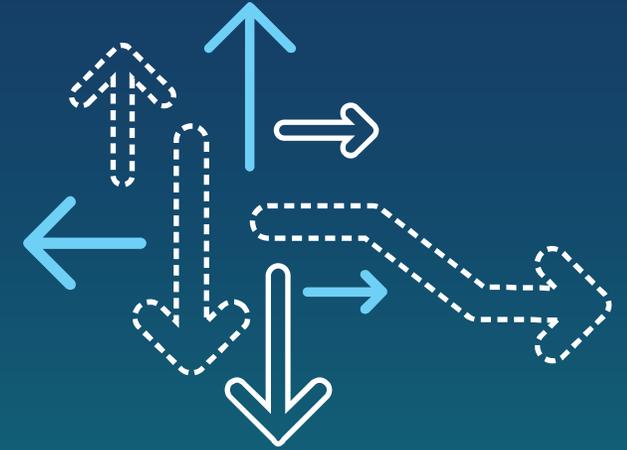


3GPP RAN #77  
September 11 - 14, 2017  
Sapporo, Japan  
Agenda Item 9.2.1

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RP-171604



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# NR Downscoping

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Qualcomm Incorporated

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# Overall progress

## Completion very challenging but not impossible

- Many decisions made in this quarter's WG meetings
- Completion by December still possible but very challenging
  - RAN1 should get more focused and use wisely the remaining available time
  - RAN2 should strictly focus on what is required for NSA operation – **so far not the case**
  - RAN4 is expected to down-select from long list of formats/options in RAN1
    - RAN4 needs a better understanding of different options to prioritize requirements
    - Note that, in our opinion, this NR prioritization/down-scoping exercise is to be carried out without reference to NR band combinations
- Risk areas
  - Limited time
    - 4 meetings left for RAN4, 3 meetings left for RAN1, 2 meetings left for RAN2/RAN3 – **Is RAN2 completion at risk?**
  - List of “controversial” topics increasing
    - More and more small topics end up burning a lot of meeting time
- To de-risk completion of NSA specification by Dec we believe that **defining a prioritization plan** is necessary

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# Overall progress

## Completion very challenging but not impossible

- Completion of NSA specification by Dec '17 is a MUST
- Arguably, current situation is triggered by long list of topics in each meeting's agenda as opposed to an incremental design/definition of NR op starting from basic mode of operation and \*only\* sophisticating it once the basic operation is defined
  - Examples:
    - Long discussions on UL sharing when basic CA operation has not been defined
    - Long list of options/formats (UE feedback modes, PUCCH/RACH formats/durations, etc.). – risk for RAN4 performance spec and even NR product definition
  - Note that many of the above items do not have an explicit reading in the NR WID and, hence, should not be controversial for down-prioritization, others are debatable
    - Clarity/guidance from RAN would ease things
  - Importance of **transparent** and **actionable** WG chairs work-plan towards completion by Dec
- Prioritization exercise based on identifying features that are essential for a competitive NSA solution
  - while taking into account limited avail. time and the fact that many areas can be improved over time (e.g., until June '18)

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# WG interdependencies

## WGs should not slow-down because of interdependencies with other WGs

- RAN1 completion requires information from RAN2 on
  - Beam-management and mobility procedures, e.g., aperiodic triggers
- RAN2 completion requires receiving information:
  - from RAN1 about all PHY parameters
    - RRC parameter list actively being discussed over RAN1 email reflector
  - from RAN1 and RAN4 about the new RRM related concepts for support for wider system bandwidth
  - from RAN1 and RAN4 on mmW, e.g. impact on MAC RACH and PHR
- RAN4 completion requires information from RAN1/2
  - “floating sync” design possible or not?
  - All signals/channels used for measurements and potential configurations (RRM)
  - PDSCH details for REFSENS reference channel (RF)
  - Details on Wideband operation and CA (RF, RRM) – Bandwidth parts and intra-band CA are same or not?
  - UL/DL sharing flavors and impact to RAN4 work not understood by RAN4

# NR WI Potential De-prioritization – (1/5) – RAN1 centric

Feature	Completion by Dec '17	Completion after Dec '17	Notes
NR CA	Important to have basic CA support in Dec version.	CA enhancements beyond Dec '17 version incl. SUL, SDL support.	
UL sharing [1]	UL sharing from NW perspective by Dec, i.e., the NR UL carrier is fully available for transmission from UE perspective.		UL sharing from UE perspective is not in Rel-15 scope
LTE-NR power sharing in NSA	Semi-static partition LTE/NR. Dynamic-partition LTE/NR specification left to UE implementation and not tested (no spec).	Dynamic-partition LTE/NR specification.	Possibly could be left to UE implementation even beyond Dec.
Switched UL (single Tx) [2]	Only scheduler based and/or in-band coexistence based. UE would assume (per spec) that it is not expected to transmit on two UL CCs when there are problematic frequency combinations.	Specification of e.g. subframe subsets, reference DL/UL configuration...	
Zero interruption mobility		Same frequency DC, non-transparent, multiple UL.	
Mixed numerology within same CC (Control/Data)	Same control/data numerology on CC.	Different control/data numerology.	
Mixed numerology across CCs	Same numerology for DL/UL and across CCs in a PUCCH group.	Different DL/UL numerology, different CA numerologies.	Required for SUL and SDL. Therefore, follow same schedule.
Mini-slot	Limit mini-slot support to x=7 OFDM symbols. Time-permitting include x=2, x=4.	Other mini-slot durations.	Define slot=14 OFDM symbols
FDD [3]	Important to have FDD support in Dec version. <b>Risky topic as discussions have not started.</b>	Half-duplex (HD) version.	

# NR WI Potential De-prioritization – (2/5) – RAN1 centric

Feature	Completion by Dec '17	Completion after Dec '17	Notes
ECP	No support.	Support.	Low priority.
Preemption support for DL and UL	Support for mini-slot based preemption (1, 2, 3,..., 13 symbols).		DL preemption: FDD and TDD. UL preemption: FDD only.
CBG related procedures	Basic CBG operation	More refined	Performance enhancement feature. Some tie-in with mini-slot, preemption.
RACH preamble formats 2 and 4	No support.	Support.	Meant to increase multiplexing capacity via use of format 2 and OCC.
TxDiv for short and long PUCCH	No support.	Support.	Only transparent schemes until Dec. <b>Last RAN1 meeting concluded on transparent schemes for CP-OFDM.</b>
TxDiv for PUSCH with DFT-S-OFDM and CP-OFDM waveforms	No support.	Support.	Only transparent schemes until Dec. <b>Last RAN1 meeting concluded on transparent schemes for CP-OFDM.</b>
Long PUCCH formats	Limited options, e.g., 9 and 10 OFDM symbols.		RAN1 spec can be made generic to cover all lengths. RAN4 could focus on a few values. Then, pick small set of mandatory values (e.g., RAN4 tested).
PDSCH and PUSCH RE mapping	Only freq-first mapping for DL and UL.		<b>Last RAN1 meeting agreed to only have freq-first mapping for CP-OFDM (DL/UL).</b> UL DFT-S-OFDM is open.
Bandwidth Part (BWP)	Only single BWP active per CC.		

# NR WI Potential De-prioritization – (3/5) – RAN2 centric

Feature	Completion by Dec '17	Completion after Dec '17	Notes
Architecture option 4 (NR anchor connected to 5GC)	No support / No discussion	This architecture option not supported in Rel-15?	The baseline NR SA is expected to take until the end of release-15.
Architecture option 7 (LTE anchor connected to 5GC)	No support / No discussion	This architecture option not supported in Rel-15?	The baseline LTE connectivity to 5GC is expected to take until the end of release-15.
Idle mode	No support / No discussion	Support with enhancement for multi-beam paging. Paging area optimizations	
RRC_Inactive	No support / No discussion	Support	RAN2 spent too much time just to confirm the same design as LTE light connection. Support for data transmission in RRC_Inactive is challenging.
NR connection control	No support / No discussion		
Slicing	No support / No discussion	Support	Designs in eLTE can be leveraged
Packet duplication in UL	No support / No discussion	Possible	Support in DL left to implementation

# NR WI Potential De-prioritization – (4/5) – RAN2 centric

Feature	Completion by Dec '17	Completion after Dec '17	Notes
NR Standalone Handover / RRM	No support / No discussion	Support - Basic intra-NR and inter-RAT handover - Conditional handover for reliability.	
System information including on-demand SI	No support / No discussion	Support	Use unicast for NR in EN-DC.
Bearer type change	Avoid too much optimization, e.g. omitting L2 re-establishment or reset in different bearer type change scenarios.		Basic function needs to be supported by Dec.
QoS flow offloading (NSA)	No support	Support	
Radio Link Failure	No elaborated detection mechanisms, e.g. for DL packet duplication	No elaborated detection mechanisms, e.g. for per DRB IP check failure	Basic function addressing mmW beam failure and recovery will require much discussion.
User plane Integrity Protection	No support / No discussion	Reuse mechanisms from SRB. No optimizations.	
Self-Organized Network	No support / No discussion	Only basic NR cell detection mechanism for ANR (NSA / SA)	
CSG	No support	CSG-like indication only	

# NR WI Potential De-prioritization – (5/5) – RAN4 centric

<b>Feature</b>	<b>Completion by Dec '17</b>	<b>Completion after Dec '17</b>	<b>Notes</b>
<b>Non-contiguous allocations in UL</b>	No support / No discussion	No support	MPR/A-MPR tables become very complicated and require a lot of study
<b>Gap enhancements – per CC gaps</b>	No support / No discussion	Support	RAN2 discussion expected to be bottleneck because capability signaling is complicated

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# Conclusions

## RAN guidance needed

- RAN to provide guidance w.r.t. aspects that are required for Dec-17 completion of NR NSA specification
  - Meeting time at WG level should be accordingly allocated
  - We provided our views of what aspects we believe are essential for NSA completion and which items are not
- RAN WG chairs to put together a workplan towards the NSA Dec-17 completion
  - Only one quarter left and much progress is needed

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# References

- [1] RP-171605, “Views on UL sharing”, Qualcomm
- [2] RP-171606, “Views on single TX switched UL”, Qualcomm
- [3] RP-171607, “NR FDD gap analysis”, Qualcomm

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# Thank you

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