3GPP TSG-RAN WG3#127 draftR3-250787

Athens, Greece, 17th – 21st February 2025

Agenda Item: 11.3

Source: Huawei

Title: Summary of Discussion on CB: # AIRAN2\_CCO

Document for: Discussions & Approval

# Introduction

**CB: # AIRAN2\_CCO**

**- Discuss the open issues above**

**- Capture agreements and provide TPs**

(moderator - HW)

Summary of offline disc [R3-250787](https://fiberc-my.sharepoint.com/personal/00918019_fibercop_com/Documents/LAVORO/PROGETTI/2025/NORMATIVA/3GPP/RAN3/RAN3%23127-Athens-17_21Feb2025/Doc%20Meeting/Inbox/Drafts/CB%20%23%20AIRAN2_CCO/Inbox/R3-250787.zip)

# For Chairman’s notes

**To be continued in the next meeting:**

**Whether to exchange time for predicted CCO issue over XnAP needs further discussion.**

**The maximum value of time for predicted CCO issue and time for future CCO state needs further discussion.**

**Agree the TP for the F1AP BLCR in R3-250804 (revision of R3-250374) capturing the agreements from the online session.**

# 3 Discussion

In Tuesday’s online discussion the following was captured the Chair’s meeting minutes:

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| **Each Future Coverage Modification Notification Item included in the Future Coverage Modification Notification List IE has a Future Coverage Modification Cause IE associated to it from DU to CU.****The Future Coverage Modification Cause IE follows the same design of the existing Coverage Modification Cause IE, i.e., it is an ENUMERATED type, but with codepoints “coverage” and “cell edge capacity” only.****Value ‘0’ for the Future Cell Coverage State IE is needed and has the same meaning as cell inactive in legacy CCO.****Exchange timer infor for predicted CCO issue over XnAP is not needed unless the usage can be identified?****The maximum value of Time for predicted CCO issue and future CCO state? 60Sec, 120 Sec or 300 Sec?****UE performance feedback for CCO? Legacy UE performance feedback is sufficient or other finer granularity, e.g., cell-/SSB-level UE performance feedback?****Whether gNB-CU provides to the gNB-DU not only the predicted CCO issue but also the corresponding future CCO state as a recommendation?** |

Due to lack of time, moderator’s proposal is to discuss at least the first two FFS, that is,

* the exchange of time information associated to the predicted CCO issue over Xn, and
* the range of the time for predicted CCO issue (and time for future coverage state as well)

## 3.1 Exchange of time information associated to the predicted CCO issue over Xn

RAN3 agreed so far to transfer over Xn and within the NG-RAN CONFIGURATION UPDATE message the coverage modification cause (reflecting the predicted CCO issue), the future coverage state and the time for the future coverage state.

It needs to be discussed whether also the time for the predicted CCO issue is provided to the neighbor node(s) over Xn along with the already agreed information.

Contributions [1], [7] and [14] proposed that there are benefits for the *gNB-CU2* from knowing the *Time for Predicted CCO Issue* for multiple reasons:

1. to allow the neighbor *gNB(-DU)2* to identify the time interval within which it needs to determine its future coverage state matching the future coverage state in *gNB-(DU)1* – this time interval starts from the time for future coverage state of *gNB(-DU)1* until the time for the predicted CCO issue in *gNB(-CU)1*. This will not force the neighbor *gNB(-DU)2* to determine and apply the matching future coverage state within the time for future coverage state in *gNB-(DU)1*;
2. if multiple predicted CCO issues are provided to the same neighbor node from multiple local nodes, sending the time information related to each predicted CCO issue (i.e., related to each coverage modification cause) over Xn can be used to understand when it is more appropriate to apply a certain future CCO state or another;
3. to understand the point in time after which the *gNB-CU2* needs to start collecting metrics to be used as feedback information (exact metrics are FFS).

On the other hand, contributions [5], [8], [4], [17], [18] proposed not to transfer the time for the predicted CCO issue over Xn, due to the following reasons:

1. by applying the matching coverage configuration in *gNB2* after the time for Future Coverage State but before the time for predicted CCO issue (both in *gNB1*) results in involved NG-RAN nodes having different and likely incompatible coverage configurations for a certain duration (from the time for Future Coverage State in *gNB(-DU)1* to the time when NG-RAN node2 applies the matching coverage configuration). Such a mismatch in the CCO configuration between neighboring nodes could negatively impact the UE and overall network performance;
2. by delaying the application of matching coverage configuration at NG-RAN node2, the NG RAN node1 will not know when NG-RAN node2 has applied the matching coverage state. Due to this the mechanism of collecting and reporting of feedback information to NG-RAN node1 will be negatively impacted as NG-RAN node1 cannot determine the time of change of coverage configuration at NG-RAN node2;
3. for an NG-RAN node which receives the future coverage state from the local node, what really matters is the fact that the CCO issue is about to happen and coverage CCO state is about to be changed in the local node. Now that the time information related to the future CCO state is already in the XnAP, the time information related to the CCO issue is not so important for the receiving node.

While contributions [6] and [2] are open to discuss if benefits are identified.

In moderator’s understanding the issue of having “misaligned” activation of future coverage states at the local node and at the neighbor node, if occurs, is a temporary situation that will be anyway solved in a short timeframe, i.e., within the time interval starting from the time for future coverage state of *gNB(-DU)1* until the time for the predicted CCO issue in *gNB(-CU)1*. Therefore, the following proposal can be discussed:

**Proposal 1: The gNB(-CU) which predicted the CCO issue sends to a neighbour gNB(-CU) over Xn the *Time for Predicted CCO Issue*.**

**Question 1**: Companies are invited to share their views on Proposal 1 above.

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| **Company** | **Support Proposal 1?** | **Comments** |
| Huawei | Yes |  |
| Lenovo | Maybe no | Neighbour gNB (CU) is responsible of determining/predicting the CCO issue for cells under its service. The question is if both of the received A. Future Issue+Time 1 and B. Future coverage + Time 2 are useful. In our understanding B. Future coverage + Time 2 would be more relevant to any future CCO issue in neighbour gNB (CU). |
| FiberCop | Yes | We think it is beneficial in order for the target to have a complete information to take effective decisions |
| ZTE | No | Timing for achieve future coverage state at sender side is before timing for predicted CCO issue. So that the CCO issue impact can be minimized. From this point of view, timing of the predicted CCO issue does not make sense.  |
| Samsung | No | We think what matters to the receiving node is the time for predicted future CCO state and actually we believe the time gap between the predicted CCO issue and coverage state would not be too long and can be ignored. |
| LGE | No | To avoid the predicted CCO issue, the time when the future CCO state is applied may be sooner than the time for predicted CCO issue. Therefore, it may be unnecessary to send the time for predicted CCO issue over Xn. |
| CATT | No | We share similar view with Samsung, i.e the valuable information between CUs is the time for the predicted coverage status which could enable the neighbor CU to predict the potential CCO issue and inform the concerned DU.And normally the time for predicted status and predicted issue is the same. |

## 3.2 Range of the time for predicted CCO issue and time for future coverage state

At this meeting there were several proposals concerning the maximum value of the time for predicted CCO issue and time for future CCO state.

It is moderator’s understanding that the encoding of these two pieces of information for both F1AP and xnAP is as an INTEGER from 1s to “max” s, and the “max” value needs to be decided – this does not preclude that these IEs could be extended in the future if needed:

Time for predicted CCO issue 🡪 INTEGER (1..max, …), with granularity of seconds (as agreed in RAN3#126)

Time for future coverage state 🡪 INTEGER (1..max, …), with granularity of seconds (as agreed in RAN3#126)

Proposals for the “max” value submitted at this RAN3 meeting are as follows:

1. 60s proposed in [5], [3] and [2], following the design of the *Requested Prediction Time* IE specified in Rel-18
2. 120s proposed in [1]
3. 300s proposed in [6], [4]
4. 3600s proposed in [18]

Value “3600s” was not included in the FFS captured in the meeting minutes from the online session, so the discussion can focus on the values explicitly captured in the FFS, that is, 60s, 120s and 300s.

It is moderator’s understanding that considering a “max” value for the timing information for CCO being higher than 60s is due to the need to ensure enough time for the CU-DU and local node – neighbor node(s) interactions (i.e., allow the receiving node to react and change its coverage state) to be completed successfully. However proponents of “max” value of 60s think that timing information of CCO should not deviate from the Rel-18 considerations on the accuracy of the predictions which led RAN3 to specify the *Requested Prediction Time* IE to be at most 60s.

In order to accommodate both views above, moderator’s proposal is to consider an intermediate value between 60s and 300s: this would allow the CU-DU and local node-neighbor node interactions to still benefit from a more relaxed timing information governing these interactions, while still preserving the accuracy of such timing information.

**Proposal 2: For both F1AP and XnAP, the time for predicted CCO issue and time for future coverage state are encoded as INTERGER (1..120, …).**

**Question 2**: Companies are invited to share their views on Proposal 2 above.

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| **Company** | **Support Proposal 2?** | **Comments** |
| Hauwei | Yes |  |
| Lenovo | Either a) or b) |  |
| FiberCop | Maybe yes | We think that a) or b) could be fine, but we are fine to compromise for sake of progress |
| ZTE | No | Frankly speaking, till now, we have still not read any detailed explanation on why 60sec is too short for the CU/DU or gNBs reaction to be used. As E// explained in online session, there is no time for the receiver entity to react in legacy CCO. In addition, our new defined duration IE is of course extendable. We may extend this max value in the future if needed.Besides, as we have already agreed in Rel-18:*The specific point in time for which the prediction information is being requested with the assumption that this specific point in time is in the reasonable future, can be configured for both one-time reporting and periodic reporting.**The encoding of Requested Prediction time as Integer with maximum value as 60 seconds with extensible IE structure.*60 sec for AI assisted CCO is good enough. |
| Samsung | No strong view |  |
| LGE | No strong view |  |
| CATT |  | Prefer a or b, but open to discuss on other options if justified. |

## 3.3 F1AP TP

**During the online session the following agreements impacting the F1AP have been captured in the meeting minutes:**

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| --- |
| **Each Future Coverage Modification Notification Item included in the Future Coverage Modification Notification List IE has a Future Coverage Modification Cause IE associated to it from DU to CU.****The Future Coverage Modification Cause IE follows the same design of the existing Coverage Modification Cause IE, i.e., it is an ENUMERATED type, but with codepoints “coverage” and “cell edge capacity” only.****Value ‘0’ for the Future Cell Coverage State IE is needed and has the same meaning as cell inactive in legacy CCO.** |

**It is moderator’s proposal to agree the TP for the F1AP BLCR in the draft folder reflecting at least the above agreements.**

**Proposal 3: Agree the TP for the F1AP BLCR in R3-25xxxx reflecting at least the agreements from the online session.**

**Question 3**: Companies are invited to share their views on Proposal 3 above.

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| **Company** | **Support Proposal 3?** | **Comments** |
| Hauwei | Yes |  |
| Samsung | Yes |  |
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# 4 References

1. R3-250374, (TPs for AI/ML BLCR to TS 38.423 and AI/ML BLCR to TS 38.473) Discussion on the AI/ML-based Coverage and Capacity Optimization, Huawei
2. R3-250702, Discussion on AI/ML assisted Coverage and Capacity Optimization, ZTE Corporation
3. R3-250465, Further discussions on AI/ML enabled CCO, Ericsson, Jio Platforms (JPL), InterDigital
4. R3-250533, (TP for BLCR to TS 38.473) Further discussion on signalling for AI/ML-based CCO, Nokia
5. R3-250170, (TP to BLCR TS38.423 and TS38.473) Open issues for AI/ML-based CCO, NEC
6. R3-250244, Discussion on remaining issues in AI/ML enabled CCO, Qualcomm Incorporated
7. R3-250274, Discussion on AI/ML based CCO, Lenovo
8. R3-250347, Discussion on AIML based Coverage and Capacity Optimization, China Telecom
9. R3-250380, Discussion on issues for AI/ML-based CCO, LG Electronics Inc.
10. R3-250700, [TP to 38.401] Support of AI/ML assisted CCO, ZTE Corporation, Lenovo, China Unicom, China Telecom
11. R3-250701, [TP to 38.423 and 38.473] Support of AI/ML assisted Coverage and Capacity Optimization, ZTE Corporation
12. R3-250466, (TP to 38.423) - AI/ML support for CCO, Ericsson, Jio Platforms (JPL), InterDigital
13. R3-250467, (TP to 38.473) - AI/ML support for CCO, Ericsson, Jio Platforms (JPL), InterDigital
14. R3-250468, AI/ML enabled CCO across multiple nodes, Ericsson, Jio Platforms (JPL), InterDigital
15. R3-250581, Further Enhancements on AIML support for CCO, Jio Platforms JPL
16. R3-250593, (TP on 38.423/38.473) Open issues on the CCO use case, CATT
17. R3-250617, Discussion on AI/ML enabled CCO, Samsung
18. R3-250673, Discussion on AI/ML-based CCO, CMCC
19. R3-250722, Conflict between legacy CCO and AI/ML-based CCO, Rakuten Mobile, Inc
20. R3-250532, (TP for BLCR to TS 38.473) Further discussion on energy efficient AI/ML-based CCO issue prediction in split architecture, Nokia, FiberCop, Jio Platforms (JPL)