3GPP TSG-RAN WG3 #114bis-e R3-221020

**E-meeting, 17th – 26th January 2022**

Source: CATT (moderator)

Title: CB: # SONMDT5\_RACHOpt

Agenda Item: 10.2.1.7

Document for: Approval

# Introduction

**CB: # SONMDT5\_RACHOpt**

**- Check TPs to reflect agreements in last meeting**

**- Define new IE structures to deliver neighbour cell information necessary for PRACH coordination? Introduce the NR cell PRACH configurations in the NR neighbour Information IE?**

**- Whether gNB-DU should be capable to request the gNB-CU to provide PRACH related information or not? A gNB-DU indicates to the gNB-CU the occurrence of PRACH reconfiguration or PRACH configuration due to conflict/potential conflict for cases when the RACH procedure is not known to the gNB-CU? SN indicates the availability of RA Report of a set of UEs specified by their XnAP UE ID?**

**- Capture agreements and provide TPs if agreeable**

(CATT - moderator)

The deadline for the first phase is 00:00 UTC on 21st January (Friday).

# For the Chairman’s Notes

TBD.

# Discussion (first phase)

## Neighbour PRACH Info

In this part we discuss only the IE structure containing the neighbour PRACH info delivered either from the gNB-CU toward the gNB-DU or from the eNB toward the en-gNB. Whether/how the gNB-DU provides some information toward the gNB-CU is discussed in Section 3.2.

### F1AP

This topic has been discussed for a long time (2 years or so) and all of the companies raised their own TPs ([1][3][5][6]) on this topic according to what we agreed last meeting, two of which ([3][5]) contained the corresponding ASN.1.

For this part we will first check the IE structure from the outermost to the innermost: the presence of the outer list, the content of the outer list item, and finally the content of the inner list item. Some other miscellaneous issue are checked later.

**Presence of the outer list (i.e. list of served cells)**

The tabular in [3][6] and the ASN.1 in [3][5] proposed that the served cell list should be an optional IE, with criticality “ignore”, within the two F1AP messages delivered from the gNB-CU toward the gNB-DU. The tabular in [1][5] didn’t propose so, but the moderator thinks they were just typos and were not intended.

**Questions 1.1-1**: Do you agree to confirm that the outer list (i.e. list of served cells) is an optional IE with criticality “ignore” directly within the two F1AP messages delivered from the gNB-CU toward the gNB-DU?

| Company | Comment |
| --- | --- |
| CATT | Agree. |
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**Content of the outer list item**

All companies agreed that each item of the served cell list should contain an NRCGI of served cell (which has been agreed in previous meetings) and the inner list, i.e. the list of neighbour cell, but view were split on the presence of the neighbour cell list.

* The tabular in [1] and the ASN.1 in [5] proposed that the neighbour list is a mandatory IE.
* The tabular in [3][5][6] and the ASN.1 in [3] seemingly proposed that the neighbour cell list is an optional IE. One reason of setting it optional is provided in [2]:

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| One approach is to define that list dedicated for NR PRACH coordination, while another approach is to define it suitable to be expanded for other cross-link interferences (at least for NR-E-UTRA PRACH coordination maybe). We general prefer the latter approach as it does not cost many more bits. As the result the NR neighbour cell list should be optional present (as one day in the future we may add an E-UTRA neighbour cell list into it). |

**Questions 1.1-2**: What is your view on whether the neighbour cell list should be mandatory or optional?

| Company | Comment |
| --- | --- |
| CATT | Both options are acceptable for us, but we prefer setting it optional. |
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**Content of the inner list item**

Views were split on the content in each item of the inner list, i.e. the list of neighbour cells. Three companies ([1][5][6]) provided one option (there is some small difference between [1] and [5][6] anyhow), whereas one company ([3]) provided another.

In addition, the moderator noticed that some company made some IEs other than the NR CGI as mandatory IE, but according to the principle of “Approach 2bis”, every IE except the NR CGI should be optional in order to avoid duplication. The moderator decided not to discuss this topic here.

**Questions 1.1-3**: Which option do you prefer for the content of the inner list, i.e. the list of neighbour cells?

| Company | Comment |
| --- | --- |
| CATT | The option in [3].  [1][5][6] didn’t provide enough information as what we agreed in Q2 2020 (see in Section 10.2.3.1 of the chairman notes / meeting reports):  RAN3#107bis-e:  **Introduce NR PRACH Configuration list per UL/SUL for a cell.**  **Reuse current NR ARFCN IE instead of introducing new IE.**  **Introduce frequencyShift7p5khz per-UL/SUL**  **No need to include the freqBandIndicatorNR**  **Introduce scs-SpecificCarrierList for UL (DL is FFS)**  **(Note: whether it should be included in serving cell information or PRACH configuration is FFS)**  **Introduce an optional IE into the Served Cell Information NR structure to indicate the SSB Positions In Burst**  **Not introduce any cause IE for random access**  **Agree exchanging NR PRACH coordination over X2AP**  **Aeparate the discussion on SCS-SpecificCarrier for DL with PRACH configuration i.e. remove the SCS-SpecificCarrier for DL in the TP and discuss this issue as a correction**  RAN3#108-e:  **Position to include scs-SpecificCarrierList should be per UL/SUL**  **introduce a new TDD pattern for RACH optimization**  **Not included Root Sequence Index BFR for PRACH Optimization in Rel-16. Due to lack of time in Rel-16 whether to introduce Root Sequence Index BFR is proposed to be discussed in Rel-17.**  **To use one newly-defined IE “PRACH Frequency Start from Carrier” to indicate the difference between the “frequency-domain start point” of the RACH occasion and the “frequency-domain start point” of associated carrier**  **To use ssb-perRACH-Occasion to indicate the mapping between RACH resources and SSB**  **to move Zero Correlation Zone Config IE out of FreqDomainLength IE**  **PRACH conflict detection in CU-DU split case is postponed to rel-17**  **PRACH configuration per served cell is signalled from DU to CU and over Xn**  **agree exchange NR PRACH coordination over X2AP**  **signal the PRACH configuration of Served Cells over X2AP, the number of PRACH configurations can be limited to 16**  **X2AP signalling of PRACH configurations of neighbour cells is postponed to Rel-17**  The IEs highlighted in blue is encoded within the NR PRACH Configuration list (and thus included in both options), whereas the IEs highlighted in green is encoded out of that list (so we have to include all of them here in the neighbour cell item, which is only obeyed in [3]). |
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**ASN.1 type**

The TPs provided by two companies respectively used different ASN.1 type:

* The TP in [3] used plain ASN.1 types, e.g. SEQUENCE. As the result the F1AP PDU contained neither IE ID nor criticality in this part.
* The TP in [5] used ASN.1 types dedicated for F1AP, e.g. “F1AP-PROTOCOL-IES”. As the result the F1AP PDU contained both an IE ID and a criticality value for each IE in this part.

**Questions 1.1-4**: Which option do you prefer for ASN.1 coding?

| Company | Comment |
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| CATT | Plain ASN.1 types. It costs far less bits (ordinarily 4 octets for each IE).  And there are a few ASN.1 coding errors in [5]… |
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**Storage in gNB-DU?**

Views are split on whether the gNB-DU may store the information.

* The TP in [1][3] proposed that the gNB-DU “may store or update” the received neighbour PRACH information besides using it for PRACH conflict resolution.
* The TP in [5][6] didn’t propose so.

**Questions 1.1-5**: May a gNB-DU store the received neighbour PRACH information?

| Company | Comment |
| --- | --- |
| CATT | We prefer yes. As pointed out in [2], this can be very useful for gNB-DU sharing scenario. Nevertheless it is not precluded that a gNB-DU not doing so. |
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### X2AP

Two companies proposed TP for X2AP ([1][4]) and their content were exactly the same (except the point that one is provided with ASN.1 and the other is not).

**Questions 1.2-1**: Do you agree with the TP for X2AP raised in [1] and [4]?

| Company | Comment |
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| CATT | Yes. |
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## Information provided from the gNB-DU toward the gNB-CU

One company proposed that the gNB-DU may provide some information toward the gNB-CU due to “the selection of a new PRACH configuration by the gNB-DU may trigger a new conflict with a neighbour not signalled by the gNB-CU” [5]. The information proposed included:

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| 1) reconfigure its local PRACH configuration for the corresponding cell(s) e.g., changing the PRACH sweeping pattern or  2) Signal to the gNB-CU that more neighbour PRACH configuration is needed in order to avoid other possible conflicts  If action 1) is carried out, the gNB-DU shall inform the gNB-CU of a PRACH sweeping pattern change so that the gNB-CU can update its neighbour cell relations. This is because a change of sweeping pattern implies that the neighbour relations of certain SSB indexes with other neighbour cells has changed.  If action 2) is carried out, the gNB-DU shall inform the gNB-CU that more neighbours´PRACH information is needed. |

On the other hand, one company expressed their opposing [6]:

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| In addition, it was discussed whether in addition to a push mechanism, a pull mechanism could also be supported where a gNB-DU requests a gNB-CU for more neighbour PRACH Configurations. In our thinking such pull mechanism is not needed since a gNB-DU has enough PRACH Configurations provided by its gNB-CU to resolve PRACH Configuration conflicts locally. |

**Questions 2-1**: What is your opinion on whether some enhancement are needed so that the gNB-DU can provide some information toward the gNB-CU, and if so, what enhancement.

| Company | Comment |
| --- | --- |
| CATT | Not needed.  The prerequisite in [5] does not stand. Please see what we agreed last meeting:  It should be possible for the gNB-CU to provide the gNB-DU with information indicating the CGI of the cells potentially in conflict and the neighbouring relation between these cells and their neighbour cells, along with the PRACH configurations of those neighbour cells, so as to prevent the gNB-DU from reconfiguring one of its cells from conflicting with one neighbour toward conflicting with another neighbour. How/whether gNB-CU do the filter is up to implementation.  So there is no such case of “the selection of a new PRACH configuration by the gNB-DU may trigger a new conflict with a neighbour”, we have prevented this.  If some company thinks the cap of 32 neighbours is not enough to cover all neighbour cells (more strictly, all homogeneous cells and larger cells), we should raise the value to e.g. 64 rather than revert what we have agreed.  Due to the lack of time we think we should stop discussing this in Rel-17. Maybe if can be left to Rel-18. |
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## SCG RA report

This issue is the continuation of CB # 11\_SCGRACHReport last meeting (R3-216204). There is one leftover issue on whether we should enhance the interface so that an SN can pull RA report from the MN.

In this meeting one company proposed so [5], whereas other companies didn’t express their opinion.

| Company | Comment |
| --- | --- |
| CATT | Postpone to Rel-18.  We have agreed that the “pull” mechanism of RA report over F1AP is postponed to Rel-18. We think the case on X2AP/XnAP should be aligned with it. |
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In addition, one company proposed adding UE AP ID(s) into the Access and Mobility Indication message. But the moderator noticed that this topic was already discussed in last meeting and the reference ID was already added into the SON BL CRs (R3-220056 and R3-220058), e.g.:

9.1.3.25 ACCESS AND MOBILITY INDICATION

This message is sent by NG-RAN node1 to transfer access and mobility related information to NG-RAN node2.

Direction: NG-RAN node 1 → NG-RAN node 2.

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| --- | --- | --- | --- | --- | --- | --- |
| **IE/Group Name** | **Presence** | **Range** | **IE type and reference** | **Semantics description** | **Criticality** | **Assigned Criticality** |
| Message Type | M |  | 9.2.3.1 |  | YES | ignore |
| **RACH Report List** |  | *0..1* |  |  | YES | ignore |
| >RACH Report List Item |  | 1 .. <maxnoofRACHReports> |  |  | EACH | ignore |
| >>RACH Report Container | O |  | OCTET STRING | *RA-ReportList-r16* IE as defined in subclause 6.2.2 in TS 38.331 [10]. | YES | ignore |
| >>UE Assistant Identifier | O |  | NG-RAN node UE XnAP ID  9.2.3.16 |  | YES | ignore |
| **Successful HO Report List** |  | *0..1* |  |  | YES | ignore |
| >Successful HO Report List Item |  | 1 .. <maxnoofSuccessfulHOReports> |  |  | EACH | ignore |
| >> Successful HO Report Container | O |  | OCTET STRING | FFS on the definition | YES | ignore |

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| **Range bound** | **Explanation** |
| maxnoofRACHReports | Maximum no. of RACH Reports, the maximum value is 64. |
| maxnoofSuccessfulHOReports | Maximum no. of Successful HO Reports, the maximum value is 64.  FFS |

Therefore this proposal is invalid and should not be discussed.

# Conclusion, recommendations [if needed]

# Reference

[1] R3-220379; (TP for SON BL CR for TS 38.473, TS 36.423): Left overs on RACH Optimization Enhancements; Huawei.

[2] R3-220529; Discussion on Rel-16 leftover issues for PRACH coordination; CATT, CMCC, China Telecom.

[3] R3-220530; (TP on SON for 38.473) TP on PRACH coordination for F1AP; CATT, CMCC, China Telecom.

[4] R3-220531; (TP on SON for 36.423) TP on PRACH coordination for X2AP; CATT, CMCC, China Telecom.

[5] R3-220579; (TP for SON BL CR for TS 38.473 and for TS38.423) RACH conflict resolution and reporting procedures; Ericsson.

[6] R3-220630; (TP for TS 38.473) Discussion on Leftover Issues of RACH Optimization; Nokia, Nokia Shanghai Bell.