3GPP TSG-RAN WG3 Meeting #124 R3-24xxxx

Fukuoka, Japan, 20 – 24 May, 2024

Agenda Item: 11.3

Source: Qualcomm (moderator)

Title: Summary of offline for AI/ML enabled CCO

Document for: Approval

# Introduction

**CB: # AIML2\_CCO**

**- Make the decision on whether to support DU inference in R19?**

**- Discuss the open issues**

**- Capture the agreements and provide TPs**

(moderator - QC)

Summary of offline disc [R3-243802](Inbox\R3-243802.zip)

**Agreement in Online session**

**For non-split architecture, future CCO state can be derived via legacy mechanism or AI/ML techniques which is up to implementation.**

**Open issues from Online session**

**For Split architecture, how to derive future CCO state needs to be further checked.**

**How to support the future CCO status and/or predicted CCO issue transmission over Xn?**

**Alt 1: NG-RAN node 1 may send the future CCO state to NG-RAN node 2 and adjust the CCO status based on feedback from NG-RAN node 2.**

**Alt 2: NG-RAN node 1 is fully responsible for prediction and only sends the future CCO state together with related time information to NG-RAN node 2.**

**Model inference in DU for CCO use case has no consensus in R19?**

**Reusing the current defined CCO issue and CCO status information for predicted CCO issue and CCO status?**

# For the Chairman’s Notes

Propose the following:

R3-24xxxa, R3-24xxxc merged

R3-24xxxc rev [in xxxg] – agreed

R3-24xxxd rev [in xxxh] – agreed

R3-24xxxe rev [in xxxi] – agreed

R3-24xxxf rev [in xxxj] – endorsed

Propose to capture the following:

**Agreement text…**

**Agreement text…**

**WA: carefully crafted text…**

Issue 1: no consensus

**Issue 2: issue is acknowledged; need to further check the impact on xxx. May be possible to address with a pure st2 change. To be continued…**

# Discussion

## I/O, Feedback and Standard Impact Predicted CCO issue and Future CCO state for Non-Split Architecture

From the TPs in [R3-243255] [R3-243269][R3-243290][R3-243385][R3-243450][R3-243467][R3-243500][R3-243559] the following input, output and feedback for AI/ML inference and standards impacts is derived in this discussion paper.

### Input

**From local node:**

- Current CCO state

- Current Radio Resource Status

- Legacy Predicted Radio Resource Status

- Legacy Predicted UE Trajectory

The above parameters are the majority view as input to AI/ML inference. Can the above parameters be agreed?

To be discussed

- Measured/Predicted UE Traffic (e.g., data volume) (ZTE, Lenovo)

Can this be agreed?

**From the UE:**

- UE measurement report

- SON Reports (RLF, CEF, RA)

- UE Mobility History Information

The above parameters are the majority view as input to AI/ML inference. Can the above parameters be agreed?

To be discussed:

- UE location information (e.g., coordinates, serving cell ID, moving velocity) (Lenovo)

Is the above needed?

**From neighbouring NG-RAN nodes:**

- Current CCO state

- Predicted CCO state

- Current Radio Resource Status

- Legacy Predicted Radio Resource Status

The above parameters are the majority view as input to AI/ML inference. Can the above parameters be agreed?

To be discussed:

- UE measurements of UEs served by the gNB2 and reporting coverage of cells served by the gNB1 (E///)

Why is the above needed?

### Output

- Future CCO State

- Time when the future CCO state can be applied

The above parameters are the majority view as input to AI/ML inference. Can the above parameters be agreed?

To be discussed:

- Predicted CCO issue (E///)

- Time when the predicted CCO issue can occur (E///)

- future replacement information for cells (e.g. cell shaping, cell splitting, cell merging) (HW)

- predicted UE offload plan (HW)

- problem type (coverage gap or cell-edge interference) (CATT)

### Feedback

To optimize the performance of AI/ML based CCO model, following feedback can be considered to be collected from NG-RAN nodes:

- UE performance for UEs handed over from source NG-RAN node.

- SON Reports (RLF, CEF, RA) from source node

- UE Measurement Report from source node

The above parameters are the majority view as input to AI/ML inference. Can the above parameters be agreed?

To be discussed:

- Cell level KPIs (e.g., throughput, delay, packet loss of current and neighbouring NG-RAN node) (QC)

- Measured UE Traffic (ZTE)

### Standard Impact

**Xn interface impact:**

- Future CCO State

- Time when the future CCO state can be applied

The above parameters are the majority view as input to AI/ML inference. Can the above parameters be agreed?

To be discussed

- Predicted CCO issue (E///)

- Time when the predicted CCO issue can occur (E///)

- Signalling of UE measurements for UEs served by gNBs neighboring gNB1 and reporting coverage of cells served by the gNB1 (and vice versa) (E///)

- future replacement information for cells (e.g. cell shaping, cell splitting, cell merging) (HW)

- predicted UE offload plan (HW)

- Predicted/Measured UE Traffic (ZTE)

## Enhanced CCO Signaling

From ZTE [3] and QC [1] paper, the below proposal is mentioned.

**QC/ZTE Proposal:** A gNB can propose a predicted coverage configuration for cells served by its neighboring gNBs. The neighboring gNB can either accept/reject this proposal and provide its own predicted coverage configuration upon request.

Can the above proposal be agreed?

## Future CCO State

Can we agree the below?

**For split architecture, future CCO state can be derived in gNB-DU via legacy mechanism or AI/ML techniques which is up to implementation in Rel-19.**

If the above is not agreeable, how can gNB-DU derive future CCO state using legacy mechanism for a predicted CCO issue?

# Conclusion, Recommendations [if needed]

If needed

# References

1. R3-243559 Discussion on AI/ML enabled CCO (Qualcomm Incorporated)
2. R3-243458 Further discussion on AIML support for CCO (Ericsson, InterDigital, Deutsche Telekom, Telecom Italia)
3. R3-243499 Discussion on AI/ML assisted CCO (ZTE)
4. R3-243467 (TP to TR 38.743) AI/ML-based Coverage and Capacity Optimization (Huawei)
5. R3-243124 (TP for TR 38.743) Further discussion on solution for AI/ML-based CCO (Nokia)
6. R3-243255 (TP to TR38.743) AI/ML based CCO (NEC)
7. R3-243269 (TP to TR 38.743) AI/ML enabled CCO (Samsung)
8. R3-243290 (TP for TR 38.743 )Support of AI/ML enabled CCO (CATT)
9. R3-243385 Discussion on AI/ML based CCO (Lenovo)
10. R3-243386 TP to 38.743 for AIML based CCO (Lenovo)
11. R3-243450 TP on AIML support for CCO (Ericsson, InterDigital, Deutsche Telekom, Telecom Italia)
12. R3-243500 (TP to TR38.743) Discussion on AI/ML assisted CCO (ZTE)
13. R3-243603 Discussion on AI/ML based Coverage and Capacity Optimization (China Telecommunication)
14. R3-243604 (TP to 38.743) Support of AI/ML based Coverage and Capacity Optimization (China Telecommunication)
15. R3-243692 Issues on AI/ML-based CCO (LG Electronics Inc.)
16. R3-243693 (TP to TR 38.743) Issues on AI/ML-based CCO (LG Electronics Inc.)
17. R3-243719 Discussion on AI/ML-based CCO (CMCC)
18. R3-243767 Identification and Rectification of CCO Issues Using AIML (Rakuten Mobile, Inc)