



3GPP TSG RAN

Current Status and Future Aspects

Wanshi Chen (Chairman of 3GPP RAN, Qualcomm)

Hiroki Takeda (KDDI)

Outline



- 📶 Short Bio of Wanshi Chen
- 📶 3GPP RAN Rel-17 Status
- 📶 3GPP RAN meeting planning
- 📶 3GPP RAN Rel-18 update

Wanshi Chen's Short Bio



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San Diego, CA, USA

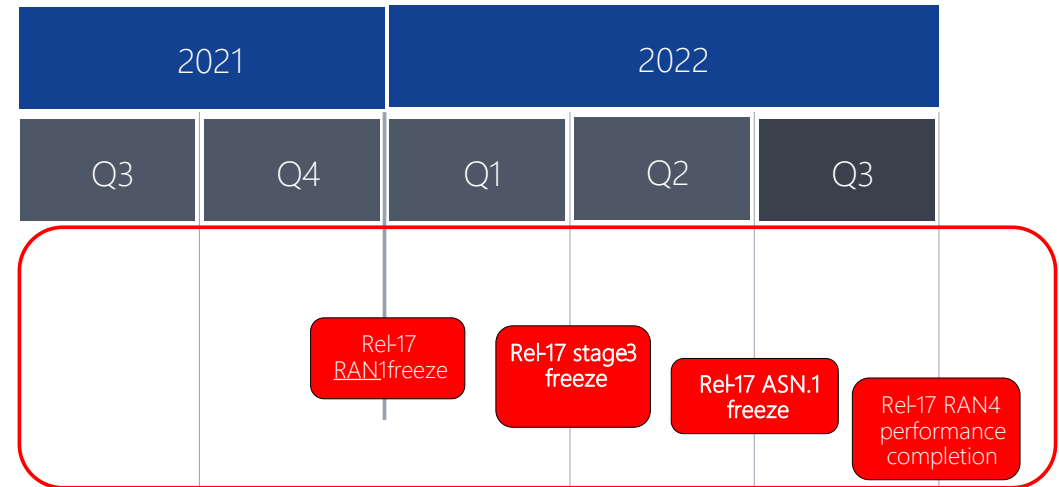
- 📶 Wanshi Chen is currently 3GPP TSG RAN Plenary Chair appointed in April 2021
 - He was TSG RAN1 Chair from August 2017 to May 2021, and TSG RAN1 Vice Chair from August 2013 to August 17
- 📶 Wanshi Chen has over 20 years of experience in telecommunications in leading telecom companies.
- 📶 The highest degree that Wanshi Chen holds is a Ph.D. degree in Electrical Engineering from the University of Southern California, Los Angeles, CA, USA
- 📶 An avid Marathon runner, with a personal best time of 2hrs 54mins

3GPP RAN Rel-17 Status



Key Timelines for 3GPP RAN Rel-17

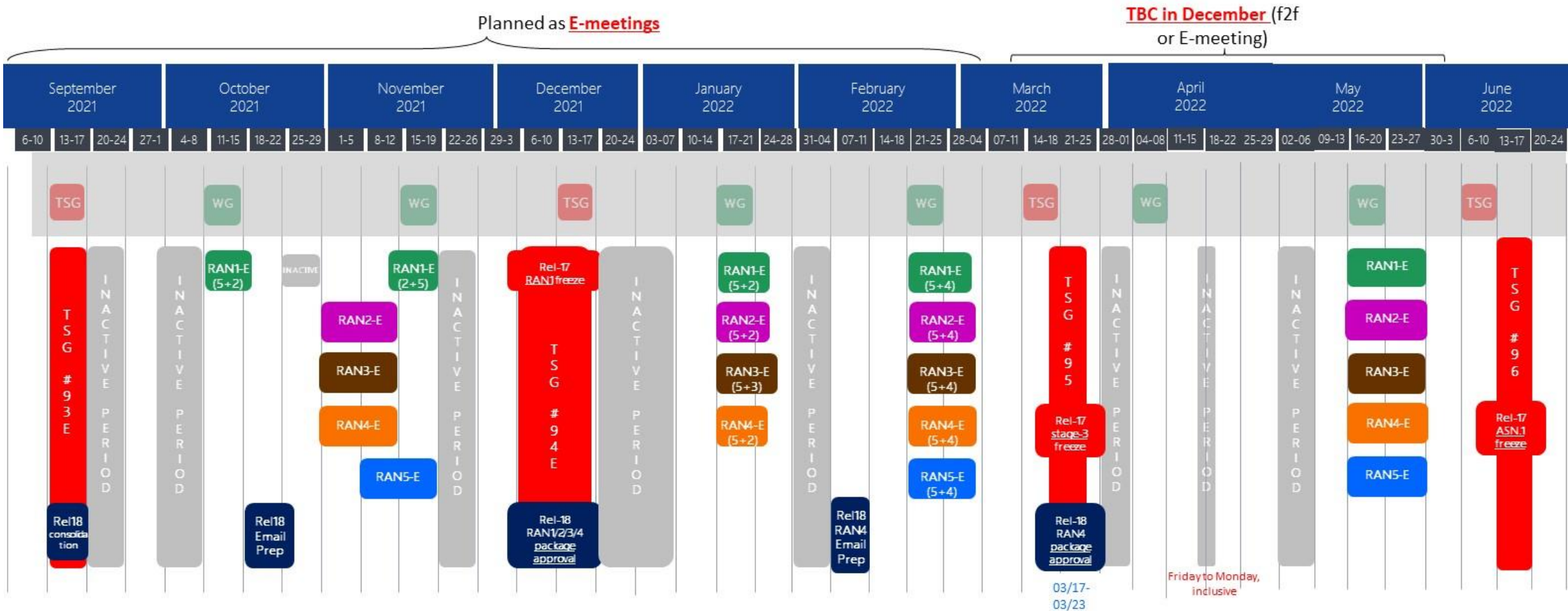
- Rel-17 RAN1 freeze: December'2021
- Rel-17 stage 3 freeze: March'2022
- Rel-17 ASN.1 freeze: June'2022
- Rel-17 RAN performance completion: September'2022



Careful planning and management are crucial in handling the challenges in completing Rel-17 in time

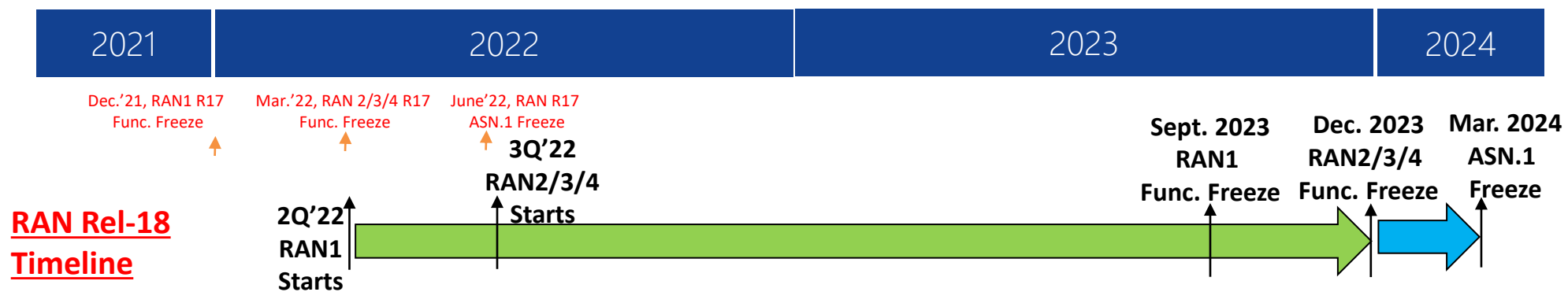
- Challenges primarily due to cancellations of physical meetings in the entire 2021 for all RAN WGs
- Important to carefully monitor Rel-17 progress and take actions when necessary

3GPP RAN Meeting Plan and Rel-18 Planning (as endorsed in [RP-212587](#))



3GPP RAN Rel-18 Timeline

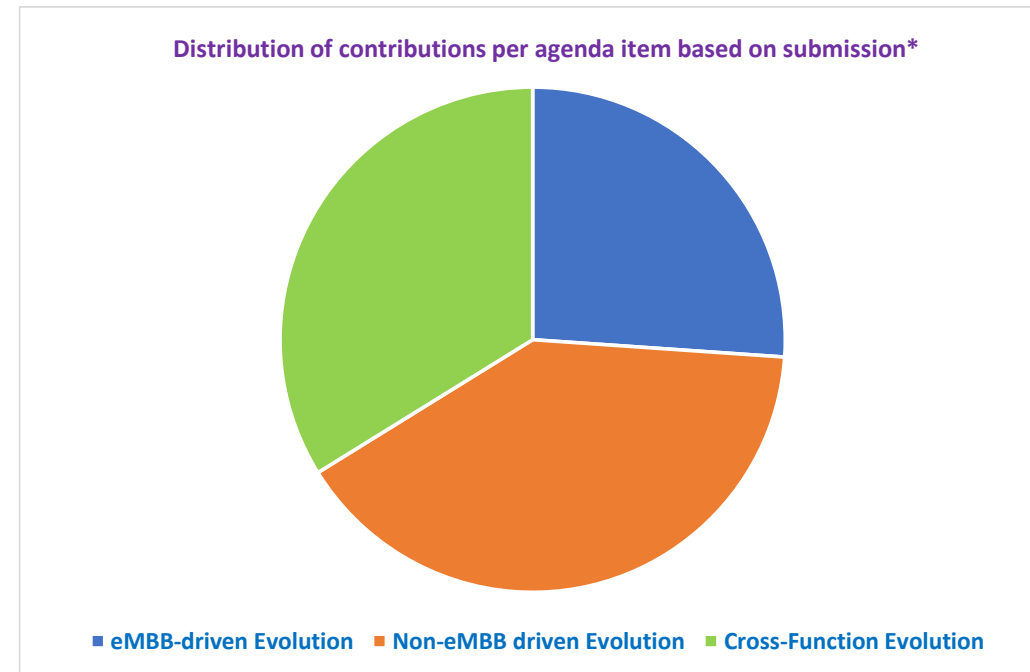
- 📶 RAN Rel-18 release duration is decided to be **18 months**
- 📶 Rel-18 starts in 2Q'22 for RAN1 and in 3Q'22 for RAN2/3/4
 - This is, RAN1 functional freeze is September'2023, RAN2/3/4 functional freeze is December'2023, while ASN.1 freeze is March'2024.



3GPP RAN Rel-18 Workshop



- 📶 Dates: **June 28th – July 2nd**
- 📶 A first discussion in 3GPP RAN on **5G-Advanced**
 - Starting from Rel-18. Official logo is shown on the right
 - 500+ submissions from ~80 different companies/organizations
 - 1200+ checked-in participants
- 📶 A generally **balanced evolution** is observed from the submissions to RAN Rel-18 workshop, and is intended to be reflected in the proposed set of topics for subsequent email discussion and in the final Rel-18 package, in terms of:
 - Balanced mobile broadband evolution vs. further vertical domain expansion,
 - Balanced immediate vs. longer term commercial needs, and,
 - Balanced device evolution vs. network evolution.



Note: the categorization of the topics (eMBB/non-eMBB/crossFunc) is a first-order approximation, and not be pursued further after the workshop

3GPP RAN Rel-18 Potential Projects (RP-212608)



Potential RAN1-led	Potential RAN2-led	Additional Projects for Considerations
MIMO Evolution for Downlink and Uplink	Mobility Enhancements	Low power wake-up receiver / wake-up signal (WUR/WUS) (as part of RedCap)
UL Enhancements (e.g. coverage enhancements; excluding MIMO)	Enhancements for XR	RAN4-led discussion: bandwidths lower than 5 MHz in dedicated spectrum and DSS
Additional topological improvements – smart repeater	Sidelink Relay Enhancements	Inter-gNB coordination
Sidelink enhancements (excluding positioning and relaying)	NTN (Non-Terrestrial Networks) evolution	UE aggregation
RedCap Evolution	Evolution for broadcast and multicast services	High-speed Packetization
Expanded and improved Positioning	UAV (Uncrewed Aerial Vehicle)	SDT (small data transmission)
Evolution of Duplex Operation	Multiple SIM (MUSIM) Enhancements	CA (Carrier Aggregation)/DC (Dual-Connectivity) enhancements (excluding mobility aspects)
AI (Artificial Intelligence)/ML (Machine Learning) for Air interface	In-Device Co-existence (IDC) Enhancements	
Network energy savings		
	Potential RAN3-led	
	Additional topological improvements – IAB/VMR	
	AI/ML for NG-RAN	
	SON/MDT Enhancements	
	QoE Enhancements	

Outline



- 📶 Short Bio of Hiroki Takeda
- 📶 Rel-17 Redcap (Reduced capability)
- 📶 Rel-17 RAN slicing
- 📶 Rel-18 Evolution of duplex
- 📶 Rel-18 AI/ML
- 📶 Conclusions

Hiroki Takeda's Short Bio



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- 📶 3GPP RAN KDDI delegate
 - RAN Plenary
 - RAN WG2/WG3
- 📶 Over 20 years of experience in telecom industry
 - 1999 - 2013 : UE software development
 - 2013 - ongoing : 3GPP RAN standardization
- 📶 Not a Marathon runner, just looking other people running 😊

Rel-17 Redcap (Reduced capability)

Motivation (Use cases)

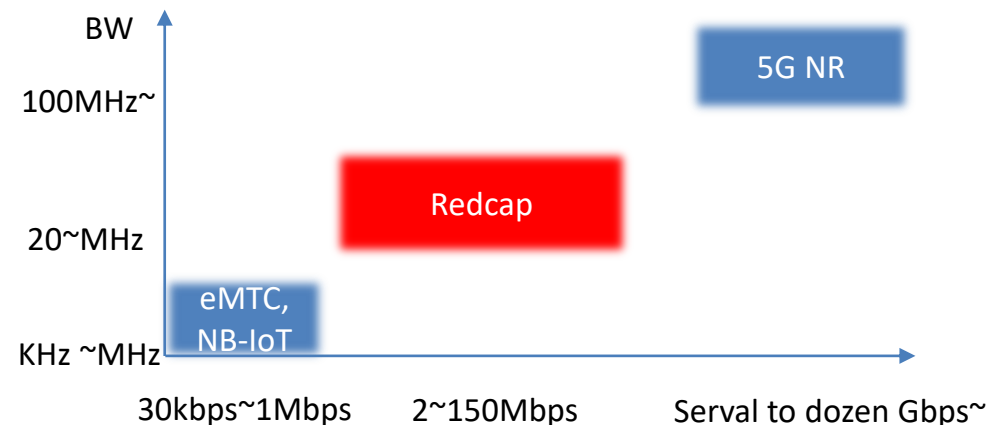
- Wearables
- Industrial wireless sensors
- Video surveillance
- Target data rate 2~150Mbps to accommodate above use cases

Reduced device capabilities

- Bandwidth reduction
- Reducing the max number of MIMO layers
- Relaxation of the max downlink modulation order
- Half-duplex (HD) operations in FDD(only FR1)

Total cost reduction

- FR1 FDD ~67%, TDD ~61%@2Rx, ~72%@1Rx
- FR2 ~53%



Technology	Category	BW	DL peak	UL peak
NB-IoT	Cat-NB1	200KHz	62.5kbps	25.3kbps
LTE-M	Cat-M1	1.4MHz	0.8Mbps	1Mbps
NR	NSA	>100MHz	4-10Gbps	4-10Gbps
Redcap	-	20MHz	2-150Mbps	2-50Mbps

Rel-17 RAN slicing

📶 Motivation

- Fast access to intended Slices
- Slice service continuity for UE mobility

📶 Cell reselection

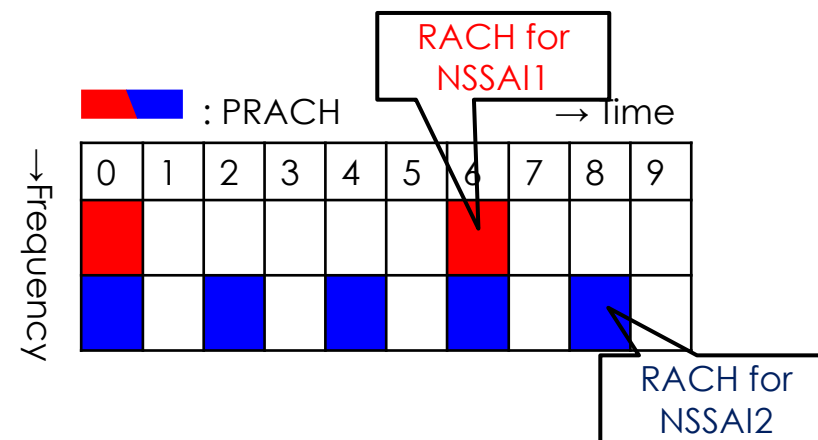
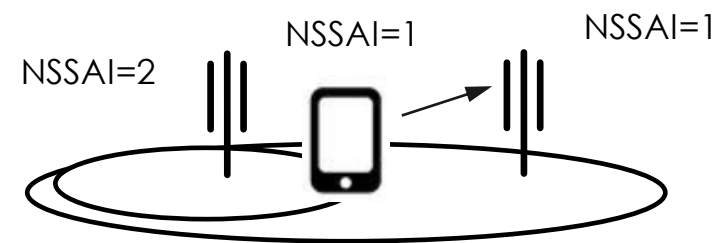
- Fast UE access to the cell supporting the intended slice
- Slice related information for cell selection is provided by both broadcast and dedicated signaling

📶 RACH partitioning

- Access resource isolation, providing guaranteed RA resources for their sensitive slices

📶 Support service continuity

- Solutions for the scenarios caused by slice resource shortage/overload
- Candidate solutions are Configuration Based Solution, Slice resource re-partitioning, Multi-carrier radio resource sharing



Rel-18 Evolution of duplex

Motivation

- Increase UL resources for TDD to reduce latency
- Full duplex enhances system capacity

UL/DL Subband

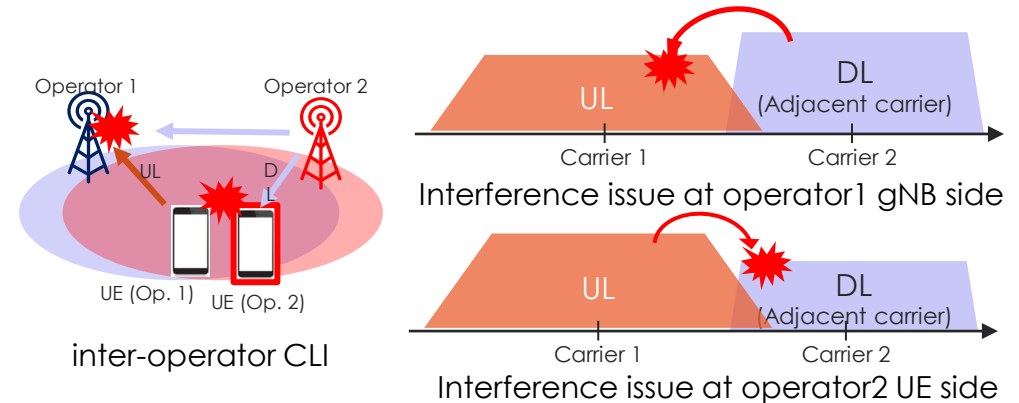
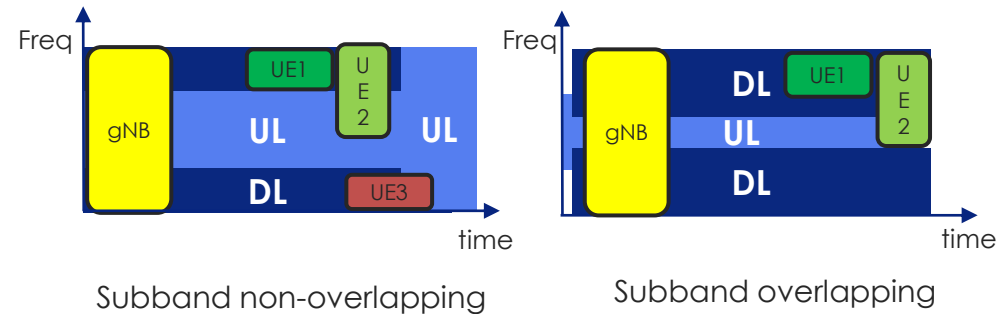
- Subband Non-overlapping
- Subband overlapping
- Full overlapping

Duplex mode

- TDD (and FDD?)
- Enhancement at gNB and/or UE

Interference Management

- inter-gNB and inter-UE CLI* (RAN1)
- self-interference and the inter-operator CLI (RAN4)
- co-existence with the legacy operation (RAN1/4)



* CLI : Cross Link Interference

Rel-18 AI/ML

Motivation

- Optimizations and system improvements
- Not fully implementation-specific, need some coordination among NW nodes, between UE and NW

Physical Layer

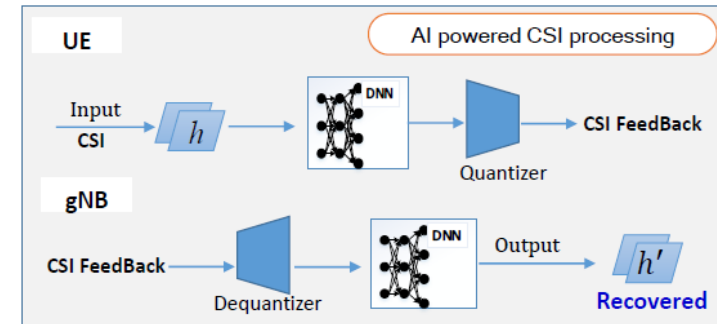
- CSI*1 feedback compression (lower overhead)
- Beam management (beam selection, beam recovery...)
- RS*2 overhead reduction (channel estimation)

Higher Layer(Continuation from Rel-17 Study item)

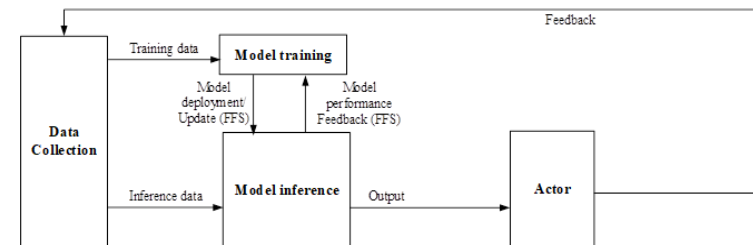
- Use case : Energy saving, Load balancing, Mobility optimization
- Procedure for training, learning, inference
- Configuration, Data management

*1 CSI : Channel State Information

*2 RS : Reference Signal



Example in CSI feedback (excerpt from RWS-210185 Samsung)



AI/ML frame work

(excerpt from 37.817 Study on enhancement for Data Collection for NR and EN-DC)

Conclusions

- 📶 Release 17 and 18 is the next step expansion from the current 5G
 - Balanced features addressing the needs from mobile industries and verticals
 - Adaptation of 3GPP techniques to other verticals, industrial, V2X, NTN
 - Covering various enhancements relevant to mobility, capacity, latency, network deployment, power saving, device costs
- 📶 Release 17 and 18 is the prologue for 6G
 - 3GPP discussion on new study areas has started in advance
 - Examples are evolution on duplex operation, AI/ML, RAN slicing
 - Further enhancements contribute to integrate cyberspace and physical space