

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

Agenda Item: 5

Source: Xiaomi

Document for: Discussion



RWS-230131

Views on R19 AI/ML in air- interface

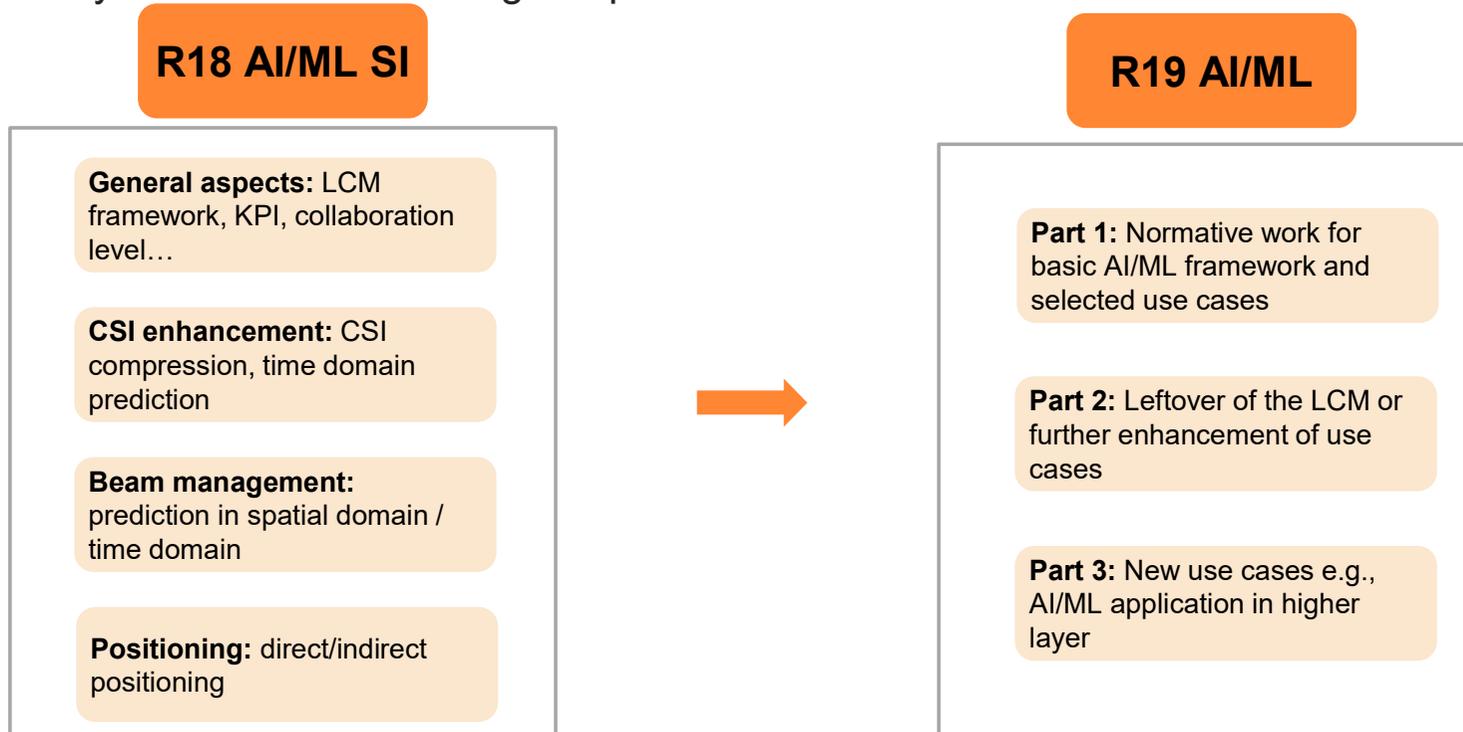
Main contents

- **General view**
- **Consideration on normative work**
- **Consideration on further study**
- **Conclusion**

General consideration for R19 AI/ML

■ General views for R19 AI/ML

- Standardize basic and solid AI/ML LCM framework with forward compatibility
- Standardize representative use case(s) with significant performance gain and acceptable complexity
- Further study and extend the foundation of the AI/ML LCM to support further evolution of 5G or future 6G
- Further study new use cases with great potential



Part 1: Normative work in R19– General aspects

■ Common work of the LCM

● Data collection

- Strive for common framework for the configuration/report of the collected data
- Potential impact on SA

● Model training/update

- Focus on offline training/update

● Functionality/model identification

- Support both functionality identification and model identification considering different application scenarios
- Strive for common procedure for the functionality/model identification
- Potential impact on SA

● Model/functionality activation/deactivation/switch/fallback

- Strive for common indication framework for both model-based LCM and functionality-based LCM

● Performance monitoring

- Support monitoring of the activated functionality/ model for the switch /fallback and the monitoring of inactive functionality/model for the activation
- Strive common performance monitoring mechanism for model monitoring and functionality monitoring

● Model delivery/transfer

- At least support model delivery/transfer from network to UE

Part 1: Normative work in R19 – Selection of (sub) use cases

- At least the following aspects should be taken into account for the selection of (sub) use cases in normative work
 - Performance gain
 - Not only intermediate KPI but also system performance
 - Cost / complexity
 - including model implementation and LCM procedure
 - Standardization impact
 - Use cases with less standardization impact tend to more easy in commercialization in the near future

	Performance	Complexity	Standardization impact
CSI compression	Limited gain in system performance (up to 10% gain in mean UPT for medium traffic load)	High (Difficulty in model training, two-sided model LCM)	High (Difficulty in two-sided model deployment and LCM)
CSI prediction in time domain	FFS on the comparison with time-domain prediction scheme in R18 MIMO	Low	Pending
Beam prediction in spatial domain	Significant RS overhead reduction with small prediction accuracy loss	Low	Small
Beam prediction in time domain	Little gain in short prediction window and relative large gain in long prediction window	Low	Small
Direct AI/ML positioning	Significant improvement in positioning accuracy (<1m @90%)	Medium (Difficulty in the data collection and performance monitoring)	Small
Indirect AI/ML positioning	Significant improvement in positioning accuracy (<1m @90%)	Medium (Difficulty in the data collection and performance monitoring)	Small

Part 1: Normative work in R19 – Selection of (sub) use cases

■ Views on the selection of (sub) use cases

- CSI enhancement
 - CSI compression
 - Representative two-sided structure VS Limited gain
 - Further enhancement to achieve higher gain can be considered
 - CSI prediction in time domain
 - Depends on the outcome of RAN#100 meeting
- AI-based beam management
 - Beam prediction in spatial domain
 - High priority for normative work
 - Beam prediction in time domain
 - Depends on the outcome of further study in R18 AI/ML study
- AI-based positioning enhancement
 - Direct AI-based positioning
 - High priority in normative work
 - Indirect AI-based positioning
 - High priority in normative work

Part 2: Leftover of R18 for R19 SI

- Leftover of general aspects in R18: The AI/ML framework should not only consider the near future in 5.5G but also need to extend and consolidate the foundation of the future generation e.g., 6G
 - Model training :
 - online training
 - Federated learning
 - ...
 - 3GPP-based model format
- Further enhancement/ extension of existing use cases
 - e.g., t-f-s CSI compression

Part 3: New use cases in high layer

- In Rel-18 AI/ML study, all use cases are physical layer use cases
- Further exploring AI/ML power in high layer application could further strengthen the confidence in the industry
- Mobility enhancement is one typical high layer scenario for the AI/ML utilization
 - More details can be found in our companion contribution [1]

Conclusion

■ For R19 AI/ML work in air-interface

- Normative work for the stable framework and mature use case(s) should be considered as first priority
- New SI to further explore new use case(s) should be considered
- Further study on the extension of R18 AI/ML framework and enhancement of existing use case(s) could be further considered if time allows

Reference

- [1] RWS-230101, AI/ML for higher layer use case, Xiaomi



Thank You