3GPP TSG RAN Rel-18 workshop **RWS-210607**

Electronic Meeting, June 28 - July 2, 2021

Agenda Item: 4.3

Source: AT&T

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

Document for: Discussion

1 Introduction

This document is meant to facilitate the email discussion [RAN-R18-WS-crossFunc-ATT] between June 14 and June 24 according to the Chairman's guidance in [1]. To help companies better understand AT&T's proposals, the main purpose of email discussion [RAN-R18-WS-crossFunc-ATT] is to ask questions that AT&T can then answer. To this end, to allow for follow-up questions, there will be two rounds.

Round 1: Questions: June 14 08:00 UTC – June 17 8:00 UTC; Answers: June 17 8:00 UTC – June 18 23:59 UTC

Round 2: Questions: June 21 08:00 UTC – June 23 8:00 UTC; Answers: June 23 8:00 UTC – June 24 18:00 UTC

A summary will be provided by the moderator before June 25, 18:00 UTC.

AT&T submitted four contributions to the Rel. 18 workshop in [2][3][4][5]. The scope of this email discussion is the fourth contribution in [5] focusing on machine learning & artificial intelligence in RAN for Rel. 18. The summaries for all contributions can be found in [6][7][8].

2 Round 1 comments, questions, and answers

2.1 Comments regarding AT&T's view on machine learning & artificial intelligence in RAN for Rel. 18

Companies are invited to comment on AT&T's views on machine learning & artificial intelligence in RAN for Rel. 18 in the table below. The moderator of email discussion [RAN-R18-WS-crossFunc-ATT] will provide answers, as applicable, in Section 4 to these comments.

Feedback Form 1:

1 – ZTE Corporation We share the similar view. Our view is to focus on the normative work of prioritized use cases, and potential interface enhancement for supporting AI in Rel-18 WI. In Rel-18 SI, federated learning/distributed learning can be studied in Rel-18 SI, which may have impact on RAN2/RAN3.
2 – China Telecommunications Thanks for the proposals, we are also interested in AI/ML enable RAN enhancement, and we think the impact on UE side when introducing AI/ML in RAN should also be considered, for example, when the federated/distributed learning is used, the UEs may also need to perform model training or inference, so the enhancement and requirement on UE side should also be considered.
3 – NEC Corporation NEC supports having a new SI in RAN3 as continuation of the current RAN3 SI covering wider scope and use cases. It is also proposed to have WI in RAN3 as continuation of the current RAN3 SI. NEC supports having SI on AI/ML for physical layer.

2.2 Questions regarding AT&T's view on machine learning & artificial intelligence in RAN for Rel. 18

Companies are invited to ask questions for clarification regarding AT&T's view on machine learning & artificial intelligence in RAN for Rel. 18 in the table below. The moderator of email discussion [RAN-R18-WS-crossFunc-ATT] will provide answers, as applicable, in Section 4 to these comments.

Feedback Form 2:

1 – China Telecommunications For the use cases listed in Page2, the mobility enhancement is already a key use cases studied in Rel17 RAN3 led item (*Enhancement for Data Collection for NR and EN-DC SI (RP-201620)*, so what is the focus or differences of the mobility to study in R18?
2 – Intel Technology India Pvt Ltd The use-cases in slide-2 are in general aligned with our view. For MU-MIMO use-case could you provide your views on specification impact ? we do recognize it is a strong use-case for implementation but wondering whether specification impact is on the NW interface/air-interface side. For the proposal for Rel-18 in slide-5, is AT&T supportive of studying/specifying NN model parameters like structure, layers, weights etc. for the air-interface ?
3 – LG Electronics Inc. Could you explain which antenna parameters are optimized by AI in the evaluation results of example use case 2?

4 – Qualcomm CDMA Technologies Are you considering for 3GPP to standardize ”ML Agent” and related interfaces?
5 – MediaTek Inc. Thanks for the contribution. Some questions on RWS-210214: 1) Does AT&T have any target benchmark for the parameters (processing power, latency) in UE or gNB? 2) Does AT&T consider any particular type of air interfaces enhancements for training and model updates?
6 – Nokia Corporation Thank for the contribution. Could you elaborate more on your expectations towards multi-vendor interoperability in AI/ML algorithm design, and how it could be achieved?

2.3 Answers provided by the moderator of email discussion [RAN-R18-WS-crossFunc-ATT]

In response to the question by China Telecom, AT&T's response is:

Q: For the use cases listed in Page2, the mobility enhancement is already a key use cases studied in Rel17 RAN3 led item (Enhancement for Data Collection for NR and EN-DC SI (RP-201620), so what is the focus or differences of the mobility to study in R18?

A: To clarify part of the Rel-18 work including mobility enhancements may be normative (i.e. RAN3-led WI), while other topics which have not yet been fully studied may be part of a study phase (i.e. RAN1-led SI)

In response to the question by Intel, AT&T's response is:

Q: The use-cases in slide-2 are in general aligned with our view. For MU-MIMO use-case could you provide your views on specification impact ? we do recognize it is a strong use-case for implementation but wondering whether specification impact is on the NW interface/air-interface side.

A: There could be multiple specification impact aspects including ML agents providing enhanced scheduling metrics, physical layer measurements, or recommended air interface configurations to the relevant network nodes.

Q: For the proposal for Rel-18 in slide-5, is AT&T supportive of studying/specifying NN model parameters like structure, layers, weights etc. for the air-interface ?

A: Specifying model parameters is relevant to the extent that exchanging or recommending parameters may be beneficial for multi-vendor interoperability.

In response to the question by LG Electronics, AT&T's response is:

Q: Could you explain which antenna parameters are optimized by AI in the evaluation results of example use case 2?

A: Initially the focus is on parameters such as downtilt, beamwidth/beam shape etc. However the study can be generic to incorporate all aspects of beamforming design and optimization.

In response to the question by Qualcomm, AT&T's response is:

Q: Are you considering for 3GPP to standardize "ML Agent" and related interfaces?

A: What may be more relevant is to understand the implications of different ML Agent architectures (e.g distributed vs. centralized) and requirements on the related RAN interfaces (e.g. types of information and latency requirements)

In response to the question by MediaTek, AT&T's response is:

Q: Does AT&T have any target benchmark for the parameters (processing power, latency) in UE or gNB?

A: This would be part of the study, to understand potential requirements on the network/device side vs. potential performance benefits

Q: Does AT&T consider any particular type of air interfaces enhancements for training and model updates?

A: This may be very scenario dependent. One aspect of the study can be to understand potential benefits of RAN "awareness" of different ML algorithms/approaches.

In response to the question by Nokia, AT&T's response is:

Q: Thank for the contribution. Could you elaborate more on your expectations towards multi-vendor interoperability in AI/ML algorithm design, and how it could be achieved?

A: Multi-vendor interoperability is critical. Aspects may include identifying common data sets (e.g. whether training data can be shared across nodes or agents) and developing generic interfaces which can support different ML algorithm designs/implementations.

3 Round 2 comments, questions, and answers

3.1 Follow-up comments regarding any aspects of Round 1

Companies are invited to comment on any aspects of round 1 and AT&T's answers in Section 2.3 specifically.

Feedback Form 3:

3.2 Follow-up questions regarding any aspects of Round 1

Companies are invited to ask follow-up questions on any aspects of round 1 and AT&T's answers in Section 2.3 specifically.

Feedback Form 4:

1 – Intel Corporation (UK) Ltd

Q1: Do you think other use cases should be further studied in RAN3 in Rel-18 (beyond what has been agreed in Rel-17)? If yes, what are the preferred use cases?

Q2: Regarding to the "common data set", Do you think the model parameter is important as part of the common data set to support multi-vendor interoperability? Or the common data set only consider input/output data for model training/inference?

2 – China Telecommunications

Thanks for the response, and we have another question about your proposal which indicate that" *Study potential interface enhancements to support training and model updates*", does it mean we need to introduce new interface or reused current interface? And what do you think about the signaling overhead issue?

3.3 Answers provided by the moderator of email discussion [RAN-R18-WS-crossFunc-ATT]

In response to the question by Intel, AT&T's response is:

Q: Do you think other use cases should be further studied in RAN3 in Rel-18 (beyond what has been agreed in Rel-17)? If yes, what are the preferred use cases?

A: We do believe other use cases should be considered in Rel. 18 beyond what was agreed in Rel. 17. Please refer to R3-212389 for example use cases we have in mind that can be considered and the corresponding architecture enhancements.

Q: Regarding to the "common data set", Do you think the model parameter is important as part of the common data set to support multi-vendor interoperability? Or the common data set only consider input/output data for model training/inference?

A: Model parameters exchange can be important for multi-vendor interoperability in addition to the input/output data.

In response to the question by China Telecom, AT&T's response is:

Q: Thanks for the response, and we have another question about your proposal which indicate that "Study potential interface enhancements to support training and model updates", does it mean we need to introduce new interface or reused current interface? And what do you think about the signaling overhead issue?

A: New interfaces might be needed depending on where various machine learning functions such as the data collection, the policy engine and the ML/AI agent itself lie. This would be related to the type of use case considered, e.g. whether it is real-time or non-real time. The AI/ML use cases considered would alternatively decrease the signaling overhead needed to achieve a given performance gain.

4 Conclusion

This contribution summarized email discussion [RAN-R18-WS-crossFunc-ATT] between June 14 and June 24 in preparation of the 3GPP TSG RAN Rel-18 workshop. Specifically, Section 2 summarizes all comments and questions with the corresponding answers received in round 1 between June 14 – June 17 and Section 3 those

of round 2 between June 21 – June 23. The corresponding contribution for email discussion [RAN-R18-WS-crossFunc-ATT] can be found in [5]. [2][3][4] reference the other AT&T contributions to the 3GPP TSG RAN Rel-18 workshop and the corresponding email discussion summaries can be found in [6][7].

5 References

[1] RWS-210002, Some details for RAN Rel-18 Workshop, RAN Chair

[2] RWS-210211, Views on 5G Enhancements for Release 18 and Beyond, AT&T

[3] RWS-210212, Views on eMBB-driven Functional Evolution for Rel-18, AT&T

[4] RWS-210213, Views on Non-eMBB-driven Functional Evolution for Rel-18, AT&T

[5] RWS-210214, Views on Machine Learning & Artificial Intelligence in RAN, AT&T

[6] RWS-210513, Email discussion summary for [RAN-R18-WS-eMBB-ATT], AT&T

[7] RWS-210553, Email discussion summary for [RAN-R18-WS-non-eMBB-ATT], AT&T

[8] RWS-210607, Email discussion summary for [RAN-R18-WS-crossFunc-ATT], AT&T