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Motivation for the new SI on Enhanced Carrier Aggregation Mobility

Intel Corporation

Justification: Legacy CA Mobility

- Legacy HO procedure for CA:

1) UE is served by cell1+ cell3 aggregation
2) Based on measurement, HO from cell1 to cell2
3) UE disconnected from cell1 and cell3
4) UE access to cell2

- The data traffic on cell3 cannot be maintained in this legacy case
- Cell3 needs to be configured/activated once more if CA is needed for high data

- Legacy HO procedure for CA:

1) UE is served by cell1+ 2+ 3 aggregation
2) Based on measurement, HO from cell1 to cell4
3) UE disconnected from cell1, 2 and 3
4) UE access to cell4, if needed, NW will configure new cells as Scells after HO, and then activate Scells

- The HO is conducted from multiple connections (cell1,2,3 in source) to single connection (only cell 4 in target)
- The activation delay will be big if more Scells need to be activated for high data

SI Justification: Enhanced CA mobility & Benifits

Enh. 1: Pcell-only HO enhancement

UE moves from Cell1 to Cell2

Enh.2 :Multiple connections/carriers based mobility

UE moves from Cell1 coverage to Cell4 coverage

- New HO procedure for CA UE:
  1) UE is served by cell1+ cell3 aggregation
  2) Based on measurement, HO from cell1 to cell2
  3) UE disconnected from cell1 only
  4) UE access to cell2 but maintain connection with cell3
- The data traffic on cell3 can be maintained
- Based on MBB scheme, the interruption of PDCCH of PCell can be only up to 5ms

Benefits from this enhancement		
Enhanced CA mobility	Interruption or data loss duration(ms)	
	Enh. Case	R14 legacy case
Enh. 1	5ms*Nscell	164 ms*Nscell
Enh. 2	5ms*(1+Nscell)	164ms*Nscell +130ms

- 5ms is the HO interruption under make before break.
- 164ms is sum of HO delay(130ms) and Scell activation time(34ms)
- Nscell is the amount of Scell
- (1+Nscell) is the amount of Scell and Pcell

- New HO procedure for CA UE:
  1) UE is served by cell1+ 2+ 3 aggregation
  2) Based on measurement, HO from cell1 to cell4
  3) UE disconnected from cell1, 2 and 3
  4) UE simultaneously access to cell4, 5 and 6, and cell4,5,6 are still CA for high data usage
- The HO is conducted from multiple connections (cell1,2,3 in source) to multiple connections (cell4,5,6 in source)
- The high data rate of UE could be maintained during HO

Objectives

Enhancement 1: Pcell-only HO for CA

- **Identify the deployment CA scenarios for these enhancements, e.g. RRH Scell shared by two Macro cells**
- **Investigate the feasibility of mobility enhancement, especially for handover procedures**
  - Investigate the feasibility of enhanced UE/NW behavior in Pcell-only handover
    - keeps SCell connection during Pcell changing
    - conduct make-before-break on Pcell during handover
  - Investigate the procedure change for Pcell-only handover
- **Evaluate the gain from Pcell-only HO, e.g. throughput, interruption or handover delay**

Objectives

Enhancement 2: Multiple carriers based HO for CA

- **Identify the deployment CA scenarios for these enhancements, e.g. UE move from a multiple aggregated cells coverage to another**
- **Investigate the feasibility of mobility enhancement, especially for handover procedures**
  - Investigate the feasibility of enhanced UE/NW behavior in multiple carriers based handover
    - Make the default status of target Scells as “activated” immediately after handover
    - Conduct make-before-break on Pcell/SCell during handover
  - Investigate the procedure change for multiple carriers based handover
- **Evaluate the gain from multiple carriers based handover, e.g. throughput, interruption or handover delay**

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