3GPP TSG-RAN WG3 #119bis-e R3-231880

E-meeting, 17th – 26th April 2023

Agenda Item: 12.2.2.2

Source: NEC (moderator)

Title: Summary of email Discussion on CB: # AIRAN3\_ME

Document for: Discussion and Approval

# Introduction

**CB: # AIRAN3\_ME**

**- The presence of time stay of UE, optional or mandatory?**

**- Whether predicted UE Trajectory spans across multiple NG-RAN nodes?**

**- Whether the actual UE trajectory is needed between NG-RAN node, the details of the solution.**

**- Capture agreements and open issues**

**- Provide TP if agreeable**

(moderator - NEC)

Summary of offline disc [R3-231880](Inbox\R3-231880.zip)

This email discussion will comprise two phases:

* Phase 1 Deadline: Thursday April 20th, 10pm UTC
* Phase 2 Deadline: Monday April 24th, 8am UTC

In the second phase, we will try to obtain TPs

# For the Chairman’s Notes

Chairman’s notes of the last meeting are quoted below for your reference:

*There is no need to include predicted RRC state in the cells in the predicted UE Trajectory in this release.*

*There is no need to include beam index information in the predicted UE Trajectory in this release.*

*The presence of the predicted time of stay of a UE in a cell is FFS.*

*FFS whether predicted UE Trajectory spans across multiple NG-RAN nodes or it is limited within a single target NG-RAN node.*

*Continue the discussion on the presence of Predicted Time UE Stays in Cell.*

# Discussion

## The presence of time stay of UE, optional or mandatory?

In the last meeting RAN3 discussed the presence of predicted time of stay of a UE in a cell in the predicted UE trajectory information, but we have no conclusion:

*The presence of the predicted time of stay of a UE in a cell is FFS.*

Some companies thinks that this is up to the RAN node capability, if some of the RAN nodes can’t support prediction of time of stay, then the presence of predicted time of stay of a UE in a cell should be optional (e.g., [1206],[1608], [1650], [1683], [5588]). On the other hand, some companies think that the presence of predicted time of stay of a UE in a cell should be mandatory (e.g., [1799], [1376], [1514]), as without the time of stay, the value to inform target NG-RAN node about the predicted cell list only with cell ID is quite limited. Since the target node does not have accurate information of the UE´s mobility pattern, and anyway needs to process further on when/how to perform handover towards the cell in the list.

**Q1: Do companies think the presence of time stay of UE should optional or mandatory?**

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| **Company** | **Optional /Mandatory** | **Comments, if any** |
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## Whether predicted UE Trajectory spans across multiple NG-RAN nodes?

The second issue is the scope of predicted UE trajectory. Some companies ([1206], [1514]) thinks that as the aim of predicted UE trajectory transferring is for subsequent mobility decision, it is better to span across the multiple NF-RAN node and does not to limit it into one node. On the other hand, some other companies ([1650]) assume that the second predicted cell in the list of cells is controlled by the neighbour NG-RAN node rather than the target node. In that case, the prediction UE Trajectory cannot be provided to the neighbour NG-RAN node because it is provided using the XnAP HANDOVER REQUEST message, and the neighbour NG-RAN node is not the target NG-RAN node. In addition, [1467] supports it is up to the capability of AI/ML module in source NG-RAN to decide whether the predicted UE Trajectory spans across multiple NG-RAN nodes or it is limited within a single target NG-RAN node and it has no impact on specification. The moderator assumes [1467] supports predicted UE Trajectory spans across multiple NG-RAN nodes.

**Q2: which option do you prefer regarding whether the predicted UE Trajectory spans across multiple NG-RAN nodes or single NG-RAN node?**

**Option 1: predicted UE Trajectory spans across multiple NG-RAN nodes.**

**Option 2: The predicted UE Trajectory should be limited within a single target NG-RAN node.**

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| **Company** | **Option1/2** | **Comments, if any** |
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## Whether the actual UE trajectory is needed between NG-RAN node.

RAN3 has agreed to support gNB (e.g., source gNB) to train an AI model that predicts the future UE trajectory in a neighbor gNB (e.g., target gNB) which can be further provided to the neighbor gNB during handover procedure. Some companies ([1435], [1376], [1683], [1467]) think that for a gNB to properly train an AI model to predict the UE trajectory at a neighbour gNB (the prediction result can be transferred during handover procedure), the training data set should include the actual UE trajectory at the target gNB. So it is necessary that actual UE trajectory should be provided to the source NG-RAN.

On the other hand, some other companies ([1608]) identified some issues to support the actual UE trajectory collection from future NG-RAN nodes:

* After UE mobility the source NG-RAN removes the UE context;
* If a trajectory prediction covers the *n* future cell hops, it is very likely that the NG-RAN node serving the *n*th cell will not be Xn connected to the source node that produced the prediction;
* By the time a measured prediction is made available to the source node, the layout of cells in a neighbourhood might have changed.

Moderator clearly see the issues identified by [1608], and kindly ask companies who support the actual UE trajectory feedback to provide some response and solutions regarding these three issues raised from [1608].

**Q3: To predict UE trajectory in the future NG-RAN node(s), whether the actual UE trajectory at the future NG-RAN node(s) is needed at the source NG-RAN node (upon implementation if it is used for training/monitoring/etc.)? If yes, please comment on the issues mentioned above.**

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| **Company** | **Yes/No** | **Comments, if any** |
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If the answer is **Yes** in Q3, [1376] gives the scenario that if multiple NG-RAN nodes are included in the predicted UE trajectory, it is necessary to obtain the actual UE trajectory in the future. But in [1435], [1799], [1683], companies have concerns that even though it is technically possible that the source gNB collects UE trajectory measurements from gNBs beyond the target gNB, it would require additional enhancements/complexity to align the UE related context cross multiple gNBs.

**Q4: do you think the source NG-RAN can collect actual UE trajectory in the future cross multiple NG-RAN nodes?**

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| **Company** | **Yes / No** | **Comments, if any** |
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How is the actual UE trajectory collected?

In [1608], companies think that UE History Information received from (other) UEs may imply future trajectory for a given UE with similar moving pattern. However, in [1683], [1435] companies think from a technical standpoint, this issue cannot be resolved by having the UE return to the original NG-RAN node that generated the predicted trajectory. This is because there is no guarantee that the same UE will be connected to the original NG-RAN node again. One simple way to collect future UE trajectory is to extend the agreed class1/2 procedures for retrieving UE performance to retrieve future UE trajectory from the target NG-RAN node as well.

**Q5: which option do you prefer for the source NG-RAN node to understand the actual UE trajectory in the future?**

**Option 1: use UE History Information reported from (other) UEs to the source NG-RAN node.**

**Option 2: use the agreed class1/2 procedure (AI/ML INFORMATION REQUEST/RESPONSE/UPDATE, the name needs further discussion) to retrieve the future UE trajectory from the target NG-RAN node to the source NG-RAN node.**

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| **Company** | **Option 1/2** | **Comments, if any** |
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# References

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| --- | --- | --- |
| [**R3-231206**](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_119bis-e/Docs/R3-231206.zip) | Discussion on Xn impact of ME | Samsung |
| [**R3-231376**](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_119bis-e/Docs/R3-231376.zip) | AIML Mobility Enhancement | NEC |
| [**R3-231435**](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_119bis-e/Docs/R3-231435.zip) | Discussion on future UE trajectory collection | Lenovo, Intel Corporation, ZTE |
| [**R3-231436**](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_119bis-e/Docs/R3-231436.zip) | (TP for TS38.423) on future UE trajectory collection | Lenovo |
| [**R3-231467**](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_119bis-e/Docs/R3-231467.zip) | Discussion on XnAP impacts of AI/ML for UE associated metrics | CATT |
| [**R3-231468**](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_119bis-e/Docs/R3-231468.zip) | (TP for 38.423) Support of AI/ML based mobility optimization | CATT |
| [**R3-231514**](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_119bis-e/Docs/R3-231514.zip) | Discussion on AI/ML based mobility optimization | China Telecommunication |
| [**R3-231538**](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_119bis-e/Docs/R3-231538.zip) | Mobility Optimization Outputs | InterDigital |
| [**R3-231539**](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_119bis-e/Docs/R3-231539.zip) | (TP for AIML BLCR for TS 38.423) Mobility Optimization Outputs | InterDigital Finland Oy |
| [**R3-231608**](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_119bis-e/Docs/R3-231608.zip) | Cell based UE trajectory prediction exchange | Ericsson, InterDigital, Qualcomm |
| [**R3-231609**](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_119bis-e/Docs/R3-231609.zip) | (TP for AIML BLCR for TS 38.423) Cell based UE trajectory prediction exchange | Ericsson, InterDigital, Qualcomm |
| [**R3-231619**](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_119bis-e/Docs/R3-231619.zip) | Open points on validity time and prediction accuracy | Ericsson |
| [**R3-231650**](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_119bis-e/Docs/R3-231650.zip) | Discussion on cell based UE trajectory prediction | LG Electronics Inc. |
| [**R3-231651**](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_119bis-e/Docs/R3-231651.zip) | (TP for NR\_AIML\_NGRAN-Core BL CR for TS 38.423) Discussion on cell based UE trajectory prediction | LG Electronics Inc. |
| [**R3-231657**](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_119bis-e/Docs/R3-231657.zip) | (TP for TS 38.423) AI/ML Mobility Optimization | Nokia, Nokia Shanghai Bell |
| [**R3-231658**](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_119bis-e/Docs/R3-231658.zip) | (TP for TS 38.423) Cell-based UE Trajectory Prediction | Nokia, Nokia Shanghai Bell |
| [**R3-231683**](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_119bis-e/Docs/R3-231683.zip) | Discussion on left issues of AI based mobility optimization | ZTE |
| [**R3-231799**](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_119bis-e/Docs/R3-231799.zip) | On Predicted UE Trajectory Information | CMCC |

# Conclusion, Recommendations [if needed]

If needed.