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Moderator's summary on new SI Study on enhancements for Artificial Intelligence (AI)Machine Learning (ML) for NG-RAN

Source: China Unicom (moderator, RAN3 VC)

1.Introduction

- This summary uses the framework given in the RAN-chair guidance document [1], referring to slide 15 (TU allocation) and 31 (**AI/ML for NG-RAN SI → WI**, the potential objectives).

Potential objectives:

- 6 months SI + 12 months WI
- Rel-18 leftovers (depends on Rel-18 outcome), e.g.:
  - Mobility optimization
    - NR-DC
    - UE Trajectory prediction
  - Energy saving
    - Prediction for energy cost
  - Continuous MDT
- ~~At least 1~~ At most 2 potential new use case/scenario which benefits from inference-based techniques
  - Coverage and Capacity Optimization
  - Potential Rel-18 use case enhancements (e.g. new scenarios for ES)
  - QoE
  - Slicing
  - Note: Model training/inference at the DU and/or F1 enhancements must be justified by the use case
- Study: Consider available functionality specified in 5GC (NWDAF, MDAS) in order to align AI/ML framework between RAN and CN

2.1 Rel-18 leftovers

- The contribution summarizes all the views (from [2] to [15]) on the potential objectives.

- **Rel-18 leftovers include the following topics:**
  - **Mobility optimization[RAN3]**
    - AI/ML based mobility optimization enhancements in NR-DC: ZTE, E///, HW, CMCC, Xiaomi, Samsung
    - UE Trajectory prediction: NEC, Nokia, ZTE, HW, CATT, Xiaomi, Qualcomm
      - ✓ Multi-hop UE trajectory across gNBs: NEC, Nokia, ZTE, HW, CATT
      - ✓ Finer granularity level UE trajectory, e.g., beam-level： ZTE, Nokia, Xiaomi, CATT
      - ✓ UE Trajectory Prediction continuity across UE RRC State Transition, e.g. RRC_IDLE/RRC_INACTIVE states: Nokia, Qualcomm
  - **Energy saving[RAN3]**
    - Prediction for energy cost: Nokia, E///, ZTE, CMCC
      - ✓ Prediction for energy cost based on additional/potential load: Nokia, E///
  - **Continuous MDT collection targeting the same UE across RRC states[RAN3, RAN2]**: Nokia, E///, Xiaomi, CMCC, ZTE, QC, HW

- **Whether the above Rel-18 leftover topics can be worked in WI phase directly?**

- **Moderator proposal:** Agree to work on the above Rel-18 leftovers in Rel-19.

2.2 New Use Case/Scenario

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- Following the guidance, "***At most 2 potential new use case/scenario which benefits from inference-based techniques.***", the preference of each use case/scenario is listed below.
  - **Use case 1: Coverage and Capacity Optimization**
    - Supportive companies for case 1: CMCC, Nokia, ZTE, E///, HW, QC, Xiaomi, CATT (8 companies)
  - ~~**Use case 2: Potential Rel-18 use case enhancements (e.g. new scenarios for ES)**~~
    - Supportive companies for case 2: CATT (1 company)
  - **Use case 3: QoE**
    - Supportive companies for case 3: CMCC, CT, E///, Samsung, Xiaomi, CATT (6 companies)
  - **Use case 4: Slicing**
    - Supportive companies for case 4: CMCC, CT, NEC, Nokia, ZTE, Samsung, CATT((7 companies)

- **The overlaps between RAN3-led AI/ML for NG-RAN and RAN2-led AI/ML mobility SI should be avoided.**

- **Moderator proposal:** Agree to capture the following two new use cases in Rel-19 SI, i.e. Coverage and Capacity Optimization, Slicing.

2.3 Coordination between CN and RAN and Architecture aspects

- **Study the benefits and potential coordination/interaction between CN and NG-RAN for support of AI/ML function per use case basis.**
  - **Supportive companies:** DT, T-Mobile US**,** NEC, CATT, ZTE, HW, E///, Xiaomi

- **Study the support on split architecture for Rel-18 and Rel-19 identified AI/ML based use cases.**
  - **Supportive companies:** CMCC, NEC, Qualcomm, ZTE, Lenovo, CATT, Xiaomi

- **Note : Coordination based on LSs with other WGs, if needed, e.g. RAN2, SA2, SA5.**

- **Moderator proposal:** Agree to capture the above two bullets as study objectives and note in the Rel-19 SI.

2.4 Time plan for Rel-19 “AI/ML for NG-RAN”

- According to the reference contributions in [2] to [16], it is proposed to agree the following time plan for Rel-19 AI/ML for NG-RAN as **“one 6-month SI and one 12-month follow-up WI”**.

- **Moderator proposal:** Agree the above time plan for Rel-19 “AI/ML for NG-RAN” .

2.5 Other Proposals

- Study for additional separated network node/function: to implement the AI model training and model inference.
- Support threshold-based conditions and events to trigger AI/ML data reporting.
- Enhancement left for inference output consisting of prediction, e.g. failure cause due to time issues.
- AI/ML based moility optimization use case: AI/ML based CHO, AI/ML based LTM.
  - AI/ML based CHO , e.g.. predicted resource reservation time window for CHO, estimated arrival probability for CHO, traffic prediction, predicting CHO candidate/target cells.
  - AI/ML based LTM, e.g., predicting LTM candidate/target cell(s) and beam(s).

- **Moderator proposal:** Further clarifications and discussions are needed during the official discussion, which are not captured in the RAN-chair guidance document [1].

References

1. RP-232745 Summary for RAN Rel-19 Package: RAN1/2/3-led RAN Chair
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3. RP-233577 Views on NR Rel-19 AIML for NG-RAN China Telecom
4. RP-233796 Need for a conistent e2e AI/ML framework Deutsche Telekom
5. RP-232889 AI/ML for NG-RAN enhancement NEC
6. RP-233084 AI/ML for NG-RAN in Rel-19 Nokia, Nokia Shanghai Bell
7. RP-233622 Views on Rel-19 AI/ML for NG-RAN ZTE, Sanechips
8. RP-233675 Discussion on Rel-19 AI/ML for NG-RAN enhancements Ericsson
9. RP-233677 AI/ML for NG-RAN in Rel-19 Huawei, HiSilicon
10. RP-233022 Views on Rel-19 AI/ML for NG-RAN Qualcomm Incorporated
11. RP-233024 Scope of AI/ML for NG-RAN in Rel-19 Samsung
12. RP-233554 Views on Rel-19 NG-RAN AI/ML Xiaomi
13. RP-232989 Views on Rel-19 AI/ML for NG-RAN CATT
14. RP-233083 Study on RAN architecture with AI and ML NVIDIA
15. RP-233645 F1 interface impacts to support AI for RAN in Rel19 Lenovo, CATT, NEC

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Thanks