3GPP TSG RAN Meeting #102 RP-233480
Edinburgh, Scotland, December 11-15, 2023

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Views on Scope for Study on AI /ML for Mobility in Rel-19

Agenda Item: 9.1.2.4

Source: Fujitsu

Document for: Discussion

Background

- In RAN#101 meeting, RANP has concluded the potential scopes/directions of the study item [1], RAN chair provided TU estimation and potential objectives as following [2]:

AI/ML for Air Interface (Mobility) SI

- References: RWS-230488, RP-231540, RP-232622
- Potential objectives: possible down-scoping in RAN#102
  - Type of mobility
    - L3-based mobility and L1/L2 -triggered mobility (LTM) are both considered
  - HO optimization in Network side ~~[/UE side]~~, including
    - Candidate/target cell prediction in L3 -based mobility, or, candidate/target beam(s) and cell(s) prediction in LTM
  - RRM measurement and event prediction, including
    - Beam-level measurement prediction
    - Cell-level measurement prediction, e.g., using intra -frequency measurement results to forecast the RRM measurement of inter -frequency/inter -RAT cells
    - HO failure/RLF prediction
    - Measurement events prediction
  - LCM framework and others
    - The conclusions in Rel -18 AI/ML study should be used as baseline
    - Other impacts are further studied
  - ~~[UE RRM enhancement, RAN4]~~
  - Note 1: no intention to change the existing framework for the mobility under connected mode
  - Note 2: In the SID, target performance metrics and impacts should be clarified
  - Note 3: Avoid overlap work with RAN3

Slide 30

- We share our views on the scope of this SI in Rel-19 with focus on mobility type, model sidedness and LCM framework.

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AI/ML for Mobility: SI (RAN2-led)

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- **Motivation:**
  - Improve HO performance
    - Efficiently improve the robustness of handover to avoid HOF/RLF, short-time stay or HO ping-pong.
  - Reduce measurement effort
    - Reduce measurement interruptions by measurement prediction with less UE measurement GAPs.
    - Reduce measurements during TTT and provide measurement results timely by reducing TTT.
  - Reduce signaling overhead
    - Reduce configurations over the air for CHO/LTM candidate cells.
    - Report accurate predicted L3/L1 measurement results to avoid large number of measured results reporting.
  - Reduce UE power consumption
    - Avoid or reduce measurements at UE side to reduce UE power consumption.

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AI/ML for mobility: Discussions-1

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- **Mobility type:**
  - L3-based mobility is considered:
    - Both Rel-15 legacy HO and Rel-16 CHO can be considered as starting point.
  - Rel-18 LTM is considered for:
    - Reducing network resources usage when maintaining the LTM candidate cells for subsequent LTM procedures.
    - Reducing signaling overhead of LTM candidate cell configurations.
    - Improving robustness of LTM based on L1-RSRP prediction and transmission of MAC CE for LTM cell switch.
  - Both L3-based mobility and LTM are suggested to be studied in this SI.
- **NW-sided Model for HO optimization:**
  - NW has full knowledge for HO optimization, e.g., the cell quality information, the loading information or other information of both serving cell and neighbor cells.
  - Model for HO optimization is preferred to be at NW side.

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AI/ML for mobility: Discussions-2

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- **RRM optimization:**
  - For measurement effort optimization, UE sided model can be considered. To ensure the reliability of the measurement, the model operations under NW control are suggested to be studied.
  - For cell/beam-level measurement prediction, it can be performed by UE-sided model. When NW gets inputs, e.g., historical measurements and UE trajectory info, NW-sided model can be considered as well to perform the cell/beam-level measurement prediction.
  - With cell/beam-level measurement prediction, both UE-sided model and NW-sided model can predict the potential abnormal cases including beam failure/HOF/RLF, short-time stay and mobility ping-pong.
  - Both NW-sided model and UE-sided are suggested to be studied.
- **LCM Framework:**
  - In Rel-18 AI/ML for air interface SID, both functionality-based LCM and model-ID-based LCM between are studied, but no unified LCM is recommended to the normative phase.
  - Both functionality-based LCM and model-ID-based LCM need to be studied in AI/ML for mobility.

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AI/ML for mobility: Rel-19 RAN2-led SI

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- **Proposed objectives:**
  - AI-based Mobility Use cases
    - Both L3-based mobility and LTM are suggested to be studied
  - HO optimization in NW side, including: [RAN2, RAN3]
    - Model sidedness:
      - NW-sided model
    - Potential applicable cases:
      - Candidate/target cell/beam prediction
      - HO time prediction
  - RRM measurement and event prediction, including:[RAN2, RAN1]
    - Model sidedness:
      - NW-sided model and UE-sided model
    - Potential applicable cases:
      - Measurement effort optimization (UE-sided model under NW control)
      - Cell/Beam-level measurement prediction (both UE- and NW-sided model)
      - Abnormal case prediction(both UE- and NW-sided model)
  - LCM framework and others:[RAN2]
    - Both functionality-based and model-ID-based LCM are suggested to be studied
    - Reuse the existing framework for the mobility in standalone case

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Reference

- [1] RP-232622, Moderator's summary for REL-19 RAN2 topic AI/ML for Air Interface SI (Mobility), 3GPP TSG RAN Meeting #102, Bangalore, September 11 – 15, 2023
- [2] RP-232745, Summary for RAN Rel-19 Package: RAN1/2/3-led, RAN Chair, 3GPP TSG RAN Meeting #102, Edinburgh, December 11-15, 2023

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