3GPP RAN Rel-19 Workshop RWS-230182

June 15th-16th, 2023, Taipei, Taiwan

Agenda Item: 5

CA Enhancements

Qualcomm Incorporated

Background

Legacy SUL and UL-CA

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

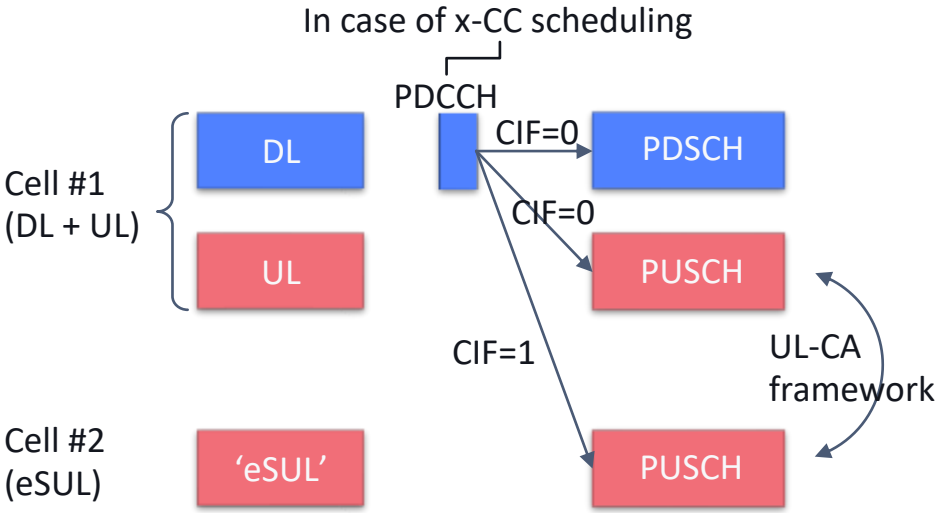
Aspect	SUL	UL-CA
UL / DL association	A cell has DL-only, DL + UL, or DL + UL + SUL	A cell has DL-only or DL + UL
Simultaneous Tx	No	Yes
UL-Tx switching	Yes (but no dual-UL for UL and SUL of a cell)	Yes (‘switchedUL’ or ‘dualUL’ for any UL-CC pair)
Scheduling mechanism	UL/SUL indicator in a DCI	Carrier 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

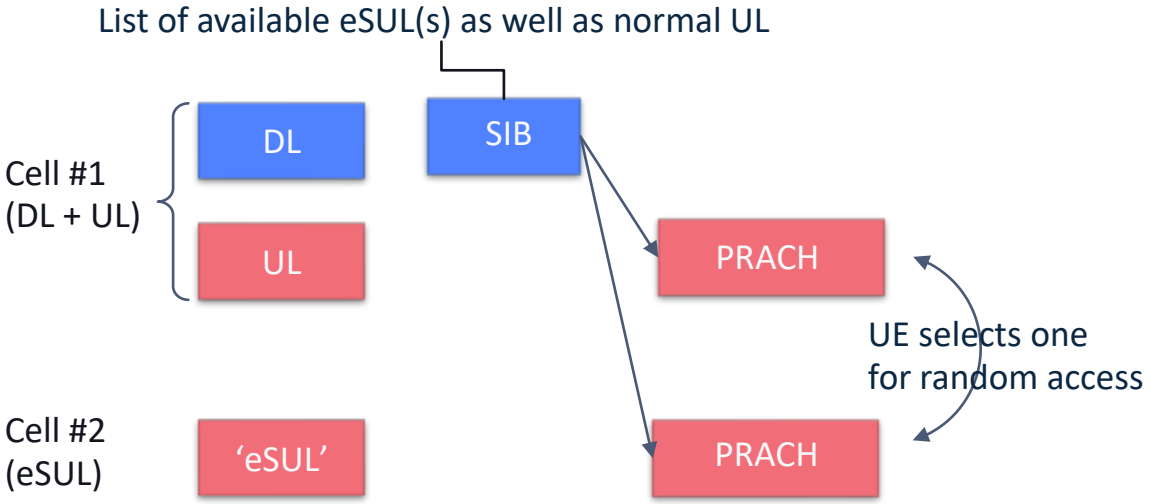
- CA enh Phase 4, WI (R1)
  - Specify enhanced Secondary UL (eSUL) that has no associated downlink in the same cell
    - Support uplink transmissions on eSUL(s) in connected mode
      - eSUL is treated as a regular UL-CC that has no DL in the UL-CA
      - Enable simultaneous Tx and UL Tx switching 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 DL 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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