中国移动
China Mobile

3GPP TSG RAN Rel-18 workshop
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Motivation of study for frequency combination based elastic cell

Agenda Item: 4.1
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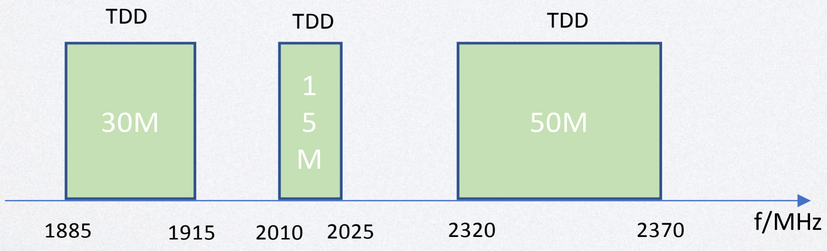
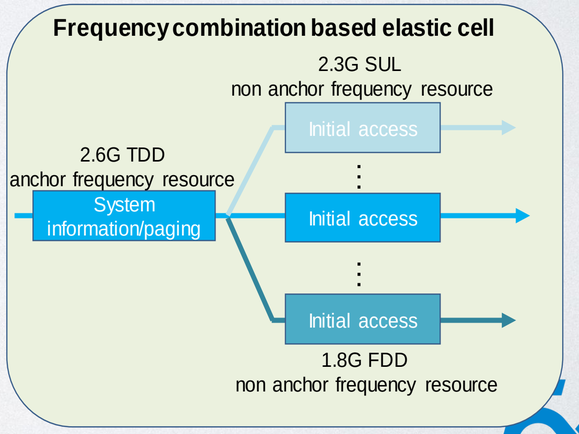
Motivation

- To realize more efficient load offloading from initial access and flexible access carrier selection among multiple carriers
  - Current multi-carrier scheme mainly focuses on improving UE throughput in connected mode, e.g. CA.
  - SUL can be used to realize offloading before RRC connection, but only limited to one carrier and only for UL carrier
  - Currently, UE chooses a cell to camp on according to frequency priority, and offloading can only be realized by handover. In this case, it cannot help to solve congestion during initial access. Handover signaling due to offloading also brings a lot of system overhead.
- To improve spectrum utilization efficiency, especially for narrow low frequency band.
  - Wide bandwidth is desired to reach high data rate requirement of NR, for FR1, it's more practical to form large bandwidth by aggregating multiple non-continuous carriers, some of them may be carriers with narrow bandwidth
    - Narrow bandwidth carrier re-farmed from LTE, 1.9GHz(30M), 2.0GHz(15M), 2.3GHz(50M)
    - Scattered carriers with bandwidth too narrow to carry SSB or system information;
  - If all the aggregated carriers are managed as independent cells, the spectrum utilization efficiency will be low due to large cell management overhead on limited bandwidth.



Possible flexible spectrum utilization solution for NR

- **Frequency combination based elastic cell**
  - Different duplex types of carriers, different number of carriers, regardless of intra-band carrier, or of inter-band carrier, can be configured in a cell.
    - This carriers are called frequency resources.
  - For idle/inactive UEs
    - System information of the cell can be broadcast only in one of the multiple frequency resources, i.e., so called anchor frequency resource, and one or more non anchor frequency resources can be visible and reachable by UE based on the system information broadcast in the anchor frequency resource, i.e., the anchor and all non anchor frequency resources can be chosen by UE for initial access.
      - This is an extension of SUL scheme as a universal solution for multiple carrier operation, where additional resource selection for initial access in a cell is no longer limited to the carrier on SUL bands, but also can be the carriers on existing TDD/FDD bands
    - Idle/inactive UEs only need to monitor paging on anchor frequency resource while the access frequency resources are selective to the UE for cell access.
  - For connected UEs
    - Similar but more flexible behavior as UE in CA. For example, BWP like behavior can be used for flexible frequency resource scheduling, with BWP aggregation for high data rate.
    - Aggregated carriers can be SUL carriers
- Advantages
  - Flexible offloading from initial access.
  - Shared common system information among multiple frequency resources and paging only on anchor frequency resource can reduce system overhead and simplify cell management effort.
  - Without unnecessary overhead, the valuable low frequency narrow band can be used for data transmission as much as possible



Potential study objectives

- Study mechanisms for supporting configuring multiple consecutive or non-consecutive spectrums in a cell, e.g., from perspectives of common system information, cell (re)selection, and inter-cell management, etc.
- Study mechanism for supporting idle/inactive state for frequency combination based elastic cell, including,
  - Mechanism for cell selection/reselection procedure, as well as paging
  - Mechanism of initial access procedure, e.g., carrier selection in a cell
- Study possible enhancement of connected state for flexible multiple carrier operation
  - Physical channel and procedures enhancement for connected state to support BWP-like flexible carrier scheduling and aggregation
    - Current CA mechanism is maximally reused;
    - Potential control channel enhancement to support unified multiple carrier scheduling, including TDD/FDD/UL only/DL only carrier
  - Enhancement for handover procedure to support the elastic cell

Thank you