

3GPP TSG RAN Rel-19 workshop RWS-230233
Taipei, June 15 - 16, 2023

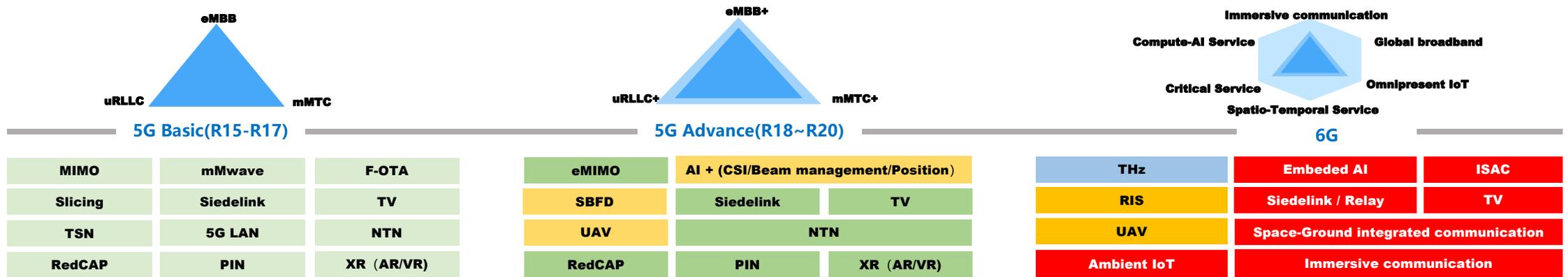
Views on Rel19 SI&WIs in RAN for NR

TCL Communication



Overview on Rel 19 SI/WIs in RAN for NR

- **Consideration #1:** besides the maximum(bit/Hz/J) designing until now, high-value service orientation should be considered for futures, bring the marketing benefit from the wireless standard both for operator, 2B, 2C or 2G.
- **Consideration #2:** Release 19 could be the pre-standard for 6G, new business use case would be considered.



For user

More XR-like service with enha.:

- Higher THP for uplink transmission
- Multi-Modal for more use cases supported, XR/Cloud Game/Digital twin/Digital person etc.

Digital TV with wider coverage:

- Convergence 5G with various digital TV protocols, ATSC/DVB etc.
- NTN for digital TV, for emergency service/sea or rural coverage etc.

For Operator

Reasonable investigation on network:

- AI for network management, including RAN, core network and operation.
- Indoor base station as the same ability as gNB but limited investigation.

More efficiency on spectrum:

- SBFD and Full-duplex both for gNB and UE side communication
- Unified designing for DC and CA, to make the spectrum more efficiency

For 2B/2G business user

E2E Deterministic network

Anywhere access with NTN

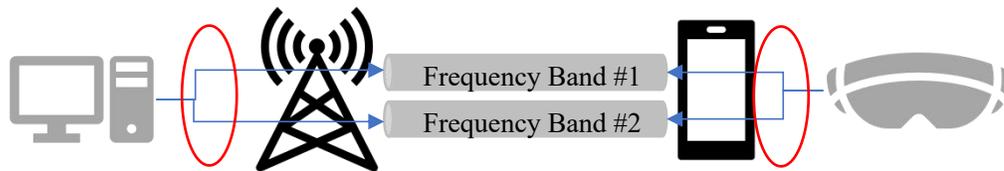
Ambient IoT for zero-power device New

Integrated sensing and communication New

Until Rel 18, 5G had support XR service with the basic capability, the new requirement from SA (such as multi-modal XR), and also for more XR-like services supported (including XR/Cloud Game/Digital twin/Digital person etc), new features would be considered on Release-19.

Higher THP for XR uplink transmission

- ① Data synchronization between different link with enhanced PDCP and MAC layer processing
- ② Xn interface enhancement for the delivery of XR-specific PDU Set related information
- ③ CG configuration on multiple carrier to support much higher uplink transmission

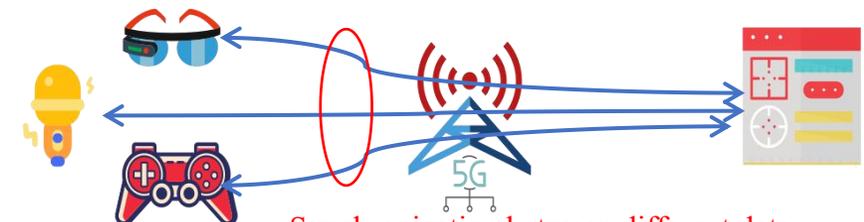


Downlink XR data splitting on RAN with DC or MTRP or CA-like methodology

Uplink XR data splitting on RAN with DC or MTRP or CA-like methodology

Multi-Modal for more use cases supported

- ① multiple data flow synchronization, including multiple flow in PDU, multiple flows in several PDUs, or across UEs,
 - ① synchronization awareness in 5G RAN
 - ② synchronization scheduling in Uu for UL/DL
- ② Support for RT Latency, also including the UL or DL-only latency limitation

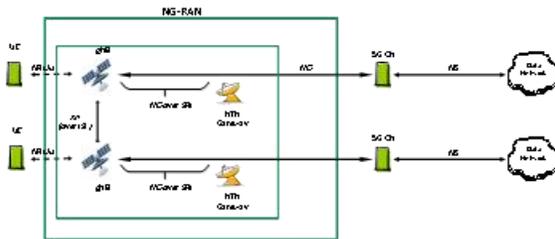


Synchronization between different data flow (intra/inter-PDU, multiple UEs)

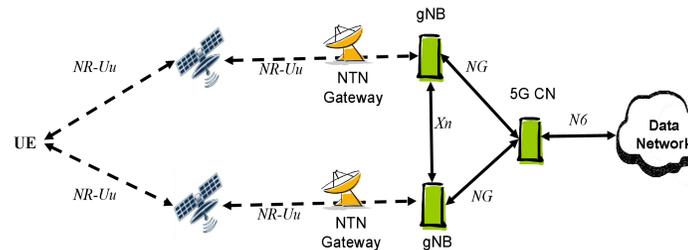
Up to Rel18, NTN only focused on the basic function for TP payload, in Rel19 NTN will be extended to the regenerative payload case and other cases identified in TR 38.821; Also, there would be have some new use case need to be supported by NTN, such as digital broadcasting service (TVs).

NTN standard evolution with more terminals supported

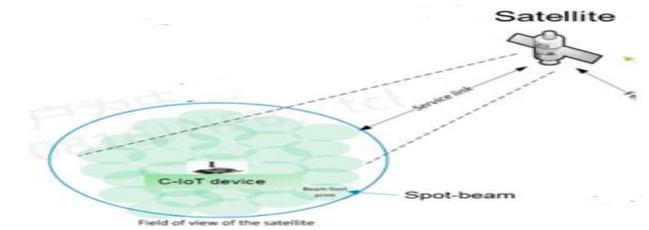
regenerative payload and ISL



MC for TP NTN-based NG-RAN

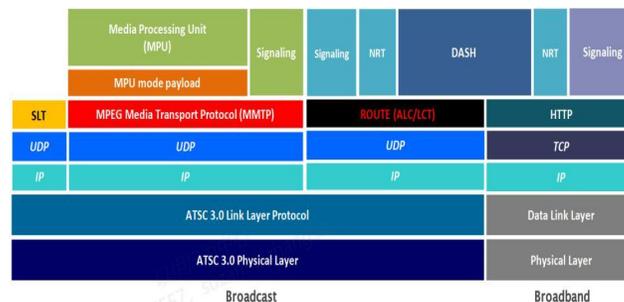


RedCap IoT-NTN for TP

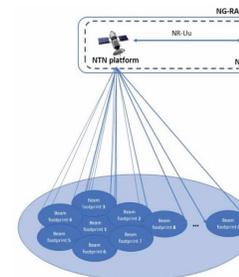


NTN with digital TV service

Multiple DTV protocols supported with 5G



NTN with digital TV services

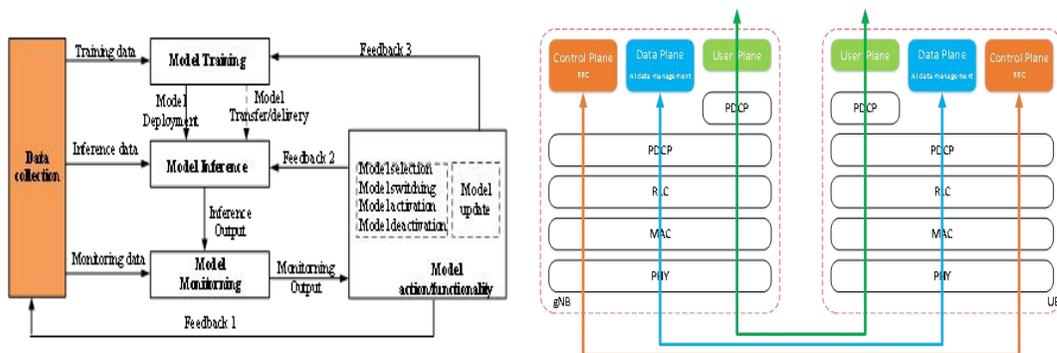


- ① Single frequency with multiple beam transmission(SF-MBT)
- ② Location verification for area-based content deliverable

In Rel 18, various AI-based functionalities or topics had been discussed, including the LCM framework/CSI/beam management / positioning/RRM/MDT, also including the NWADF. In Rel19 common normalized wireless AI architecture would be determined, also some new cases(multi-models etc.) will be investigated in RAN1 and RAN2.

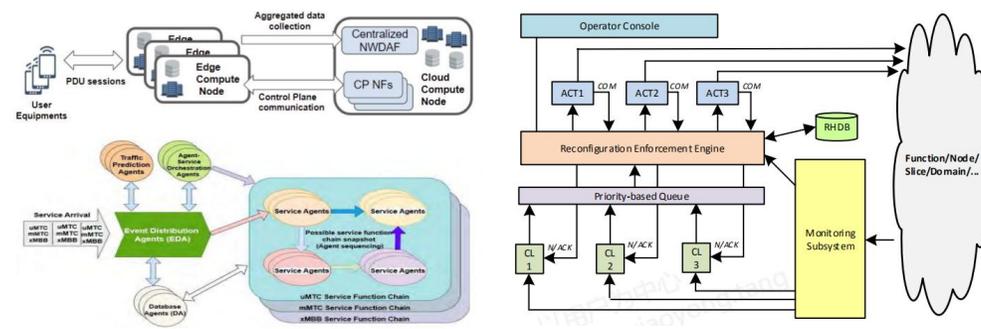
Normalized wireless AI architecture

- ① Another plane (different from legacy CP and UP) would be introduced for AI-dedicated operations, including data management, model management, service opening etc.
- ② The AI wireless architecture should support various hardware ability in gNB and UE-side, also UE-Mesh should be supported.



Multi-AI models cooperation

- ① Distributed learning scheme and control traffic exchanges to enable such feature at low-complexity/energy cost
- ② Coordination and governance of multiple, AI-driven control loops, also including the multi-agent system in the continuum orchestration



Aim to deterministic network access and feasibility on 2B2G business use case, many topic had been researched until Rel-18, including uRLLC/TSN etc. In Release-19, more reasonable network investigation, higher spectrum utilization would be considered, promoting the E2E DNA can be widely used by industry.

Intelligence MIMO with low complexity

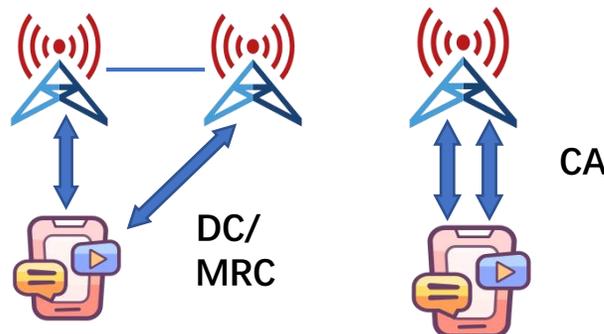
- ① Few bits AD/DA with larger-scale indoor antenna system.
- ② CSI enhancement for fast&high-THP uRLLC transmission.
- ③ Zero-handover among different bands (FR1, FR2 etc)

Higher spectrum utilization

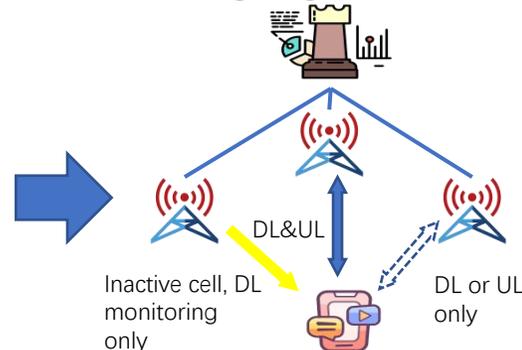
- ① SBFD both supporting for gNB and UE-side
- ② AI-based for reducing PA-induced out-of-band emissions by the Tx-side CNN jointly with an ML-based receiver

New framework would be considered for future spectrum utilization

Current designing for DC and CA



Unified designing cross bands



- ① A new MC solution combining the best from CA and DC to provide both extreme reliability and excellent flexibility
- ② Decouple DL and UL (e.g., two DL connections and one UL connection)
- ③ Inherent use of in-active connections

CA enhancement: Based on the enhancement in previous version, some new usecase, such as FR1+FR2, SBFD+CA, and some scheduling limitation, such as the same SCS, the total number of CCs and the number of PxSCH per CC would be investigated for further enhancement

CE: Based on the enhancement in previous version, different Tx beams for multiple PRACH transmission and DMRS bundling with multiple TBs for high date rate uplink transmission are an important requirement and would be investigated for further enhancement.

CA enhancement

The diagram illustrates CA enhancement with two UE devices. Each UE is connected to two carriers: CC1 and CC2. For each carrier, there are two subframes labeled 'D' (Downlink) and 'U' (Uplink). The subframes are arranged in a grid, showing the scheduling of multiple carriers and subframes.

- ① SBFD operation across carries within intra-band CA (e.g. FR2)
- ② Multiple carriers with same or different SCS scheduled by a single DCI
- ③ Multi-PxSCHs across multiple carriers scheduled simultaneously by a single DCI
- ④ CBG-based scheduling and corresponding HARQ-ACK codebook enhancement for Multiple carriers
- ⑤ Decreasing the DCI overhead for multiple carriers scheduling
- ⑥ Multiple carriers operation for idle/inactive mode, e.g. initial access

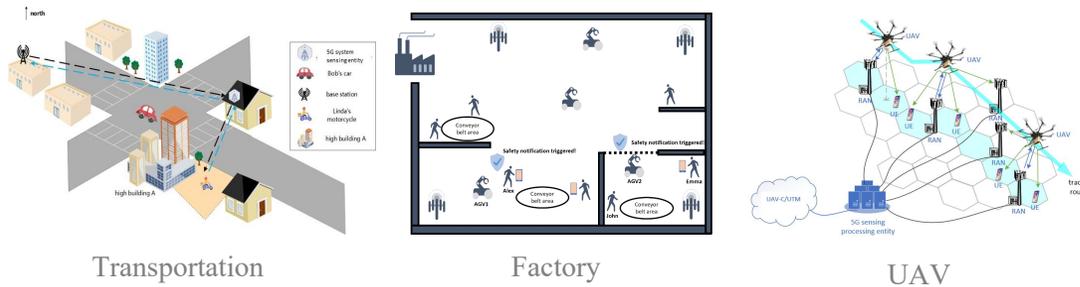
Coverage enhancement

The diagram illustrates coverage enhancement. A gNB (base station) is shown on the left, and a UE (user equipment) is shown on the right. Four beams (Beam1, Beam2, Beam3, Beam4) are shown originating from the gNB and pointing towards the UE. Beam1 is green, Beam2 is yellow, Beam3 is blue, and Beam4 is grey. This represents multiple PRACH transmission with different Tx beams.

- ① Multiple PRACH transmission with different Tx beams
- ② Extending the DMRS bundling into multiple TBs
- ③ Coverage enhancement for high date rate, e.g. combination with SBFD and CA

In SA1, ISAC and Ambient IoT WI will be finished for Rel19, more than 20 cases have been identified for each WI. In RAN, two SIs for the prioritized use case identification, feasibility, evaluation will be needed.

Integrated sensing and communication



Transportation

Factory

UAV

- ① Identify prioritized use case, study feasibility and evaluation
- ② Potential standardization direction for ISAC
 - Frame structure designing to for ISAC, CP-based or dedicated OFDM symbols and SCs, also Multiple-TRP sensing cooperation supported.
 - CSI measurement enhancement, doppler/phase etc.
 - Data transmission with sensing assistant, etc. low-overhead beam management, loading balance etc.

Ambient IoT

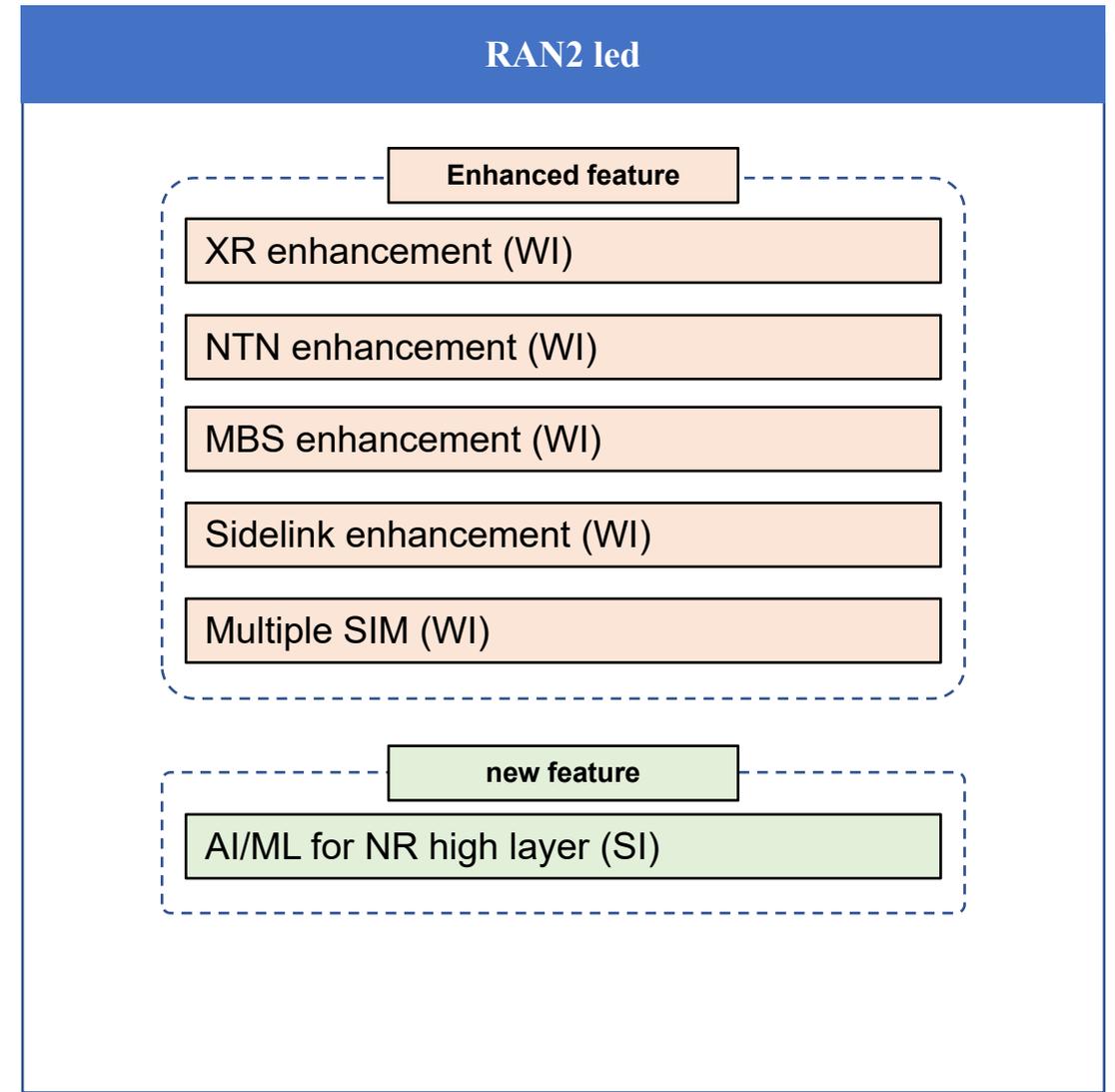
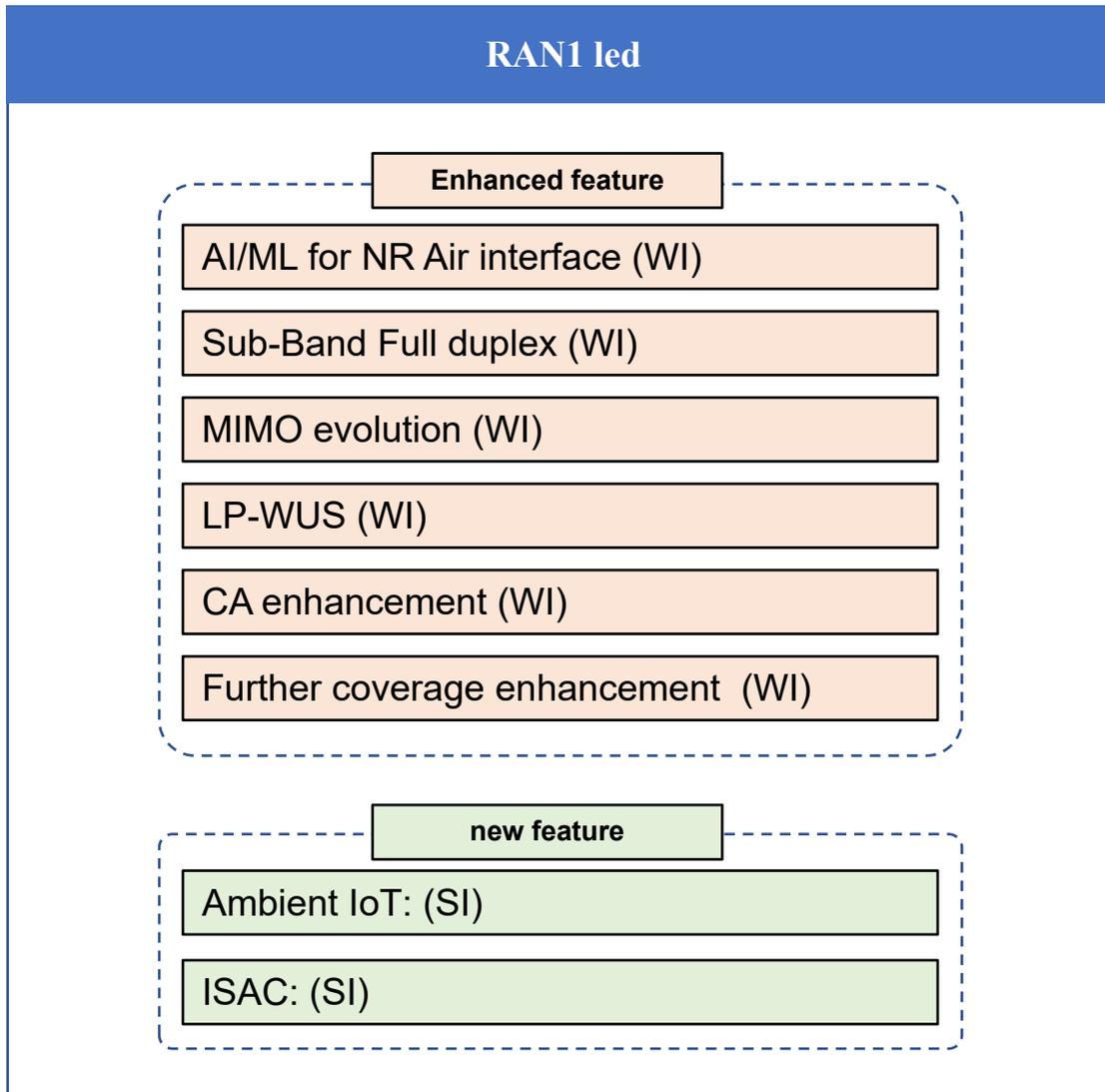


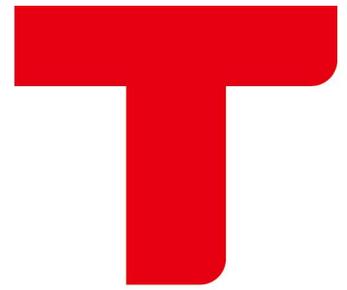
warehousing and supply chain

Forest and agriculture

- ① Identify prioritized use case, study feasibility and evaluation
- ② Potential standardization direction for Ambient IoT
 - Signaling designing to support scatter communication, including modulation (SSK), or CP-based.
 - CG configuration for uplink transmission with stimulus signal association.
 - Resource multiplexing between ambient IoT and legacy UE, especially for uRLLC transmission.

Summary on proposed SI/WIs in RAN for NR





THANK YOU