3GPP TSG RAN Rel-18 workshop
Electronic Meeting, June 28 - July 2, 2021
Agenda: 4.1

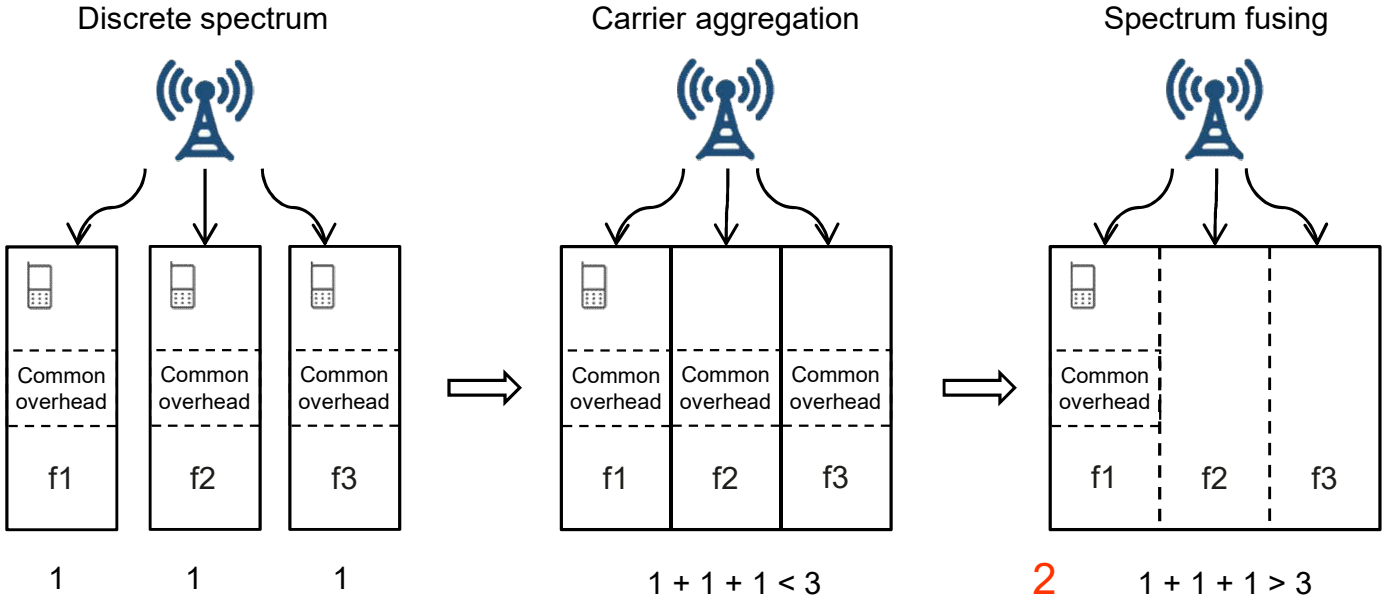
RWS-210147

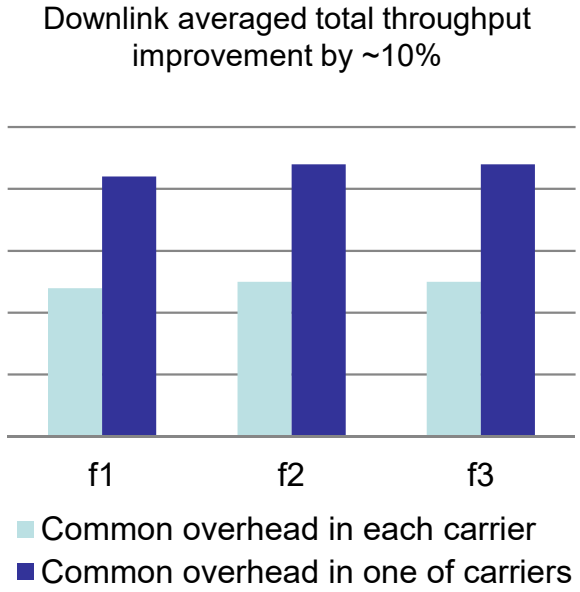
Flexible Spectrum Fusing for Rel-18

China Telecom

Flexible spectrum fusing - motivation

- As growth of data traffic and explosion of services, up to 5 down link carriers CA are proposed in RAN4. The Carrier Aggregation has been identified as a direct technology to achieve larger bandwidth and high data rate for NR and LTE. However, from operator point two key aspects need to considerate when deploying CA. The first is cost, addition of carrier will increase the network multiple cells management cost; the second is spectrum efficiency of CA, more control channels and signallings will cause CA spectrum efficiency lower than single carrier with the same total bandwidth.
- The flexible spectrum fusion changing the discrete spectrum utilization from simple aggregation to fusion, and will achieve 1+1+1>3 by reducing common overhead. The composite spectrum efficiency improvement is expected to be larger than 10% by comparing to traditional CA.

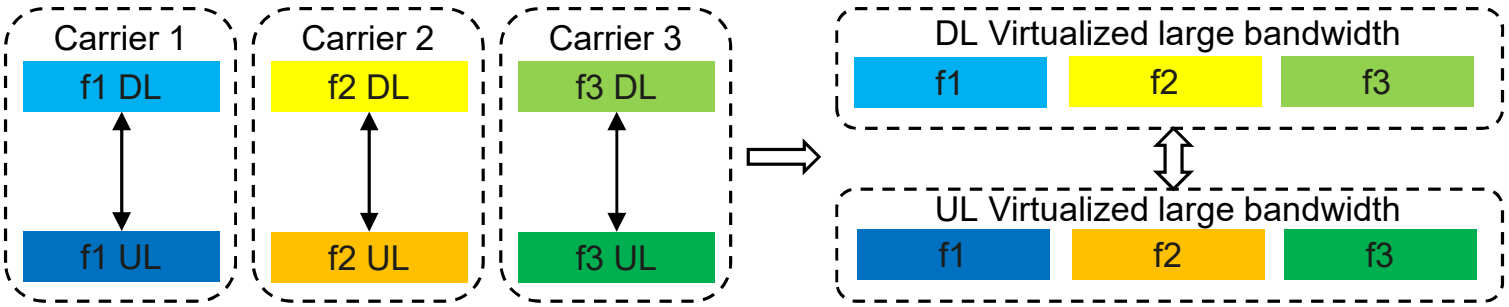




Flexible spectrum fusing - motivation

- Sub-1GHz plays the important role in wireless communication due to outstanding coverage performance, which on contrary made the sub-1GHz spectrum rare and fragmentally allocated in such as 700/800/900 MHz for IMT. In future, possibly more sub-1GHz spectrum bands such as 700/800/900 MHz can be operated under the co-construction and sharing business mode. How to integrate these fragment spectrums efficiently and schedule the resource more flexibly to meet 2B/2C requests will be the key question.
- The idea of flexible spectrum fusing is to integrate the bandwidths from different carriers to one virtualized bandwidth, will make scheduling more flexible and improve the spectrum efficiency extremely. Below figure gives an example for fusing 700/800/900MHz to one virtualized large bandwidth, flexible scheduling could happen in the virtualized bandwidth.

Flexible spectrum fusing



Flexible spectrum fusing - scope

- Scenarios
  - » Focus on the spectrum frequency of which the bands are neighboring, e.g. 700MHz/800MHz/900MHz or 1.8GHz/2.1GHz, etc.
    - Consider co-locate deployment for the multiple bands for fusing
    - Limit multiple bands for fusing to be neighboring bands

- Frameworks
  - » The frameworks to achieve flexible spectrum fusing include multiple cells of CA and single cell
  - » Whether to down-select the framework is FFS.

Flexible spectrum fusing - scope

- For multiple cells of CA
  - » Enable flexible configuration of downlink and uplink physical carrier frequency for one cell in one or multiple frequency bands (RAN1, RAN2, RAN4)
    - Flexible uplink and downlink carrier linkage (FDD and TDD)
    - One downlink physical carrier can be shared by multiple cells
  - » Combine PDCCHs from multi-carriers and allocate in one of carriers (RAN1, RAN2)
  - » Simplify SSB designation to allocate in one of carriers (RAN1, RAN2)
    - Impact to gNB implementation to compensate impairments among bands including Sync timing difference, Path loss difference and QCL difference

Flexible spectrum fusing - scope

- For single cell with multiple downlink and multiple uplink carriers
  - » Specify single cell mapped into non-contiguous bandwidth of one or multiple frequency bands, subject to aggregated cell bandwidth no more than Rel-17 maximum carrier bandwidth per cell. (RAN1, RAN2, RAN4)
    - A band combination of multiple bandwidths of the same duplex mode can be mapped into single cell
  - » Combine PDCCHs from multi-carriers and allocate in one of carriers (RAN1, RAN2)
  - » Simplify SSB designation to allocate in one of carriers (RAN1, RAN2)
    - Impact to gNB implementation to compensate impairments among bands including Sync timing difference, Path loss difference and QCL difference

Flexible spectrum fusing – impact and Options

- Enable flexible downlink and uplink configuration for multiple frequency bands
  - » Impact to the duplex of bands
    - Option1: Restrict duplex mode of the multiple bands for fusing to same duplex
    - Option2: For TDD band, redefine the duplex to be FDD or consider other changes
- Enable concurrent uplink transmission for multiple frequency bands, especially for neighboring bands
  - » Impact to the UE Tx chain architecture
    - Option1: keep/Increase number of Tx chains by at lease two to enable low frequency bands concurrent transmission
    - Option2: Share the same Tx chain for neighboring bands in low frequency such as sub-1GHz
    - Option3: No concurrent transmission, restrict the uplink transmission within single band

Thanks!