that the current text is enough for option 2. |
| CATT | See comment | We agree with Nokia, currently the spec has already capture it clearly. |
| China Telecom | See comment | We think the current specification does not clarify the target NR PSCell SMTC configuration during the NR SA to EN-DC handover. But the current spec can cover the scenario. So, there is no need for spec modification.  |
| Samsung | Agree but | We wonder whether the addition “for the case of EN-DC handover with PSCell addition or SN change” is meaningful in the sense that the previous texts clearly clarity it.  |
| Apple | See comments | Current spec has already covered this case.But if companies wouldl like to clarify this case, we are fine to capture the understanding somewhere, in chairman notes or in NOTE2 of the spec.  |
| OPPO | See comments | We think the Note2 should be applicable for the concerned case and corresponding calrification is needed. |
| Lenovo | See comments | Agree with Nokia. |
| NEC | See comments | We have the similar understanding as Nokia. |
| Intel | See comments | We agree this scenario has not been discussed previously. However, we also agree with Nokia comment that the current specification text is aligned with option 2 and no change to stage 3 specs seems essential if we conclude on option 2. We are also open to confirming this explicitly in the specs. |
| vivo | Agree | From our perspective, the current TS 36.331 is only applicable to EN-DC handover, since the description following refers to the case where the source cell and the target cell are both EUTRA cells, whereas the case mentioned is for the source cell is NR and the target cell is EUTRA. So the clarification is necessary for the case of NR SA to EN-DC handover.

|  |
| --- |
| NOTE 2: It is not specified whether the timing reference for the SMTC configuration is the source EUTRA PCell or the target EUTRA PCell in case the NR PSCell addition or SN change takes place simultaneously with handover. As a consequence, explicit SMTC configuration is only supported when the source EUTRA PCell and the target EUTRA PCell of the handover are SFN/subframe-synchronized. |

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**Rapporteur’s summary:**

14 companies answered this question with the views below:

Companies’ views can be categorized into “the clarification is necessary” and “current spec has already covered this case”.

* The clarification is necessary [3/14]
* Current spec has already covered this case [11/14]

Although majority of companies think the current spec has already covered the case of NR SA to EN-DC handover with PSCell addition, it is ambiguous for some companies. Furthermore, two companies who hold the view that no change to stage 3 specs are also fine to confirm this explicitly.

With the majority’s preference, the following proposal is given:**Proposal 2: TS 36.331 CR (R2-2110526) is not pursued.**

## 3.2 UP security policy update

In the incoming LS from RAN3 [5], the following action is required:

**To RAN1 :** RAN3 kindly requests RAN2 to provide feedback whether the enabling/disabling of ciphering or integrity protection of one or multiple DRBs can be achieved by intra-cell handover within one RRC reconfiguration message.

There are several contributions related to this issue as follows.

[6] R2-2110685 Discussion on UP security policy updated by intra-cell handover Ericsson discussion Rel-16 TEI16

[7] R2-2110686 [Draft] Reply LS on UP security policy updated by intra-cell handover Ericsson LS out Rel-16 TEI16 To:RAN3 Cc:SA3

[8] R2-2111037 Discussion on Ls on UP security update vivo discussion Rel-16 TEI16

[9] R2-2111200 Discussion on UP security policy updated by intra-cell handover China Telecommunications discussion

Referring to contributions above, all companies express similar views, i.e., enabling/disabling of ciphering or integrity protection of one or multiple DRBs can be achieved by intra-cell handover within one RRC reconfiguration message. The rapporteur shares the same view with these companies, according to current TS 38.331, clause 5.3.1.2, integrity protection and ciphering for all DRBs related to the same PDU session are always activated together. A DRB can be reconfigured using *RRCReconfiguration* message according to the TS 38.331 clause 5.3.5.3.

In order to form a common view to reply to RAN3’s question, companies are encouraged to answer the following question.

**Question 4: Do companies agree** **that enabling/disabling of ciphering or integrity protection of one or multiple DRBs can be achieved by intra-cell handover within one RRC reconfiguration message？**

|  |  |  |
| --- | --- | --- |
| Company | Agree or not | Comments |
| Nokia | Yes | From NR perspective this implies reconfiguration and sync in single RRC message. We think also DRB release and add is another option and even that is possible with single reconfiguration message. |
| Huawei, HiSilicon | See comments | Whether/how the ciphering/integrity protecting can be enabled or disabled has been discussed in Rel-15, and RAN2 agreement is that it can only be done by DRB release and add. This was captured in RRC spec in section 5.3.5.6.5 as Note 5: Ciphering and integrity protection can be enabled or disabled for a DRB. The enabling/disabling of ciphering or integrity protection can be changed only by releasing and adding the DRB.”Based on above, the key point to reply to RAN3 is that in RAN2 spec, enabling/disabling of ciphering or integrity protection of one or multiple DRBs can be achieved only by releasing and adding the DRB which can be configured in the same RRC reconfiguration message. In case of intra-cell handover, the target gNB can configure DRB release and add within the same target RRC reconfiguration message carrying reconfigurationWithSync.  |
| Ericsson | Yes but | We agree in principle that enabling/disabling of ciphering and intergrity protection algorithms can do done via an intra-cell handover within one RRC reconfiguration message.However, based on the text in the LS RAN3 understanding is the following:However, according to TS38.331, ciphering and integrity protection can be changed only by releasing and adding the DRB. This is not correct according to the current NR RRC when the changing on the security algorithm can only be done via a reconfiguration with sync.5.3.1.2 AS SecurityThe integrity protection and ciphering algorithms can only be changed with reconfiguration with sync. The AS keys (KgNB, KRRCint, KRRCenc, KUPint and KUPenc) change upon reconfiguration with sync (if *masterKeyUpdate* is included), and upon connection re-establishment and connection resume.For us, this needs to be clarified in RAN3, otherwise they may get the wrong impression that DRB release and add is the only way to do it.  |
| ZTE |  | Agree with Huawei’s comments. |
| MediaTek | Yes | And also agree the comment from Huawei |
| CATT | Yes,but | We think both ways are feasible,it is up to gNB implementation on which way(i.e. reconfiguration with sync,DRB release/setup) to use.If only the security policy of one DRB is changed,maybe DRB release/setup is more suitable,as it may avoid impact to other DRBs.For other cases, reconfiguration with sync can be used. |
| China Telecom | Yes | 1. This question was discussed in Rel-15. And the agreement/conclusion was captured in TS38.331,clause 5.3.5.6.5

NOTE 5: Ciphering and integrity protection can be enabled or disabled for a DRB. The enabling/disabling of ciphering or integrity protection can be changed only by releasing and adding the DRB.1. We share the views with all companies on enabling/disabling of ciphering and intergrity protection can do done via an intra-cell handover within one RRC reconfiguration message. Based on this agreement, RAN2 could confirm the question from RAN3.
 |
| Samsung | Agree, but | Same view as Huawei i.e. it can be done by release/addition of the DRB. However, we should let RAN3 know that such approach cannot guarantee lossless transmission. When DRB is released and added, the data loss can happen even for AM DRB because PDCP re-establishment is not applicable in this case. |
| Apple | Yes | We have same view as Huawei.  |
| OPPO(Boyuan) | Yes | The DRB add and release is natural with single reconfiguration message to carry the enabling/disabling of ciphering or integrity protection. But we think RAN3’s intention is focused on only the enabling/disabling of ciphering or integrity protection rather than the change of integrity protection and ciphering algrithhm. Therefore, we do not need to use reconfiguration with sync. |
| NEC | Yes | We agree with Huawei’s point. |
| Intel | See comments | This issue is not related to the algorithms but about whether to enable or disable IP/ciphering.The field description for *integrityProtection* in the PDCP config says:The network configures all DRBs with the same PDU-session ID with same value for this field. The value for this field cannot be changed after the DRB is set up. Hence it is clear that this cannot be changed for the life time of the DRB and it cannot be changed for the same DRB even with intra-cell HO. The only way to change this is to do DRB release and add as RAN3 mentions in the LS and this can be done in the same message. So we are OK with that part of the LS.Regarding use of same DRBId and intra-cell HO, neither of these are essential but at the same time, network should take care to meet the security requirements such as same key and DRB id combination is re-used, data from old RLC bearer should not be delivered to new DRB etc. |
| vivo | Yes | We agree that enabling/disabling of ciphering or integrity protection of one or multiple DRBs can be achieved by intra-cell handover within one RRC reconfiguration message for the reasons as below:* According to TS 38.331 clause 5.3.1.2, integrity protection and ciphering for all DRBs related to the same PDU session are always activated together.
* According to TS 38.331 clause 5.3.5.6.5, the enabling/disabling of ciphering or integrity protection can be changed only by releasing and adding the DRB.
* According to TS 38.331 clause 5.3.5.3, a DRB can be reconfigured using *RRCReconfiguration* message.
* The intra-cell handover is performed by *RRCReconfiguration* message.
 |

**Rapporteur’s summary:**

13 companies answered this question and 11 companies’ answer is yes. Based on the answers from companies, almost all companies agree that the enabling/disabling of ciphering or integrity protection can be changed only by releasing and adding the DRB. The main concern is whether to use reconfiguration with sync, since in the case of intra-cell handover, the target gNB can configure DRB release and add within the same target RRC reconfiguration message carrying reconfigurationWithSync.In the rapporteur’s understanding, DRB release and add configuration and reconfigurationWithSync can be put in one RRC reconfiguration message. So the following proposal is given:

**Proposal 3: From RAN2’s perspective, enabling/disabling of ciphering or integrity protection of one or multiple DRBs can be achieved by intra-cell handover within one RRC reconfiguration message.**

**Proposal 4: Please provide comments on the draft reply LS from China Telecom in Phase 2.**

# 4 Conclusion

**Proposal 1: RAN2 confirms that UE applies the PSCell SMTC configuration based on the timing reference of target EUTRA PCell for the case of NR SA to EN-DC HO with PSCell addition (if explicit SMTC configuration is present in *RRCConnectionReconfiguration*).**

**Proposal 2: TS 36.331 CR (R2-2110526) is not pursued.**

**Proposal 3: From RAN2’s perspective, enabling/disabling of ciphering or integrity protection of one or multiple DRBs can be achieved by intra-cell handover within one RRC reconfiguration message.**

# **Proposal 4: Please provide comments on the draft reply LS from China Telecom in Phase 2.**5 Reference

[1] R2-2110523 Discussion on the Timing Reference of PSCell SMTC Configuration vivo discussion Rel-16 NR\_newRAT-Core

[2] R2-2110524 Clarification on the Timing Reference of PSCell SMTC Configuration vivo CR Rel-16 38.331 16.6.0 2836 - F NR\_newRAT-Core

[3] R2-2110525 Define the UE capability for PSCell SMTC configuration vivo CR Rel-16 38.306 16.6.0 0652 - F NR\_newRAT-Core

[4] R2-2110526 Clarification on the Timing Reference of PSCell SMTC Configuration vivo CR Rel-16 36.331 16.6.0 4735 - F NR\_newRAT-Core

[5] R2-2109346 LS on UP security policy updated by intra-cell handover (R3-214464; contact: China Telecom) RAN3 LS in Rel-16 TEI16 To:RAN2 Cc:SA3

[6] R2-2110685 Discussion on UP security policy updated by intra-cell handover Ericsson discussion Rel-16 TEI16

[7] R2-2110686 [Draft] Reply LS on UP security policy updated by intra-cell handover Ericsson LS out Rel-16 TEI16 To:RAN3 Cc:SA3

[8] R2-2111037 Discussion on Ls on UP security update vivo discussion Rel-16 TEI16

[9] R2-2111200 Discussion on UP security policy updated by intra-cell handover China Telecommunications discussion