

3GPP TSG RAN Rel-19 Workshop
Taipei, June 15 – 16, 2023
Agenda Item: 4

RWS-230003

Views on 3GPP RAN Release 19

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3GPP RAN Release 19 Overview

- Duration of Release 19 is 18 months, starting with RAN1 in January 2024 and ASN.1 freeze in December 2025
- This is the second release for 5G Advanced and possibly last major release for 5G while its further evolution is still expected
- Focus should be to make 5G Advanced more useful and commercially attractive instead of as a test bed for 6G technologies
- A small number of major new/upgrading features with clear commercial targets are preferred over many continuing items

Potential R19 Items

**AI/ML for air
interface
SI/WI**

**Ambient IoT:
SI and WI**

**Fast Beam
Management**

**MIMO /
Capacity
Enhancement**

**XR: Service
Evolution and
Support**

LP-WUS WI

**Network
Energy
Saving Vol.2**

**Sidelink
Further
Evolution**

**Evolution of
Duplex
Operation WI**

Sensing ?

AI/ML for Air Interface for Release 19 (Details see RWS-230004)

- A small number of Use cases to be selected for R19 work
 - From 6 sub use cases of the 3 R18 SI use cases (CSI, BM, POS)
- Performance benefits need to be significant to justify the efforts
 - For example, in CSI reporting use case, CSI codebook/look-up-table generated via AI/ML autoencoder model and vector quantization can **reduce the feedback overhead by 80-90% from that of Type-II codebook without performance loss**
- Standards impacts considerations
 - Option 1: only support the selected use case(s)
 - Option 2: support the selected use case(s) with (limited) consideration on extendibility to other use cases in future release(s)
 - Option 3: design framework that can support lots of potential use cases with the selected use case(s) as the first few in R19

Option 2 is preferred considering the workload and the upcoming 6G work
- In R19, SI first followed by WI

Ambient IoT SI/WI Scope Discussion (Details see RWS-230005)

- In R19, SI first followed by WI
- To have a focused scope for early to market time, study and support
 - Device type A (and B) or Device type C: backscattering versus active RF
 - Coverage (of system) and range (of link): design target with good tradeoff between performance, device complexity/power-consumption, and standardization efforts
 - Prioritize Topology 1 (BS ↔ Ambient IoT device) with licensed (or dedicated) spectrum
- Protocol and procedure design:
 - Much simplified protocol stacks and access procedures from that of NR
 - Reuse/upgrade of existing network cell sites/infrastructure if possible

Antenna Architecture / Procedure for Fast BM (Details see RWS-230006)

- Better utilization of spectrum with higher frequency is critical, including FR2 and high-middle band.
 - Hybrid beamforming with small number of digital chains and corresponding BM procedure (beam sweeping and reporting) is slow with high overhead and results in frequent beam failure events.
 - Enhancements in R17/18 on beam indication does not solve fundamental issue. What AI/ML-based algorithm can do is also limited.
- A new antenna architecture with two parts is proposed to take advantage of analog/hybrid antenna architecture and the all-digital antenna architecture for very fast BM:
 - A low-resolution digital array (only) for the receiver **adds to** an analog/hybrid array with a small number of high-resolution digital chains for both transmitter and receiver. The two can share antenna panels
 - Beam acquisition is performed using the low-resolution digital array by receiving signal and deriving the best beam(s) at baseband **without** beam sweeping
 - Acquired beam(s) are then applied for data/control channel reception and transmission (using analog/hybrid array) assuming beam correspondence
- Very fast beam acquisition and recovery can be achieved

MIMO Evolution for Capacity Enhancement (Details see RWS-230006)

- **Motivation: spectrum efficiency / capacity further improvement**
 - Areas demand higher efficiency / capacity: XR, URLLC, cell-edge, etc.
 - MIMO enhancements for everything beyond eMBB/data channel
- **Cooperative MIMO w/ non-ideal backhaul**
 - Cooperative MIMO for TDD with downlink inter/intra-cell interference avoidance via SRS utilizing DL/UL reciprocity
 - Distributed operation across gNBs/TRPs without channel and scheduling information exchange, well suit for non-ideal backhaul
 - Substantial capacity gain (up to over 50%) observed for XR and FTP traffics
- **MIMO Transmission Schemes for URLLC, XR, etc.**
 - New transmission schemes to fully utilize the many Degrees of Freedom (DoFs) offered by MIMO channel for URLLC and XR traffics
 - Tradeoff between capacity and reliability (via. multiplexing and diversity)
 - Substantial improvement of achievable data-rate with high reliability

XR: Service Evolution and Support (Details see RWS-230007)

- Enhancing Rel-18 XR with features deferred from Rel-18
 - PDCP enhancements
 - Selective PDCP duplication/split bearers based on PDU Set Info to improve QoS.
 - Enhanced handling of PDU Set based discarding at PDCP/RLC.
 - MAC enhancements
 - e.g., enhancements on LCP, BSR, CG, if any.
 - Relay/SL enhancements for improving the tethering link for XR.
 - Support of XR UEs with 2Rx antennas if deemed necessary per plenary conclusion.
- Enhancing R18 XR with new features and new capabilities to support advanced use cases
 - Coordinated Layer 2 handling of multi-modal flows (intra-UE or inter-UE)
 - Support of XR services with mobility, e.g., up to 120-350 kmph.

Quick Views on Several Items

LP-WUS WI: based on R18 SI conclusions and targeting significant power saving for devices

Network Energy Saving WI: further enhancements based on R18 SI recommendations especially on T/F domain schemes

Sidelink further evolution WI: following R18 WI and extend to support of FR2 and CA depending on R18 progresses

Duplex evolution WI: based on R18 SI conclusions and targeting commercially useful scenarios and schemes

Integrated Sensing and Communication: it is pre-mature for RAN1/PHY study/work

Thank You.

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