

RP-192787

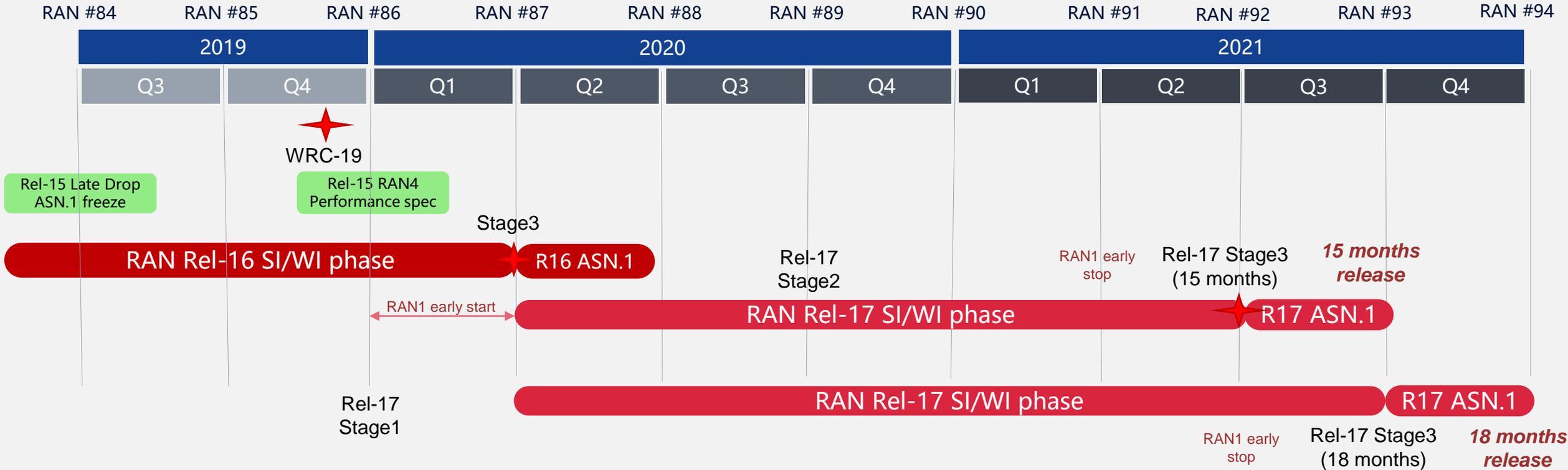
3GPP TSG RAN Meeting #86
Sitges, Spain, December 9th – 12th, 2019

Views on Rel-17 package

Huawei, HiSilicon



3GPP Rel-17 Timeline



18-month release is preferable

If capacity is planned based on 15 months, it should be from 2020/Q2 to 2021/Q3 for RAN1 (shifted one for RAN2/RAN3)

Available Capacity in WGs

	NR (R16)	LTE (R16)	Total (R16)	RAN#71 (2016.3) (pre-5G capacity)	R17 expectation? (from WG chairs)
RAN1	21 + 2 maint	10 + 2 maint	31 + 4 reserved	33 + 5 maint (26L+12U)	27? (meaning -4*7=-28 reduction by one full meeting within 15 months)
RAN2	18 + 4 maint + 1 TEI	10 + 4 maint + 1 TEI	28 + 10 reserved	22 + 9 maint (18L+13U)	Slight increase in capacity (+2 TU) with up to 3 parallel NR sessions
RAN3	7	12	19	12 + 7 maint	19 (remain with one session)
RAN4 RF	24	3	27 (incl Perf)	12 (core) + ~5 (perf) = 17	Expect same capacity
RAN4 RD	15	3	18 (incl Perf)	12 (core) + ~12 (perf) = 24	Expect same capacity

Reducing the capacity would clearly not match the demands expressed for the content of Rel-17

Possible Rel-17 Package (RAN1/2/3)

2019		2020				2021				TU per quarter at full speed				2020 TU												2021 H1 TU																																																		
Q4		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	R1 R2 R3 R4				Q1			Q2 (2x)			Q3			Q4 (2x)			Q1			Q2 (2x)																																															
Rel-16 RAN1 freeze		Rel-16 freeze		Rel-16 ASN.1		Rel-17 RAN1 freeze		Rel-17 freeze						R1 R2 R3 R4			R1 R2 R3			R1 R2 R3			R1 R2 R3			R1 R2 R3			R1 R2 R3																																															
		NR MIMO (R1)								4.0				2.0			8.0			4.0			8.0			4.0																																																		
		SI on NR coverage enh. (R1)		NR coverage (R1)								3.0 0.5 0.5				1.5			6.0			3.0			6.0 1.0 1.0			3.0 0.5 0.5			1.0 1.0																																													
		NR sidelink (R1)								3.0 1.0 0.5				1.5			6.0 1.0 1.0			3.0 1.0 0.5			6.0 2.0 1.0			3.0 1.0 0.5			2.0 1.0																																															
		NR URLLC/IIoT (R1)								2.0 2.0				1.0			4.0 2.0			2.0 2.0			4.0 4.0			2.0 2.0			4.0																																															
		NR positioning (R1)								2.0 1.0 1.0				1.0			4.0 1.0 2.0			2.0 1.0 1.0			4.0 2.0 2.0			2.0 1.0 1.0			2.0 2.0																																															
		NB-IoT & LTE-MTC (R1)								3.0 3.0 0.5				2.0			6.0 3.0 1.0			3.0 3.0 0.5			6.0 6.0 1.0			3.0 3.0 0.5			6.0 1.0																																															
		NR CA with DSS (R1)								1.0 0.5				1.0			2.0 0.5			1.0 0.5			2.0 1.0			1.0 0.5			1.0																																															
		SI on NR Light (R1)		NR Light (R1)								1.0 1.0 0.5							2.0 1.0 1.0			1.0 1.0 0.5			2.0 2.0 1.0			1.0 1.0 0.5			2.0 1.0																																													
slow RAN1 start		SI on XR traffic modelling (R1)								0.5							1.0			0.5			1.0																																																					
		SI on waveform for NR above 52.6 GHz (R1, R4)								2.0							4.0			2.0			4.0			2.0																																																		
		NR NTN (R2)								0.5 2.0 0.1							1.0 2.0 0.2			1.0 2.0 0.1			3.0 4.0 0.2			1.5 2.0 0.1			4.0 0.2																																															
		SI on NR Layer-2 sidelink relay (R2)		NR L2 sidelink relay (R2)								0.5 2.5 1.0							0.5 2.5 2.0			1.0 2.5 1.0			1.5 5.0 2.0			1.0 2.5 1.0			5.0 2.0																																													
		NR small data (R2)								1.0 1.5							2.0 1.5			1.0 1.5			2.0 3.0			1.0 1.5			3.0																																															
		NR UE power savings (R2)								1.0 1.0							2.0 1.0			1.0 1.0			2.0 2.0			1.0 1.0			2.0																																															
		NR multicast/broadcast (R2)								0.5 2.0 1.0							1.0 2.0 2.0			0.5 2.0 1.0			1.0 4.0 2.0			0.5 2.0 1.0			4.0 2.0																																															
		MR-DC (R2)								1.5 1.0							1.5 2.0			1.5 1.0			3.0 2.0			1.5 1.0			3.0 2.0																																															
		NR QoE (R2)								1.0 1.0							1.0 2.0			1.0 1.0			2.0 2.0			1.0 1.0			2.0 2.0																																															
		NR IAB (R2)								1.0 2.0 1.0							2.0 2.0 2.0			1.0 2.0 1.0			2.0 4.0 2.0			1.0 2.0 1.0			4.0 2.0																																															
		SI on multi-SIM UE (R2)		Multi-SIM UE (R2)								1.0 1.0 0.5							2.0 1.0 1.0			1.0 1.0 0.5			2.0 2.0 1.0			1.0 1.0 0.5			2.0 1.0																																													
		SI on NR RAN slicing (R2)		NR RAN slicing (R2)								1.0 1.0							1.0 2.0			1.0			2.0			1.0			2.0																																													
		NR UDC (R2)								1.0 0.5							1.0 1.0			1.0 0.5			2.0 1.0			1.0 0.2			2.0 1.0																																															
		Navic for NR (R2)								0.5							0.5			0.5			1.0																																																					
		NR UAV (R2)																								0.5			1.0																																															
		RAN data collection SON/MDT (R3)								1.0 2.0							1.0 4.0			1.0 2.0			2.0 4.0			1.0 2.0			2.0 4.0																																															
										total used				27.0			27.0			12.1			10.0			0.0			0.0			53.5			26.5			23.2			28.0			26.5			10.6			56.5			54.0			22.2			28.0			27.0			10.8			0.0			54.0			22.2		
										max capacity				31			28			19																																																								
														slow RAN1 start			slow RAN2 start (TU not doubled)																																																											

Legend
R17 Study Item
R17 Work Item

See next slides for WI/SI scopes



Topic	Proposed Scope
MIMO enhancements	<ol style="list-style-type: none"> 1. Sub 3-GHz FDD MIMO spectral efficiency enhancements via partial channel reciprocity 2. FR2 enhancement (focus on real-world issues: overhead reduction for beam management, enable multi-panel UE) 3. High speed UE: SRS multiplexing capacity extension for TDD with more base sequences, high-speed train 4. Multi-TRP support for PDCCH, PUSCH, PUCCH (also for URLLC/IIoT)
Coverage enhancements	<p>Targeted scenarios:</p> <ol style="list-style-type: none"> 1. Outdoor-to-indoor coverage 2. High-data rate coverage in dense urban outdoor, including fixed outdoor UEs such as video cameras 3. VoIP coverage in rural <p>Objectives:</p> <ol style="list-style-type: none"> 1. Enhance PUSCH and PUCCH coverage with link-level evaluations in FR1 scenarios (above) 2. Evaluate whether DL coverage enhancements are also necessary e.g. for indoor scenarios <p>Note that multi-TRP enhancements and FR2-specific enhancement are covered by NR MIMO (multi-panel UE, beam management enhancements)</p>
Sidelink enhancements	<p>Further expand V2X and sidelink use cases and applications, including for commercial use, e.g. AR/VR.</p> <ol style="list-style-type: none"> 1. Include FR2 with limited beams and low mobility with a focus to support high data-rate commercial, i.e. non-V2X use cases (≥ 1 Gbps) 2. Include reporting of sidelink CSI to gNB, to improve efficiency of gNB control, spectral efficiency, data rate, and latency. 3. Multi-carrier sidelink could be lower priority if there are TU limitations. <p>Note: V2X Uu multicast and sidelink relative positioning are objectives under other work items</p>
Sidelink relay	<ol style="list-style-type: none"> 1. Select L2 relay as sidelink based UE relay for NR 2. Study solutions for L2 relay (UE-to-network relay and UE-to-UE relay) and if possible specify in Rel-17 <ol style="list-style-type: none"> 1. Study network controlled (re-)selection of relay UE 2. Study how to satisfy the service continuity and QoS considering the following <ol style="list-style-type: none"> 1. Multi-link (multi-connectivity) selection and maintenance 2. Fast link switching mechanism 3. Study PDCP level data split/duplication to improve reliability and spectrum efficiency for relay performance
CA enhancements with Dynamic Spectrum Sharing	<p>Specify PDCCH capacity enhancements along with L1 control overhead reduction in the context of DL CA where some scheduled carrier(s) could use DSS between NR and LTE, to reduce DL control overhead on DSS and non-DSS carriers. The enhancements should support at least the following functionalities:</p> <ul style="list-style-type: none"> • Ability to schedule PDSCH on at least 2 cells with a single DCI • Ability to schedule PDSCH on PCell with PDCCH on SCell

Topic	Proposed Scope
NR Light	<ol style="list-style-type: none"> 1. Study framework of feasibility of specifying relaxation to mandatory UE capabilities ensuring smartphones won't implement such relaxation 2. UE capability relaxation for MTC/IoT UEs for selected features (without reduction of SSB bandwidth), targeting e.g. video cameras, sensors 3. Specify enhancements to limit impact to system performance (e.g DL coverage recovery in case of reduction of number of receive antennas)
Small data	<ol style="list-style-type: none"> 1. Enable one-shot data transmission in RRC_INACTIVE state (using uplink configured-grant on UL, using enhanced paging for DL) 2. Specify solution to handle scenarios with large number of connections
UE Power Saving enhancements	<ol style="list-style-type: none"> 1. Extension to Rel-16 DCI-based power saving adaptation during DRX Active Time for an active BWP, including PDCCH monitoring reduction 2. Enhancements for RRM relaxation including serving-cell RRM relaxation for e.g. low mobility UE 3. Paging enhancement(s) to reduce unnecessary UE paging reception subject to no impact to legacy UEs and applicability to both eMBB and NR-Light UEs, for example paging sub-grouping mechanism 4. Additional UE assistance information for UE preference in processing timeline, SCell configuration, BWP configuration, etc
NB-IoT & LTE-MTC	<p>For NB-IoT:</p> <ol style="list-style-type: none"> 1. Issue from real deployment: Improve RLF-based cell change, by enhancing mobility triggers and measurements (note: not connected mode handover!) 2. Extend use cases without reaching LTE-MTC data rates: peak data rate enh. (16QAM UL/DL, wider BW/multi-carrier CA) 3. Network management: multi-carrier enhancements (frequency hopping between NB-IoT carriers, coverage level or service association to NB-IoT carrier) <p>For NB-IoT and LTE-MTC:</p> <ol style="list-style-type: none"> 1. IoT relay based on Uu 2. Working with NR/5GC for long-term deployment stability (multi-mode UE, inter-RAT cell selection to/from NR) <p>Note: Support of NB-IoT multicast/broadcast with 5GC may be discussed under work area on broadcast/multicast</p>

Topic	Proposed Scope
NR multicast broadcast	<p>Mixed-mode dynamic multicast/unicast aligned with SA2, including support of V2X Uu multicast, video and public safety. Focus on NR SA with priority for RRC CONNECTED, allowing some support in RRC idle and RRC inactive. SC-PTM-like, allowing limited SFN area (up to network implementation). Small RAN1 impact (adapt UL feedback for multicast/broadcast PDSCH).</p> <p><u>The minimum set of objectives (first priority) includes:</u></p> <ul style="list-style-type: none"> • Specify RAN basic functions for broadcast/multicast for UEs in RRC_CONNECTED state [RAN1, RAN2, RAN3]: • Specify a group scheduling mechanism to allow UEs to receive Broadcast/Multicast service [RAN1, RAN2] • Study the necessary solutions to support service continuity in mobility, e.g. a RAN based, gNB controlled dynamic switching of bearers between multicast (Point To Multipoint) and unicast (Point To Point) for a given UE, and specify what is necessary/beneficial.[RAN2, RAN3] • Specify required changes on the RAN architecture and interfaces, considering the results of the SA2 SI on Broadcast/Multicast [RAN3] • Specify required changes to improve reliability of Broadcast/Multicast service, e.g. by UL feedback. The level of reliability should be based on the requirements of the application/service provided.[RAN1, RAN2] • Study the support for dynamic control of the Broadcast/Multicast transmission area and specify what is needed to enable it, if anything [RAN2, RAN3] • Specify RAN basic functions for broadcast/multicast for UEs in RRC_IDLE/ RRC_INACTIVE states [RAN2]: • Specify required changes to enable the reception of Point to Multipoint transmissions by UEs in RRC_IDLE/ RRC_INACTIVE states, after the UE received the configuration of the PTM bearer carrying the Broadcast/Multicast service while in RRC CONNECTED state [RAN2]. <p><u>The additional set of objectives (second priority) includes,</u> in order of priority, and to be studied if time allows and specified if the complexity/cost vs. gain/benefit balance is deemed appropriate by RAN2</p> <ul style="list-style-type: none"> • Specify RAN basic functions to enable the reception of Point to Multipoint transmissions by UEs in RRC_IDLE/ RRC_INACTIVE states, without the constraint that the UE received the configuration of the PTM bearer carrying the Broadcast/Multicast service while in RRC CONNECTED state. [RAN1, RAN2, RAN3]
MR-DC enhancements	<p>Plan for better mobility in networks mixing operation of SA and NSA</p> <p>Objectives:</p> <ul style="list-style-type: none"> • ISSUE1: one-step handover from NR SA to NSA (already in Rel-16), to support lossless inter-system HO between NR and LTE/EN-DC in Rel-17 • ISSUE2: 0ms change for SN in NSA deployment, to support 0ms SN change in NSA deployment in Rel-17 by taking UE complexity into account • ISSUE3: 0ms handover between EN-DC cells, to support 0ms HO between EN-DC cells in Rel-17 by taking UE complexity into account • ISSUE4: fast (de)activation for SN/Scell (if not in Rel-16) • FR2 mobility improvement • Conditional PSCell change/addition (potential leftover from Rel-16) <p>Additional objectives requires a reasonable scoping due to various views from companies:</p> <ul style="list-style-type: none"> • Reduced interruption for inter-MN handover without SN change in MR-DC (maintain SN link during inter-MN HO with SN change) • Common SCell configuration for NR MCG and SCG (for reduction of configuration signaling overhead) • MCG failure recovery improvement to support more failure types. • SCell handling for DAPS (Dual Active Protocol Stack), with impact to RAN4 • Combination of DAPS and CHO (conditional handover)

Topic	Proposed Scope
Positioning enhancements	<p>Specify enhancements to positioning techniques targeting the following requirements (may require prioritization among scenarios):</p> <ol style="list-style-type: none"> 1. Industrial IoT environments: 0.5m@90% (Horizontal), 2m@90% (Vertical) 2. Sidelink relative positioning for V2X: relative lateral position 0.3m@90% and relative longitudinal position 0.5m@90% 3. Outdoor scenario (UMi): 5m@80% (Horizontal), 2m@80% (Vertical) 4. Indoor scenario (InH): 1m@80% (Horizontal), 2m@80% (Vertical)
IIoT & URLLC	<p>Enhancements for FR1 and FR2 for high data rate, enhancements for improving system availability and efficiency, TSC enhancement. No UE processing time reduction in Rel-17. No strong need for QoS enhancements for IIoT. No strong motivation to support URLLC/IIoT over NR unlicensed spectrum.</p> <ol style="list-style-type: none"> 1. Study and specify required Physical layer enhancements [RAN1, RAN2] <ul style="list-style-type: none"> • Enhanced MCS indication and/or UE feedback for a more adaptable MCS selection • CSI feedback enhancements • HARQ-ACK feedback enhancements 2. Inter-UE multiplexing to address collision between eMBB PUSCH and CG URLLC PUSCH [RAN1] 3. Intra-UE multiplexing and prioritization of traffic with different priority based on work done in Rel.16 [RAN1, RAN2] 4. RAN enhancements based on knowledge of 'survival time' [RAN2] 5. Propagation delay compensation enhancements [RAN1, RAN2, RAN4]
XR and cloud gaming	<p>Study to define traffic models and KPIs. No need for evaluations in the same study (except possibly for verifications)</p>
NR IAB enhancements	<p>IAB enhancements could skip one release after being specified in release 16.</p> <p>If IAB enhancements are targeted for Rel-17, focus should be on:</p> <ul style="list-style-type: none"> • Completing 256QAM requirements • Duplexing enhancements (FDM, FDM/SDM) • Some topology adaptation enhancements

Topic	Scope
RAN slicing	Slicing-specific mobility management for idle/connected UEs <ul style="list-style-type: none"> • Fast access to the intended slice, e.g., UE awareness, Cell (re)selection, slice based RACH/Paging • Slice re-mapping • Support smaller granularity than Tracking Area for slice deployment
NR UDC	Specify LTE UDC solution for NR SA and for NR in EN-DC
NR UAV	Specify as in LTE (no RAN1 impact for NR)
Multi_SIM	Study and specify DL and UL capability adjustment for using capabilities on a SIM while reducing capabilities on the other SIM, for dual-SIM UEs with 2 Rx chains <ul style="list-style-type: none"> • Target scenario: inter-MNO case NR SA + NR SA dual-SIM UE connected-idle states combination • Second priority (if needed): LTE+NR SA and EN-DC+NR SA Study in-device coexistence for dual SIM UEs <p>No need to enhance LTE+LTE and LTE+EN-DC (solutions exist and are implemented in commercial devices), no LTE specification impact. Problems coming from 'Single Rx UE' can be addressed by implementation (reusing RF channels) to address paging collisions.</p>
QoE	Support to collect the UE KPI report for certain services to optimize the UE QoE Support general framework for triggering, configuring, measurement collection and reporting for various 5G use cases.
RAN Data Collection (SON/MDT) enhancements	Priority for real market needs, Continuation of Rel-16 WI, Network energy efficiency part of this item Left over from Rel-16 <ul style="list-style-type: none"> • Rel-16 WI e.g. PCI selection, Energy Saving, at least ... • Rel-16 SI concluded but not conducted: e.g. CCO, Inter-system inter-RAT energy saving, Inter-system inter-RAT load balancing, ... • Rel-16 SI not concluded due to lack of time and deserve more study, e.g. Per UE local RRM policy, ... SON/MDT enhancement should be considered at early stage for Rel-17 e.g. <ul style="list-style-type: none"> • V2X MDT e.g. SL QoS monitoring and feedback, RAT/Path selection optimization, • Other Rel-16 features e.g. CHO (conditional handover), RACH-less, etc.