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Discussion on the WID detail of AI/ML for Air IF in Rel-19

Source: Fujitsu Limited

Agenda: 8A.2.1

Document for discussion

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Observation on Study Item Progress

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- Although SI is not completed in 3Q 2023, **it can be completed if additional time units during maintenance phase are available**.
- In the study phase, there are 3 use cases as examples of the AI/ML applications. Meaningful gains are observed.
- Necessary frameworks to conduct LCM, data collection, etc were discussed.

Observation 1: WI phase for AI/ML for Air IF can be started without study phase in Rel-19 if additional discussion is allowed in 4Q 2023.

Observation 2: All the 3 use cases can be considered in the normative phase.

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Rel-19 WI Scope: General

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- **Background and Motivation**
  - Rel-18 discussed how to manage AI/ML models, with different collaboration levels assumption.
  - As this is the first release to specify AI/ML application to air interface, simple frameworks to apply AI/ML should be prioritized to have stable specification.
- **Proposed objectives**
  - Specify procedures to support LCM of AI/ML models, including model/functionality identifications, monitoring, and update procedures
  - Specify signaling procedure to identify model between UE and NW, under assumption of **collaboration level y** as the priority.
    - Specify input/report procedure to/from model inference entities
  - Specify UE/NW side data collection schemes

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CSI enhancement

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- Background
  - In Rel-18, two sub use cases are under study: CSI compression and CSI prediction
  - Gains of AI/ML application were evaluated
    - Performance gain over legacy approach
    - Model generalization/scalability was confirmed among different scenarios/configurations, and under multi-vendor/quantization issues
  - Studied model monitoring and following-up model operations
- Proposed objectives
  - Specify both CSI compression (two-sided model) and CSI prediction (one-sided model)
  - Enhancements on AI/ML-specific CSI configuration/reporting framework
    - AI/ML-based CSI configuration and CSI reporting: parameter configurations, reporting setting and priority rules
    - Model alignment: procedure for aligning two-sided models
    - Monitoring and following-up mechanisms: switching/fallback between AI/ML and legacy CSI reporting
    - Data collection: RS configuration and CSI reporting enhancement

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Beam enhancement

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- Background
  - Rel-18 studied beam prediction in spatial/time domain via AI/ML
  - AI/ML benefits have been evaluated, including
    - The performance gain (e.g., prediction accuracy, UE throughput, RS overhead reduction, etc.)
    - Model generalization over different scenarios/configurations, and RSRP quantization impacts
  - Studied data collection and model performance monitoring
- Proposed Objectives
  - Enhancements on procedure/signaling for inference, data collection, and monitoring
    - Inference: parameter configurations; beam reporting and indication for two stages (Top-K beams and the optimal beam)
    - Data collection: RS configuration, beam measurement and reporting, RSRP quantization enhancement
    - Monitoring and following-up mechanisms: performance metrics, performance reporting, switching/fallback between AI/ML-based and legacy beam reporting

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Positioning enhancement

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- Background
  - Rel-18 studied direct AI/ML positioning and AI/ML assisted positioning
  - AI/ML positioning accuracy improvements over non-AI methods have been evaluated
  - Model monitoring labels/methods have been studied
- Proposed objectives
  - Enhancements on AI/ML positioning LCM signaling and procedures
    - Inference: new (e.g., CIR, PDP, DP) or enhanced (e.g., TDOA, LOS/NLOS) reporting based on PRS/SRS measurements
    - Monitoring: metrics calculation and monitoring decision made with or without ground truth labels
    - Data collection for training: LPP/NRPPa enhancement or other mechanisms for ground truth generation and quality verification
    - Identification: normative works on AI/ML positioning related feature/FG definition in UE capability
  - Enhancements on AI/ML positioning performance improvement
    - Enhance NR-Positioning and/or sidelink frameworks to deal with environment impairments and PRU issues

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