

[RAN1 led] Multi-Carrier switching for RedCap

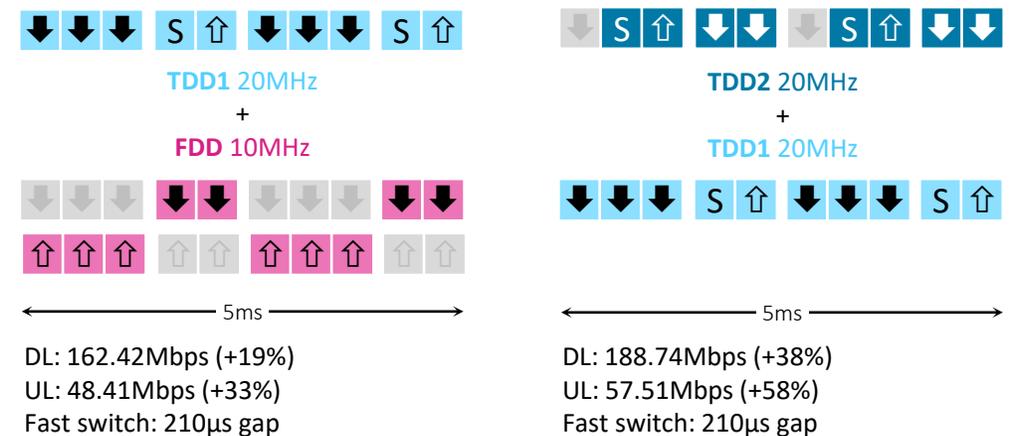
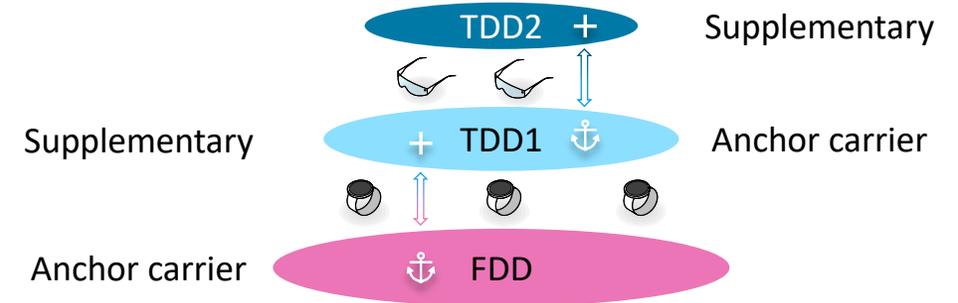
[WI]

Motivation

Improve Redcap performance with same UE complexity envelope

- Lack of CA & 20MHz CBW prevents RedCap UE from using available resources to maximize data rate & latency performance
 - Available resource constraint, e.g., <20MHz in many FDD bands and no simultaneous DL + UL in TDD
 - FD-FDD capable UE may be unable to use its simultaneous 20 MHz DL + UL processing capability
- Redcap Multi-Carrier Switching would allow RedCap UE to:
 - Independently switch UE DL or UL to supplementary band to allow simultaneous cross-band UL and DL operation
 - Overcome available resource constraints in one FDD/TDD carrier

Note: Semi-static switching configuration = no new L1 signalling overhead
- Enables greater use of available spectrum:
 - to improve RedCap UE throughput & latency
 - while maintaining complexity envelope

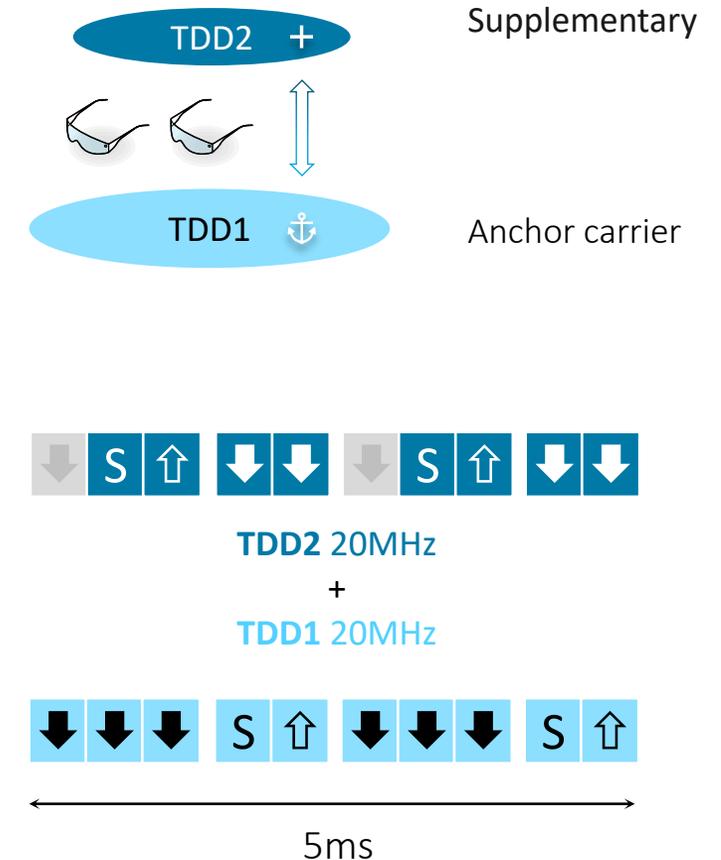


Proposal: RedCap Multi-Carrier switching

Design considerations

[1/2]

- High level operating scenario
 - Configuration of 2 carriers: Anchor and supplementary carriers
 - FR1 and co-located carriers (single TAG)
 - Inter-band carrier switch operation for UE supporting FD-FDD
- Inter-band carrier switch operation, considering at least
 - *Semi-static* configuration of carrier switch pattern
 - Common search space, RLM and RRM only on anchor carrier
 - CSI acquisition and UL power control for supplementary carriers
 - PUCCH carrier switch for HARQ feedback
- Band combination and switch period for DL carrier switch
 - Data interruption during switch period
 - **210 us** period feasible based on semi-static carrier switch pattern
 - Duplexer not needed with sufficient distance between bands

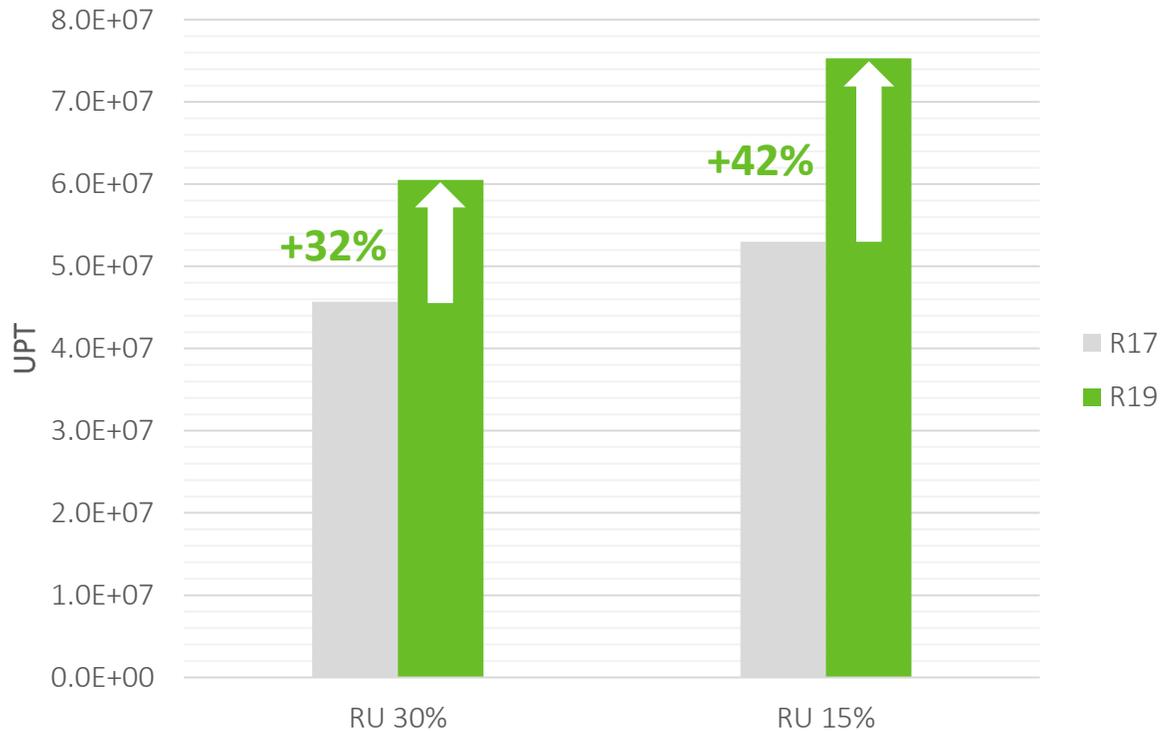


Proposal: RedCap Multi-Carrier switching

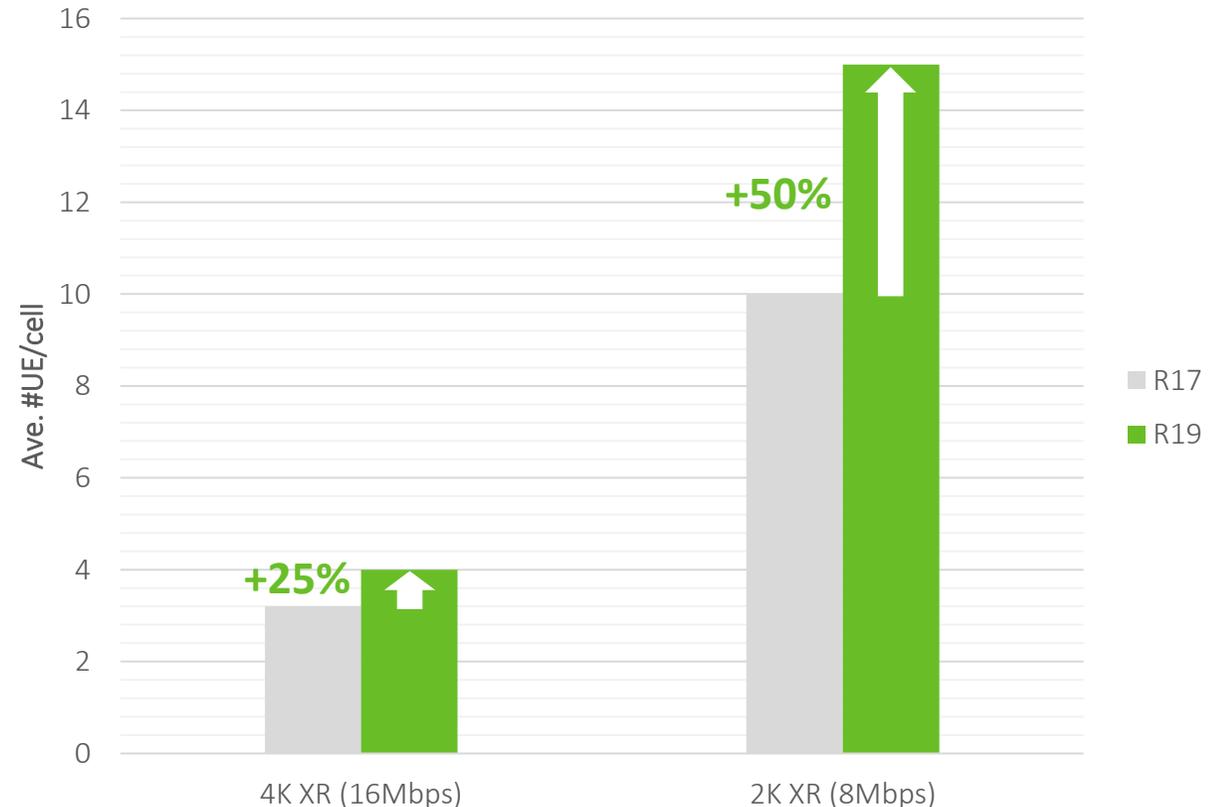
Benefits vs no switching at UE

[2/2]

- Baseline: 2 TDD carriers w/o multi-carrier switching UE
- User-perceived throughput (UPT) gain for FTP traffic
 - Assume large data download and RU of 15% - 30%



- System capacity benefits for XR services
 - Assume 10 ms PDB and 90% user satisfaction target



Objective

SA/CT Dependency: No

Enable inter-band carrier switch operation with up to two carriers within a single cell for RedCap UE in FR1 [RAN1, RAN2, RAN4]

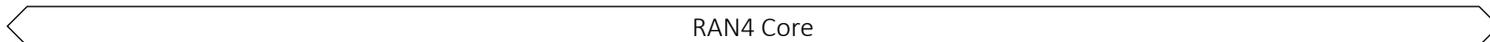
- Specify Inter-band carrier switch mechanism [RAN1]
 - Carrier switch based on a configured carrier switch pattern
 - Common search space, RLM and RRM only on anchor carrier
 - CSI acquisition and UL power control for supplementary carrier
 - PUCCH carrier switch for HARQ feedback
- Specify configurations of Inter-band cross-carrier switch operation for a cell [RAN2]
 - Addition of one supplementary carrier (with both DL and UL) for a cell
 - Semi-static configuration of carrier switch pattern
- Specify band combination and switch period for DL carrier switch [RAN4]
 - Collocated carriers (single TAG)
 - Data interruption during switch period
 - Consideration of RedCap UE complexity limitation

Expected TU

	2024												2025 [Calendar TBC at the time of writing]												2026		
	Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4			Q1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
RAN	103			104			105			106			107			108			109			110			111		
R1	115b	116		116b	117			118		118b	119		119b	120		120b	121			122		122b	123		123b	124	
R2	124b	125		125b	126			127		127b	128		128b	129		129b	130			131		131b	132				
R3	122b	123		123b	124			125		125b	126		126b	127		127b	128			129		129b	130				
R4	109b	110		110b	111			112		112b	113		113b	114		114b	115			116		116b	117		117b	118	
R1								0.5		0.5	0.5			0.5		0.5	0.5										
R2														0.5		0.5	0.5			0.5							
R3																											
R4 RD										0.5	0.5			0.5		0.5	0.5			0.5							
R4 RF										0.5	0.5			0.5		0.5	0.5			0.5							

Study TU

Feature TU



Thank you!