

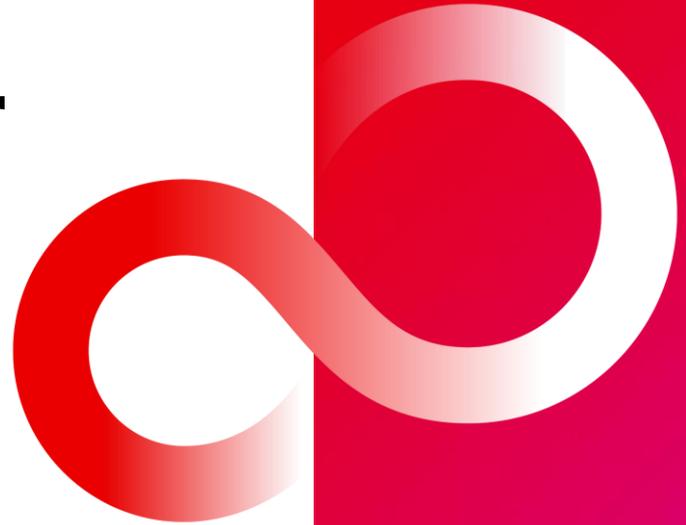
RWS-230271

**3GPP TSG RAN Rel-19 Workshop
Taipei, June 15 - 16, 2023**

Views on AI/ML for Air Interface in Rel-19

Fujitsu Limited

FUJITSU

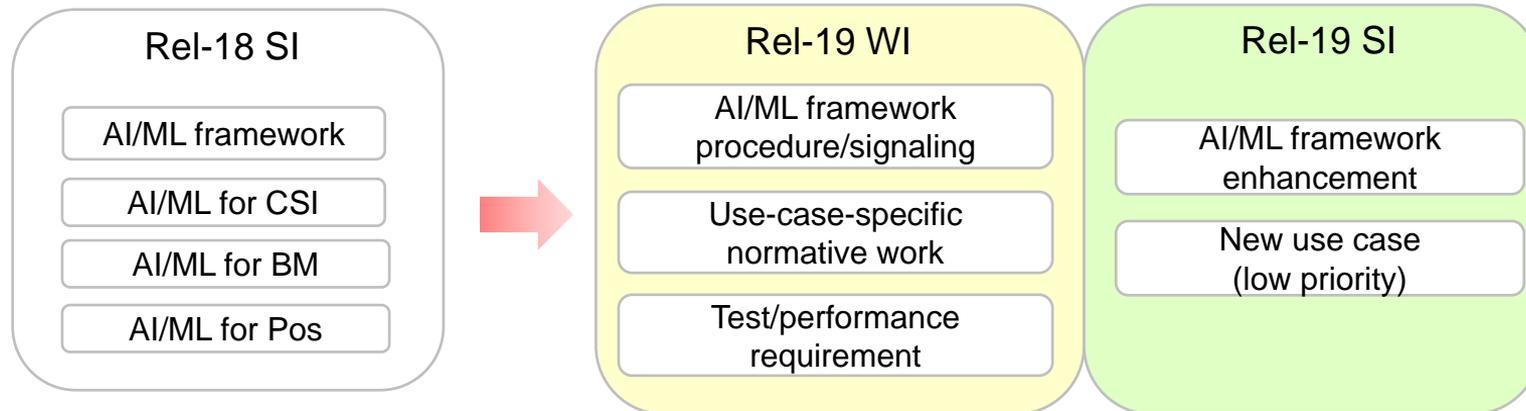


Rel-19 WI

- ❑ Three use cases: Normative work to support (sub) use cases studied in Rel-18 SI
- ❑ AI/ML framework: Model/functionality-based procedure/signaling
- ❑ AI/ML requirement and testing

Rel-19 SI

- ❑ AI/ML framework enhancement
 - Robust and reliable AI/ML
 - Rel-18 deferred topics
- ❑ New use case (low priority)



● Background and motivation

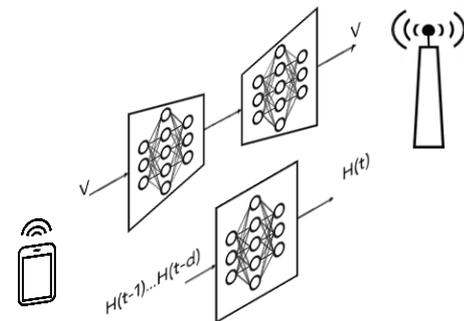
- Rel-18 studied/concluded AI/ML terminologies, model stages, and functional framework diagram
- Rel-18 studied model-ID-based LCM and functionality-based LCM
- Rel-18 categorized collaboration levels between UE and gNB, cases of model delivery/transfer, and types of model identification
- **Rel-19: to support basic AI/ML operations/procedures in NR**

● Potential objectives

- Detailed procedures/signaling for functionality-based LCM and model-ID-based LCM
 - Capability/applicability report for functionality identification
 - Model-ID-based procedures
- Data collection for model training and monitoring
 - Procedures and signaling for data transmission between UE and NW or OAM
- Test cases and performance requirements for selected (sub) use cases

● Background and motivation

- Rel-18 studied two sub use cases: CSI compression and CSI prediction
- Benefits from using AI/ML were evaluated
 - Performance gains over the legacy approach were observed
 - Model generalization/scalability: AI/ML gain can be observed among different scenarios/configurations, and under multi-vendor/quantization issues
- Studied model monitoring and following-up model operations
- **Rel-19: to specify AI/ML-based CSI reporting**

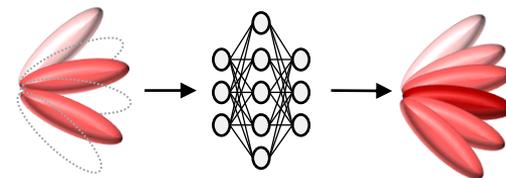


● Potential objectives

- Normative work for 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 AI/ML models
 - Monitoring and following-up mechanisms: switching/fallback between AI/ML and legacy CSI reporting
 - Data collection: RS configuration and CSI reporting enhancement

● Background and motivation

- 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
- **Rel-19: to specify AI/ML-based beam measurement and reporting**

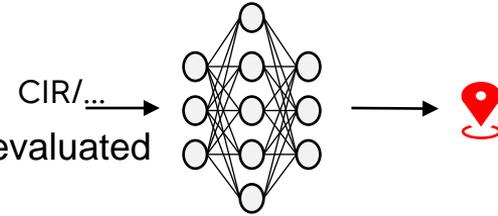


● Potential objectives

- 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
- UE capability report on AI/ML for BM

● Background and motivation

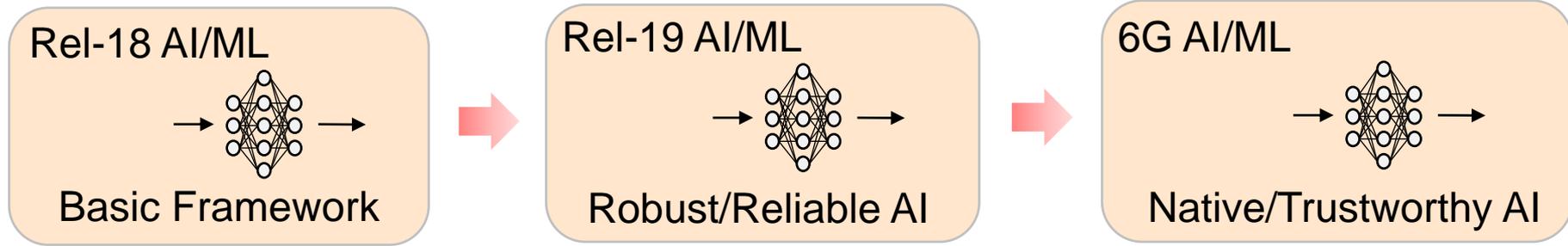
- Rel-18 studied direct AI/ML positioning and AI/ML assisted positioning
- AI/ML positioning accuracy improvements over non-AI methods have been evaluated
- Model monitoring labels/methods have been studied
- **Rel-19: to specify positioning enhancement via the studied AI/ML methods**



● Potential 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 side-link frameworks to deal with environment impairments and PRU issues

Rel-19 SI: To Pave the Road Towards 6G

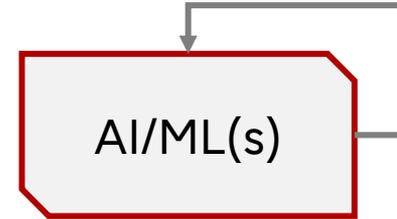


● Rel-19: Study AI/ML framework enhancement to pave the road towards 6G

- Study on new use case (low priority)
 - ❑ Only if new model type (other than one-sided/two-sided model) can be justified
 - ❑ Only if new AI/ML LCM procedure can be justified
- Study on robust and reliable AI/ML (high priority)
 - ❑ To support robust AI/ML functionality/model with wide applicability
 - ❑ To provide reliable AI/ML with guaranteed performance gain over non-AI/ML methods

- Objective-1: Study robust AI/ML

- Aiming to support AI/ML with wide applicability
 - Study enhanced data collection with the consideration of wide data coverage and non-ideal factors
 - Study unaware/fast model-switching for AI/ML enabled feature
 - Study the potentials of almost always-on model



- Objective-2: Study reliable AI/ML performance

- Aiming to support AI/ML with guaranteed performance gain
 - Study enhanced pre-activating prediction/post-activating monitoring on model performance
 - Study model-ID-based model performance sharing
 - Study online model assessment for untested models



- Objective-3: Study the following topics which are deferred in Rel-18 but with long-term significance
 - Online training/real-time training
 - Study the framework/requirements (e.g., dataset availability, real-time training/update operations) for the selected (sub) use cases
 - Study training entities, required procedure and signaling to enable online/real-time training and model update
 - Study testing methodology for online model
 - Model transfer/delivery between UE and NW
 - Study the cases deferred in Rel-18, e.g., z5
 - Study the transmission framework/containers with a given model size
 - Open AI framework (open format model, open dataset, etc.)
 - Study open format model and reference/open model
 - Study open dataset and field data sharing

