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Agenda Item: 8A.2.12.2

Views on scope for NR Multi-carrier enhancements in Rel-19

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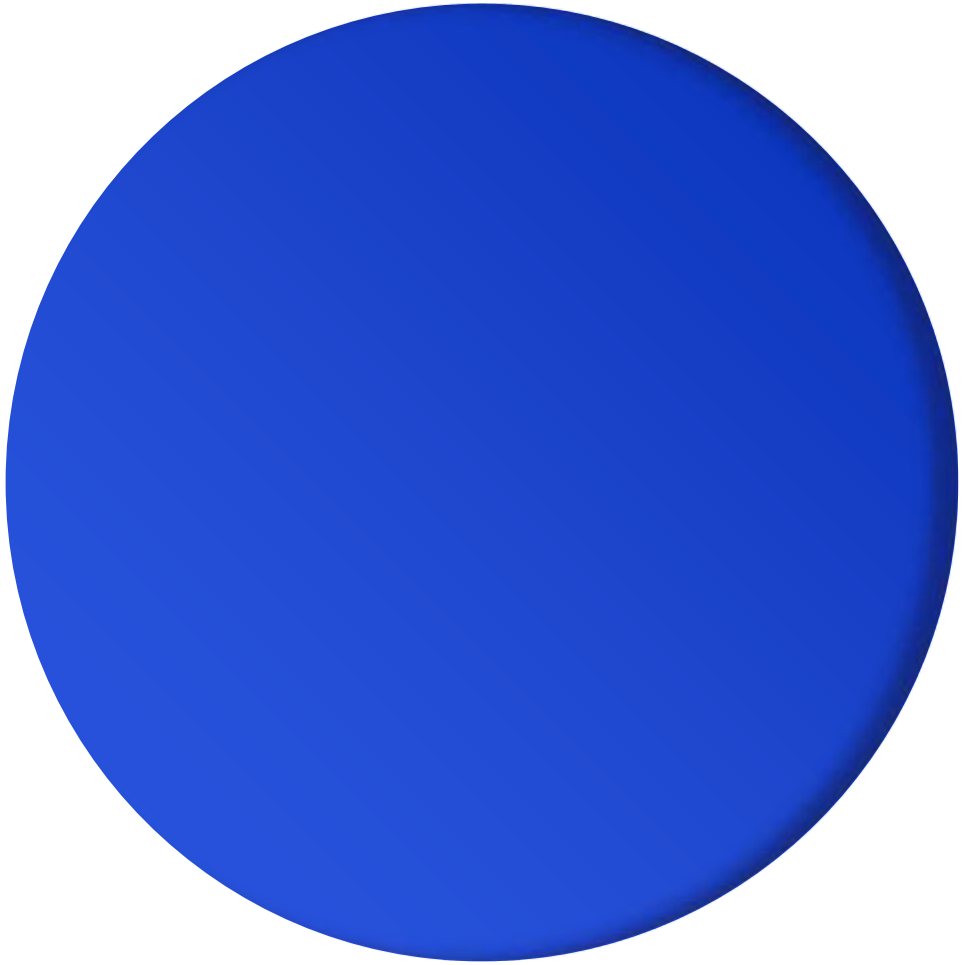
Outline

- Is a WI needed?
- Views on Rel-19 WS proposals on multi-carrier enhancements
- Proposal on eSUL for Rel-19

Is a WI needed?



Is a multi-carrier enhancements WI needed in Rel-19?

- Multi-carrier enhancements was a key focus in Rel-17 and Rel-18
- Unclear if another round of enhancements is necessary
- Given many other items of higher priority in Rel-19, need for a multi-carrier enhancement WI in Rel-19 must be critically examined
- If Rel-19 is to include a multi-carrier enhancements WI, we strongly suggest that its scope be significantly limited and to only include urgent/critical enhancements
- In the next few slides, we provide our input on enhancements to deprioritize/prioritize

Views on Rel-19 WS proposals on multi-carrier enhancements

Views on R19 WS proposals on multi-carrier enhancements

The potential scope, if any, should be minimal and fit with “almost-zero” TU(s)

Proposal	Reference	QC’s view
Enhancements on multi-cell scheduling by a single DCI • Enabling different SCSs/carrier types among co-scheduled cells • More than one scheduling cell for each scheduled cell • Multi-slot scheduling for multi-cell scheduling • Larger number of co-scheduled cells	RWS-230077, RWS-230236, RWS-230251, RWS-230287, RWS-230322, RWS-230357, RWS-230366, RWS-230386, RWS-230417, RWS-230431	• No use-cases/benefits identified
Support of 2-stage DCI framework	RWS-230114, RWS-230236, RWS-230431	• Need significant amount of studies
Serving cell enhancements • Non-contiguous carriers • Flexible DL and UL association • Switching carriers for DL and UL	RWS-230077, RWS-230114, RWS-230115, RWS-230236, RWS-230287, RWS-230322, RWS-230386, RWS-230431	• Need significant amount of studies
Complementary UL-DL configurations across cells	RWS-230236	• Benefit is unclear
eSUL	**RWS-230182, RWS-230251, RWS-230287**	• **Can be enabled with minimal effort**
Multiple SULs per NUL	RWS-230322	• eSUL covers the use-case with less standard impact

Proposal on eSUL for Rel-19

Background

Legacy SUL and UL-CA

- **Separate specifications for SUL and UL-CA cause fragmentations**

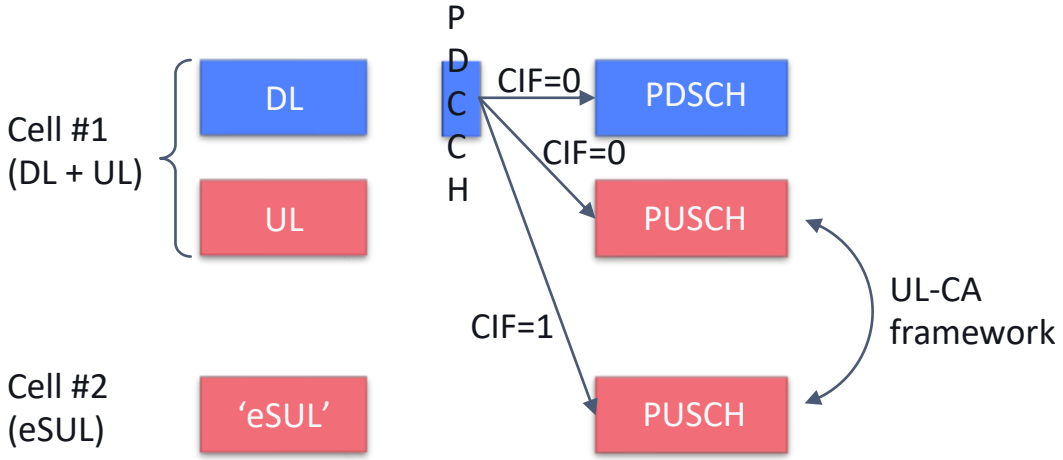
Aspect	SUL	UL-CA
UL / DL association	A cell has DL-only, DL + UL, or DL + UL + SUL	A cell has DL-only or DL + UL
Simultaneous Tx	No	Yes
UL-Tx switching	Yes (but no dual-UL for UL and SUL of a cell)	Yes (‘switchedUL’ or ‘dualUL’ for any UL-CC pair)
Scheduling mechanism	UL/SUL indicator in a DCI	Carrier indication field (CIF) in a DCI
Multi-cell scheduling	No	Yes
HARQ space	One HARQ space for UL/SUL carriers of a serving cell	Independent HARQ spaces for each component carrier
Support of random-access for idle mode	Yes	No (only on PCell)

Key Objectives

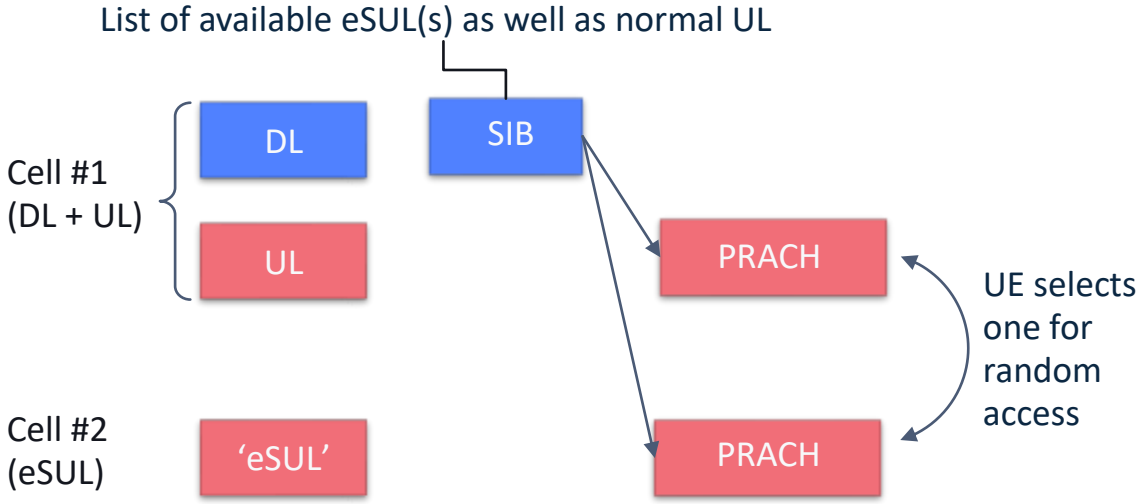
- CA enh Phase 4, WI (R1)
  - Specify enhanced SUL (eSUL) that has no associated downlink in the same cell
    - Support uplink transmissions on eSUL(s) in connected mode
      - eSUL is treated as a regular UL-CC that has no DL in the UL-CA
      - Enable simultaneous Tx and UL Tx switching Option 1/2 for any pair of eSUL(s) / normal UL(s)
    - Support random-access procedure using an eSUL in idle mode
      - Legacy SUL principle is largely re-used

Example details of eSUL

- **eSUL in connected mode: treated as a regular UL-CC of UL-CA that has no DL**
  - Cross-carrier or multi-cell scheduling for eSUL
  - Independent HARQ space for each UL/eSUL
  - For timing/power control, eSUL has a configured RS in another cell that has DL
  - Half-duplex capability b/w eSUL and a DL cell is allowed
  - UE supports either simultaneous-Tx or UL Tx switching option 1/2 (as legacy UL-CA)



- **eSUL in idle mode: random-access on eSUL largely re-uses legacy SUL principle**
  - SIB carries information of eSUL(s) as well as UL that can be used for random-access
  - A UE selects UL or an eSUL for random-access



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