3GPP TSG-RAN WG3 #119bis-e R3-231897

E-meeting, 17th – 26th April 2023

Agenda Item: 12.2.2.1

Source: ZTE (moderator)

Title: Summary of email Discussion on CB: # AIRAN2\_LB

Document for: Discussion and Approval

# Introduction

**CB: # AIRAN2\_LB**

**- How to support partial reporting mechanisms?**

**- Whether the indication that an indication in the new agreed request message that UE performance feedback is provided after handover event is in implicit or explicit way?**

**-** **The details of the trigger indication in the HO request message to indicate that UE performance feedback is requested after HO completion?**

**- The structure of UE performance feedback IE, and whether the UE performance feedback is reported by one-time or periodically?**

**- Discuss how to support validity**

**- Capture agreements and open issues**

**- Provide TP if agreeable**

(Moderator - ZTE)

Summary of offline disc [R3-231879](Inbox\R3-231879.zip)

Two phases of this email discussion:

- Phase 1 Deadline: Thursday April 20th, 13:00 UTC

- Phase 2 Deadline: Monday April 24th, 10:00 UTC, we will try to come up with agreeable TP in the 2nd phase discussion before online session.

Note: Following the chair’s guidelines and limitation of the number of questions, not all proposals in the submitted papers will be treated in this SoD. If something is strongly needed to be discussed, please use Section 3.7.

# For the Chairman’s Notes

Propose the following:

R3-20xxxa, R3-20xxxc merged

R3-20xxxc rev [in xxxg] – agreed

R3-20xxxd rev [in xxxh] – agreed

R3-20xxxe rev [in xxxi] – agreed

R3-20xxxf rev [in xxxj] – endorsed

Propose to capture the following:

**Agreement text…**

**Agreement text…**

**WA: carefully crafted text…**

Issue 1: no consensus

**During RAN3-116e, 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

## The impact on procedures for HO-ed UE performance

In the previous meeting, it was agreed that The agreed class1 procedure (AI/ML INFORMATION REQUEST/RESPONSE, the name needs further discussion) is used to configure UE performance feedback reporting. And the discussion on indication in the agreed new request message and HO request message is to be continued.

[1] proposes the indication in AI/ML Information Request that UE performance feedback is provided after handover event should be in implicit way.

[3] compares the implicit indication with explicit indication, and propose that no event indication is needed in the agreed Class 1 AI/ML message requesting feedback. Measurement ID to be used as a common identifier between Class1 AI/ML message requesting feedback and in the Handover Request message.

[5] No additional explicit indication in the agreed new request message (e.g., AI/ML INFORMATION REQUEST) is needed. In the HANDOVER REQUEST message, a pair of Measurement IDs can be included to explicitly associate the handover procedure with a previous UE performance feedback request.

[10] proposes to add an *Event Index* IE in the AI/ML INFORMATION REQUEST message (FFS on the name) to let the receiver identify the event triggering the report (for instance a handover event) and the event reporting configuration for it. And the same Event Index IE is introduced in the AI/ML INFORMATION UPDATE and HO message.

[14] considers gNB can implicitly know the requirement of the source gNB and wait the specific UE handover based on the Request Characteristic IE in the AI/ML INFORMATION REQUEST message. And introduce the pair measurement ID in the Handover Request message, which is the same ID in the AI/ML INFORMATION REQUEST/RESPONSE message.

[17] propose no explicit indication is needed to indicate UE performance feedback is requested after handover completion. Measurement ID pair IE is introduced to associate the HO request to UE performance feedback configuration. And UE performance feedback IE is introduced in HO request to indicate UE performance feedback is required for the UE after HO completion.

[21] considers providing UE performance measurement items and reporting configuration in the agreed new request message for AI/ML information can be used as an implicit indication that UE performance feedback is provided after handover event. And the handover timestamp and/or additional AI-based load balancing handover cause indication in HO request message can be used as an implicit trigger indication that UE performance feedback is requested after HO completion.

Above all, with respect to the issue whether the indication that an indication in the new agreed request message that UE performance feedback is provided after handover event is in implicit or explicit way, it appears that two options have been proposed:

* **Option 1:** No explicit indication is required in the AI/ML INFORMATION REQUEST message (FFS on the name).
* **Option 2**: Introduce an explicit indication of the Event ID in the AI/ML INFORMATION REQUEST message (FFS on the name).

**Q1: Companies are invited to provide their views on which option above is preferred, regarding an indication in the new agreed request message that UE performance feedback is provided after handover event?**

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| **Company** | **Option 1 or Option 2** | **Comments** |
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In addition, regarding the details of the trigger indication in the HO request message to indicate that UE performance feedback is requested after HO completion, it appears that two options have been proposed:

* **Option 1:** Introduce the indication (e.g., NG-RAN node Measurement ID) in the HO request message, to establish relationship with the AI/ML INFORMATION REQUEST message (FFS on the name).
* **Option 1a:** Introduce the pair Measurement ID (e.g., NG-RAN node1 Measurement ID and NG-RAN node2 Measurement ID) in the HO request message, to establish relationship with the AI/ML INFORMATION REQUEST message (FFS on the name).
* **Option 2:** Introduce the Event ID in the HO request message, which is the same Event ID in the AI/ML INFORMATION REQUEST message, to establish relationship with the certain event in the AI/ML INFORMATION REQUEST message (FFS on the name).
* **Option 3:** Introduce the handover timestamp and/or additional AI-based load balancing handover cause indication in HO request message.

**Q2: Companies are invited to provide their views on which option above is preferred, regarding the details of the trigger indication in the HO request message to indicate that UE performance feedback is requested after HO completion?**

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| **Company** | **Which option?** | **Comments** |
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**[3] suggests that the agreed Class 1 AI/ML should indicate that measurements are requested as feedback for a specific AI/ML action. This is to prevent the receiver from sending measurements immediately. On the other hand, [14] suggests introducing the Request Type IE in the request message to trigger measurements after the UE(s) handover. The primary purpose of this indication is to inform the requested NG-RAN node whether the requested information is reported immediately or after a specific action, such as a handover.**

**Q3: Companies are invited to provide their views on whether the explicit indication is beneficial in the AI/ML INFORMATION REQUEST message (FFS on the name) in order to inform the requested NG-RAN node whether the requested information is reported immediately or after a specific action?**

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| **Company** | **Yes/No** | **Comments** |
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## The structure of UE performance feedback IE

[6][10][14] proposes the agreed new class2 non-UE associated procedure (AI/ML INFORMATION UPDATE, which name is FFS) can contain a list of UE performance feedbacks each is related to a particular UE. [13] consider that if a source node requests a target node for UE performance feedback information it should be capable to correlate a UE or a number of UEs to the UE performance feedback information provided by the target node.

It appears that two kinds of UE performance feedback IE in the AI/ML INFORMATION UPDATE message (FFS on the name) have been proposed, see yellow-highlighted part:

**Alternative 1:** A list of UE performance feedbacks in the AI/ML INFORMATION UPDATE message (FFS on the name).

9.1.3.FF AI/ML INFORMATION UPDATE (FFS on the name)

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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 |
| NG-RAN node1 Measurement ID (FFS on the name) | M |  | INTEGER (1..4095,...) | Allocated by NG-RAN node1 | YES | reject |
| NG-RAN node2 Measurement ID (FFS on the name) | M |  | INTEGER (1..4095,...) | Allocated by NG-RAN node2 | YES | reject |
| *Skipped* | | | | | | |
| UE Performance List |  | *0..1* |  |  | YES | reject |
| >UE Performance Result Item |  | *1 .. < maxnoofUEPerformance >* |  |  |  |  |
| >>UE Performance | M |  | 9.2.3.X |  |  |  |
| >>UE Assistant Identifier | O |  | NG-RAN node UE XnAP ID  9.2.3.16 |  | YES | ignore |

**Alternative 2:** A single UE performance feedback IE in the AI/ML INFORMATION UPDATE message (FFS on the name).

9.1.3.FF AI/ML INFORMATION UPDATE (FFS on the name)

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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 |
| NG-RAN node1 Measurement ID (FFS on the name) | M |  | INTEGER (1..4095,...) | Allocated by NG-RAN node1 | YES | reject |
| NG-RAN node2 Measurement ID (FFS on the name) | M |  | INTEGER (1..4095,...) | Allocated by NG-RAN node2 | YES | reject |
| *Skipped* | | | | | | |
| UE Performance | O |  | 9.2.3.Y |  |  |  |

9.2.3.Y UE Performance

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| --- | --- | --- | --- | --- |
| Source UE XnAP ID | O |  | NG-RAN node UE XnAP ID  9.2.3.16 |  |
| Average UE Throughput DL | O |  | 9.2.3.4 |  |
| Average UE Throughput UL | O |  | 9.2.3.4 |  |
| Average Packet Delay | O |  | 9.2.3.w31 |  |
| Average Packet Loss | O |  | 9.2.3.w32 |  |

**Alternative 3:** An average UE performance feedback IE in the AI/ML INFORMATION UPDATE message (FFS on the name), the specific UE performance feedback configuration is introduced in the AI/ML INFORMATION Request message (FFS on the name).

9.1.3.CC AI/ML INFORMATION REQUEST (FFS on the name)

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| **UE Performance Reporting Configuration** | ifReportCharacteristicsFourthBitIsSet |  |  |  | YES | ignore |
| >Starting time | O |  | INTEGER (0..4095) | Corresponds to the starting time of the UE performance measurement after successful handover completion. Value 0 indicates that the measurement is started immediately upon successful handover completion.  Unit: [second]. |  |  |
| >Averaging window | O |  | INTEGER (0..60) | Corresponds to the measurement averaging window. Value 0 indicates single measurement.  Unit: [second]. |  |  |
| >>Direction | M |  | ENUMERATED (ul, dl, both, ...) |  |  |  |
| >>UE Performance Metric | M |  | BITSTRING  (SIZE(32)) | Each position in the bitmap indicates the object the NG-RAN node2 is requested to report.  First Bit = Averaged Throughput,  Second Bit = Averaged Packet Delay,  Third Bit = Averaged Packet Loss |  |  |

9.1.3.FF AI/ML INFORMATION UPDATE (FFS on the name)

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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 |
| NG-RAN node1 Measurement ID (FFS on the name) | M |  | INTEGER (1..4095,...) | Allocated by NG-RAN node1 | YES | reject |
| NG-RAN node2 Measurement ID (FFS on the name) | M |  | INTEGER (1..4095,...) | Allocated by NG-RAN node2 | YES | reject |
| *Skipped* | | | | | | |
| UE Performance | O |  | 9.2.3.Y |  |  |  |

**Q4: Companies are invited to share their opinions on which structure of UE performance IE is preferred.**

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| **Company** | **Alt1, Alt2, or Alt3** | **Comments** |
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[1] advocates for on-demand reporting to be supported for UE performance feedback reporting, whereas proposal [6] supports periodic UE performance feedback reporting, and request for feedback on one-time UE performance reporting is unclear.

**Q5: Companies are invited to express their views on whether UE performance feedback can be reported through one-time reporting, periodic reporting, or both.**

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| **Company** | **One-time reporting, periodic reporting, or both** | **Comments** |
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## Partial reporting mechanisms

**In last meeting, it was confirmed that partial reporting is supported in the agreed AI/ML information procedure, and the solution to support the partial reporting is FFS.**

**Several companies support partial reporting and have proposed solutions to address it:**

**[1] suggests that the requesting node should indicate in the request message whether partial reporting is supported or not. If partial reporting is supported, the requesting node should indicate which objects must be reported. The requested node should then indicate which objects it can provide in the response message.**

**[7] does not suggest introducing any "partial success allowed" indicator in the request message, as it may not cover typical cases. Instead, it proposes relying on the method where the requesting node can cancel its request if it finds that the accepted items are too few to use. It also proposes introducing a list into the response message (and the failure message) with each item including a cause value and a bit map of failed characteristics.**

**[10] believes Partial reporting is not supported in the Resource Status Reporting Initiation procedure in TS38.423. The reporting node can use the AI/ML INFORMATION RESPONSE messages to explicitly indicate the measurements that can be provided and the list of failed measurements together with the corresponding cause indicating the reason for failure per measurement. Besides, the reporting node can use the AI/ML INFORMATION UPDATE messages to indicate potential issues preventing the reporting.**

[14] proposes to support partial reporting mechanisms by introducing the Partial Reporting Indication IE in the request message to indicate whether partial reporting is allowed by the NG-RAN node. It also suggests introducing a new cause value "Partial Reporting Failure" and the Successful Report Characteristic IE in the response message to indicate which requested measurement is successfully indicated.

**Additionally, some companies support partial reporting without any specification impacts:**

[4] suggests that partial reporting can be understood by the network implementation between the source NG-RAN node and the target NG-RAN node.

[13] proposes reusing existing Xn principles to support partial success over XnAP for NG-RAN AI/ML use cases.

[21] suggests that partial reporting can be supported without any new indication in the agreed new class 1/2 procedures for AI/ML purposes.

Moderators believe that the current discussion pertains to how the newly agreed procedures for AI/ML RAN can support the partial reporting mechanism, as opposed to exploring whether the existing principles of Xn are capable of supporting partial reporting. So, it is suggested that the participants shift their attention towards finding a solution that will aid in the support of the partial reporting mechanism.

**Q6: Companies are invited to express their views on how to support partial reporting mechanism, regarding whether the explicit indication in the request message is needed:**

* **Alt 1: Introduce an indicator in the AI/ML INFORMATION REQUEST message (FFS on the name), that indicate partial reporting is allowed or not allowed.**
* **Alt 2: Introduce a new IE to indicate which objects must be reported**
* **Alt 3: No explicit indication.**

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| **Company** | **Alt 1, Alt 2, Alt3, or combination?** | **Comments** |
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**Q7: Companies are invited to express their views on how to support partial reporting mechanism, regarding how to indicate partial reporting result in the response message:**

* **Alt 1: Introduce *Successful Report Characteristic* IE (name is FFS) in the response message**
* **Alt 2: The list of failed measurements together with the corresponding cause indicating the reason for failure per measurement.**
* **Alt 3: No explicit indication.**

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| **Company** | **Alt 1, Alt 2, Alt3, or combination?** | **Comments** |
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## Timing information

**[5] suggests to agree when exchanging prediction information over Xn interface, the two NG-RAN nodes should understand the prediction is about what time window/point in the future (i.e., validity time).**

**[7] suggest the existing “Reporting Periodicity” IE should be renamed into e.g. “Time Window Length” in order to cover one-shot report. Nevertheless, it is also used as the periodicity for periodical reporting.**

[9] [13] **[14] [18] propose that** the time of a prediction shall be indicated in the message requesting the prediction.

**Q8: Companies are welcome to provide their opinions on whether the inclusion of timing information in the request message is necessary to specify the time window of the requested information.**

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| **Company** | **Yes/No** | **Comments** |
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**Q9: If the answer to Q7 is yes, companies are invited to express their views on whether the timing information specified in the request message pertains solely to predicted information or if it includes all types of information that is being requested.**

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| **Company** | **Predicted information, or all kinds of information** | **Comments** |
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## Accuracy

[5] suggest to discusses the pros/cons and down select from the following options for a requesting NG-RAN node to understand the accuracy of received prediction information

a. Option 1: required prediction accuracy in prediction request

b. Option 2: prediction accuracy in prediction report

c. Option 3: via requesting actual measurement

[7] [18] propose **prediction accuracy could be provided to the requesting node when requested.**

[9] thinks there is no need to transfer the prediction accuracy information over Xn interface for the receiving node.

[13] believes that trigger unsuccessful outcome if the NG-RAN node providing predictions can’t satisfy the minimum requirements placed by the requesting node.

**Q10: Companies are welcome to provide their opinions whether the accuracy information is necessary to transfer between requested node and requesting node.**

**If yes, which option is preferred:**

* **Option 1: Inclusion of accuracy information in the request message (FFS on the name) to specify required accuracy of prediction**
* **Option 2: Accuracy information together with each predicted information in the update message (FFS on the name).**

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## Other predicted information

[3] [13] [18] propose to agree the predicted radio parameters including predicted TNL capacity indicator, predicted slice available capacity, predicted composite available capacity group, should also be exchanged in the predicted resource status information between the neighbour NG-RANs.

**Q11: Companies are welcome to provide their opinions whether following predicted information can be agreed to transfer between the neighbour NG-RANs now, or discuss these information later:**

* **Predicted TNL capacity indicator**
* **Predicted slice available capacity**
* **Predicted composite available capacity**

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| **Company** | **Yes/No** | **Comments** |
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## Others

Please use this section to provide additional input on postponed issue, if strongly needed.

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| **Company** | **Comments** |
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# References

|  |  |
| --- | --- |
| 1. [R3-231205](..\..\..\Docs\R3-231205.zip) | Discussion on Xn impact of LB (Samsung) |
| 1. [R3-231209](..\..\..\Docs\R3-231209.zip) | TP to 38.423 for partial reporting of AI/ML information (Samsung) |
| 1. [R3-231260](..\..\..\Docs\R3-231260.zip) | Feedback for NG-RAN AI-ML (Qualcomm Incorporated) |
| 1. [R3-231378](..\..\..\Docs\R3-231378.zip) | AIML Load balancing (NEC) |
| 1. [R3-231433](..\..\..\Docs\R3-231433.zip) | Discussion on prediction accuracy and time information (Lenovo) |
| 1. [R3-231434](..\..\..\Docs\R3-231434.zip) | Discussion on UE performance feedback collection (Lenovo) |
| 1. [R3-231465](..\..\..\Docs\R3-231465.zip) | Discussion on partial success and validity time (CATT) |
| 1. [R3-231469](..\..\..\Docs\R3-231469.zip) | (TP for 38.423) Updates on non-UE associated messages to support AI/ML (CATT) |
| 1. [R3-231515](..\..\..\Docs\R3-231515.zip) | Discussion on validity time and prediction accuracy (China Telecommunication) |
| 1. [R3-231602](..\..\..\Docs\R3-231602.zip) | AI-ML Event triggered UE performance reporting (Ericsson, InterDigital, Deutsche Telekom) |
| 1. [R3-231603](..\..\..\Docs\R3-231603.zip) | (TP for AI/ML BLCR to TS 38.423) AI-ML Event triggered UE performance reporting (Ericsson, InterDigital, Deutsche Telekom) |
| 1. [R3-231616](..\..\..\Docs\R3-231616.zip) | (TP for AI/ML BLCR to TS38.423) Partial success for the AI-ML Assistance Data Reporting procedure (Ericsson, InterDigital) |
| 1. [R3-231656](..\..\..\Docs\R3-231656.zip) | (TP for TS 38.423) LB and AI/ML Information Exchange over Xn (Nokia, Nokia Shanghai Bell) |
| 1. [R3-231680](..\..\..\Docs\R3-231680.zip) | Further discussion on remaining issues on procedures for AI (ZTE) |
| 1. [R3-231681](..\..\..\Docs\R3-231681.zip) | (TP to 38.423 and 38.420) AIRAN impact on Xn Interface (ZTE) |
| 1. [R3-231795](..\..\..\Docs\R3-231795.zip) | Discussion on AIML UE performance feedback (CMCC) |
| 1. [R3-231796](..\..\..\Docs\R3-231796.zip) | (TP for 38.423)Procedure for AIML related Information (CMCC) |
| 1. [R3-231798](..\..\..\Docs\R3-231798.zip) | Remaining issues on predicted information (CMCC) |
| 1. [R3-231259](..\..\..\Docs\R3-231259.zip) | Xn enhancements for NG-RAN AI-ML (Qualcomm Incorporated) |
| 1. [R3-231432](..\..\..\Docs\R3-231432.zip) | Miscellaneous Xn interface issues (Lenovo) |
| 1. [R3-231824](..\..\..\Docs\R3-231824.zip) | (TP for AIML BLCR for TS 38.423) Remaining open issues for load balancing (Huawei) |
| 1. [R3-231620](..\..\..\Docs\R3-231620.zip) | (TP for AI/ML BLCR to TS38.423) AI-ML Threshold Based Events (Ericsson) |

# Conclusion, Recommendations [if needed]

If needed.