RAN-R18-WS-crossFunc-NEC - Version 0.0.5
RAN

3GPP TSG RAN Rel-18 workshop RWS-210632

Electronic Meeting, June 28 - July 2, 2021

Agenda Item: **4.3**

Source: **NEC**

Title: **Email discussion summary for [RAN-R18-WS-crossFunc-NEC]**

1 Introduction

This discussion thread covers two papers:

1. Views on AI/ML for NR Physical Layer [RWS-210128]

2. 5G-Advanced Architecture Evolution to Support AI/ML [RWS-210129]

2 General Comments

Feedback Form 1: [1st Round QA] General Comments

Feedback Form 2: [2nd Round QA] General Comments

3 Questions/ Comments on "Views on AI/ML for NR Physical Layer [RWS-210128]"

Observation 1: AI/ML can bring physical layer performance improvement in a few use cases proposed by the companies.

Proposal 1□A separate study item of AI/ML for physical layer is needed. It will collect and identify the use cases that AI/ML can bring benefit. The placement of AI/ML models will be decided based on the use cases.

Proposal 2□SI will carry out evaluation to study the benefit of AI/ML for the physical layer. Detailed AI/ML algorithms and models are out of the scope of this SI.

Proposal 3□SI will study the specification impact if AI/ML is introduced for physical layer.

Based on the above analysis, we think the study item will study the necessities to introduce AI/ML to physical layer by:

- Identify the possible use cases of interests. Companies are encouraged to input the use cases based on their experiments. The placement of AI/ML models will be decided based on the use cases.

- Evaluate the benefits of AI/ML on the collected use cases. The data for training among the different companies needs to be aligned. Detailed AI/ML algorithms and models are out of the scope of this SI.

- Study the specification impact for the identified use cases e.g. the signaling between the network and the terminal, which may be needed by an AI function as input and which may be produced by an AI function as output. Complexity, computation load, power consumption and time delay that the AI/ML may introduce. In addition, the implementation issues which don't require specification support can also be identified in the process.

This study is mainly carried out in RAN1, but the coordination with other groups working on AI/ML is expected.

Feedback Form 3: [1st Round QA] Questions/ Comments on "Views on AI/ML for NR Physical Layer [RWS-210128]"

1 – Rakuten Mobile

Thanks for contribution.

We support use of AI/ML for NR Physical layer & our proposal (RWS-210198) is seems align with NEC .

2 – Sony Corporation

Thanks for the contribution. We have a question.

- "*Network or terminal vendors may implement their own solutions to deploy AI/ML models for their hardware.*" in section 2.3. Is this mean that gNB and UEs train AI model independently?

3 – Fujitsu Limited

Thanks for the contribution. we share the same view of having study item on AI for PHY. Here is a question:

what is your view on how to select/judge the use case of AI for PHY?

Table 1: [1st Round Q&A] Answers to Questions/ Comments on "Views on AI/ML for NR Physical Layer [RWS-210128]"

Company	Answer
Rakuten Mobile, Inc	Thank you very much for the support.

Sony Corporation	Thank you for the question. As AI/ML for physical layer is new, we are open to discuss the possible models in network side and terminal side. The model can be located in network side, UE side or both. The training process largely depends on the use cases in which the training process may involve either one or both. So we think it will become clearer when the use cases have been identified.
Fujitsu Limited	Thank you for the question. We share the similar view as many companies and would like to consider the following issues in selecting/judging the use cases - The benefit of the use cases. It should have enough benefit to be implemented in the real networks. - The cost to introduce such use cases, e.g. the computation resource, power consumption, specification impact, etc. - The TU allocation in Rel-18. As this is a new feature, we think the early cases should be simple enough. The complex ones can be introduced in future releases.

Feedback Form 4: [2nd Round QA] Questions/ Comments on ”Views on AI/ML for NR Physical Layer [RWS-210128]”

1 – ZTE Corporation

We also see the importance to study some of the mentioned use cases in Rel-18 AI based air interface. But we think it’s not possible to include all the use cases that companies are interested in. We should focus on the study of the use cases with wide interest from companies, e.g., CSI feedback, channel estimation, BM, positioning.

2 – Samsung Electronics Polska

For Rel-18 SI on “NG-RAN architecture enhancements to support AI/ML”, as AI/ML model is out-of-scope, what is this SI to support, the AI related data transferring?

Table 2: [2st Round Q&A] Answers to Questions/ Comments on ”Views on AI/ML for NR Physical Layer [RWS-210128]”

ZTE Corporation	Yes, we share the same view that limited cases should be selected to start the AI/ML discussion.
Samsung Electronics Polska	Thank you for the question. As shown in our tdoc RWS-210128, “Detailed AI/ML algorithms and models are out of the scope of this SI“. So we don’t prefer to study the AI/ML model in this SI, either. Use cases and the related signaling support are the focus. To do this, evaluation is also necessary.

4 Questions/ Comments on "5G-Advanced Architecture Evolution to Support AI/ML [RWS-210129]"

Proposal 1: It is proposed to have Rel-18 WI on “AI/ML for NG-RAN performance optimization” that will be normative work based on the results of Rel-17 RAN3 “Study on enhancement for Data Collection for NR and EN-DC.” Similar to SI, it is proposed that the WI will focus on the current NG-RAN architecture and interfaces.

Proposal 2: It is proposed to have Rel-18 SI on “NG-RAN architecture enhancements to support AI/ML” that will study new functional entities and interfaces to allow more tight integration of AI/ML models and solutions to 5G-Advanced NG-RAN architecture.

Feedback Form 5: [1st Round QA] Questions/ Comments on ”5G-Advanced Architecture Evolution to Support AI/ML [RWS-210129]”

1 – CATT

Thank you for the contribution. We also think there should be a follow up WI in Rel-18 to do normative work. We have a question for clarification on the objective of Rel-18 SI. Since the name is NG-RAN

architecture enhancement, do you mean to introduce new network entity or network interface?
2 – LG Electronics France Q) On P2, would you please clarify more on introducing new entities and interfaces to allow more tight integration of AI/ML models from NG-RAN point of view? It seems there is a big change for the framework in the current SI.
3 – Lenovo Information Technology we support the proposals. As stated in our contribution RWS-210253, we also support to study tight integration iof AI/ML modes. v Study potential enhancements on RAN interfaces to support distributed intelligence, which may include intelligent task segmentation, data sharing, computing offloading and learning model sharing among devices and RAN nodes for a certain AI task; v Study potential enhancements on air interface to address the QoS related requirements regarding data sharing, computing offloading and learning model sharing between UE and RAN node.
4 – Samsung Electronics Polska For Rel-18 SI on "NG-RAN architecture enhancements to support AI/ML", as AI/ML model is out-of-scope, what is this SI to support, the AI related data transferring?

Table 3: [1st Round Q&A] Answers to Questions/ Comments on "5G-Advanced Architecture Evolution to Support AI/ML [RWS-210129]"

Company	Answer
CATT	Thank you for your comment and question. We propose to have a WI in RAN3 as continuation of the current RAN3 SI and to have a new SI in RAN3 as continuation of the current RAN3 SI covering wider scope and use cases. The new RAN3 WI will have the same scope as the current RAN3 SI focusing on the current RAN architecture and interfaces. In the new RAN3 SI we propose no to have limitation that only current RAN architecture and interfaces are considered, but have a possibility to propose new functional entities and interfaces based on the discussion of use cases and solutions.

LG Electronics France	Thank you for your question. We propose to have a WI in RAN3 as continuation of the current RAN3 SI and to have a new SI in RAN3 as continuation of the current RAN3 SI covering wider scope and use cases. The new RAN3 WI will have the same scope as the current RAN3 SI focusing on the current RAN architecture and interfaces. In other words same framework as the current SI. In the new RAN3 SI we propose no to have limitation that only current RAN architecture and interfaces are considered, but have a possibility to propose new functional entities and interfaces based on the discussion of use cases and solutions.
Lenovo Information Technology	Thank you for your support. We believe that if the new RAN3 SI there is no limitation that only current RAN architecture and interfaces are considered, it would be beneficial to cover more use cases and solutions.
Samsung Electronics Polska	Thank you for your questions. In the current RAN3 SI there is a limitation to consider only the current RAN3 architecture and interfaces. Also, not all use cases may be considered. We propose to have a new SI in RAN3 as continuation of the current RAN3 SI covering wider scope and use cases. Wide scope means that new functions/functional entities and interfaces could be studied based on use cases and solutions.

Feedback Form 6: [2nd Round QA] Questions/ Comments on ”5G-Advanced Architecture Evolution to Support AI/ML [RWS-210129]”

5 Summary of Discussion

The following questions have been discussed for the paper ”[RWS-210128] Views on AI/ML for NR Physical Layer”:

- AI/ML model deployment and training

- Criteria for use cases selection/prioritization

- Topics to be considered in the SI (scope of the SI).

The following questions have been discussed for the paper ”[RWS-210129] 5G-Advanced Architecture

Evolution to Support AI/ML”:

- Wider scope in the new SI compared to the current RAN3 SI including possibility to consider new interfaces and/or new functional entities.

Based on the discussion NEC proposes to consider the following directions for RAN AI/ML in Release-18:

- New RAN1/2 SI for AI/ML for NR physical layer to study use cases, potential solutions, and standardization impacts, as well as, evaluation methodology including test data sets, evaluation metrics, and performance requirements

- RAN3 WI based on the results of RAN3 SI that focuses on the current NG-RAN architecture and interfaces to develop normative specifications for the selected use cases

- RAN3 SI with wider scope to study wider range of use cases, deplyment and architecture options, multi-vendor interoperability, etc.

Also, the following two directions looks promising for Release-18:

- AI/ML related traffic over 5G-Adavanced inclduing traffic related to specific use cases and AI/ML model transfer and distribution

- UE-based or RAN-UE-distributed AI/ML.

6 References

[RWS-210128] Views on AI/ML for NR Physical Layer

[RWS-210129] 5G-Advanced Architecture Evolution to Support AI/ML