3GPP TSG RAN #93-e

13th – 17th September 2021

RP-212336

Rel-18 Further Enhancements of NR Mobility

Agenda Item: 9.0.3

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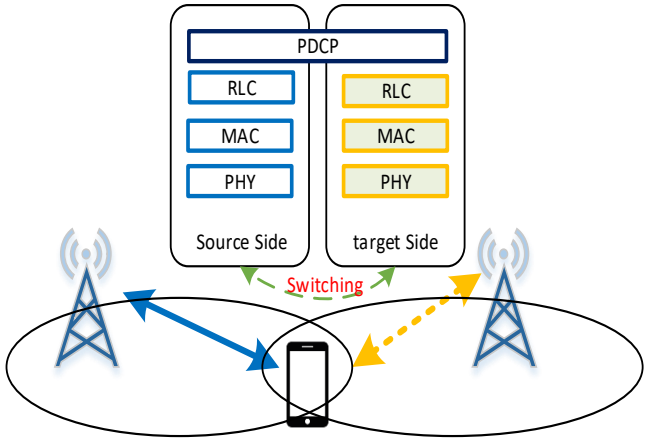
Key scenarios to be considered

- Use cases:
  - For new services, e.g. XR, 4K/8K video and cloud gaming, etc, the packet delay, throughput requirement is stringent. Normally CA/DC and high frequency are deployed to provide additional capacity. Therefore low interruption handover is important for CA/DC and high frequency scenario.
  - To support URLLC services, low interruption and high reliability handover is need;
  - “handover between nodes with different releases” will be more popular when NPN is used widely. The performance should be improved;

- We consider following scenarios are important and should be considered in Rel-18:
  - Scenario 1: Mobility enhancements on FR2, especially to enable low interruption for XR, 4k/8k, cloud gaming, etc new services;
  - Scenario 2: To support consistent data rate with low interruption during handover for XR, 4k/8k, cloud gaming, etc new services;
  - Scenario 3: To support low interruption + reliability simultaneously during handover for URLLC services;
  - Scenario 4: Low interruption upon switching of SCG, switching between MCG and SCG, etc for XR, 4k/8k, cloud gaming, etc new services;
  - Scenario 5: support lossless HO and delta signalling for HO between nodes with different releases, especially for NPN scenarios;

Fast cell group switching (L1/L2 based mobility)

- DAPS was introduced in Rel-16 to reduce the latency for PCell change, however:
  - DAPS requires simultaneous operation between source and target cell which is quite challenging in implementation and not feasible for FR2-FR2;
  - No solution to reduce the interruption caused by the switching of MCG, SCG, or between MCG and SCG;



- Objectives for fast cell group switching
  - Specify solution for fast cell group switching without the need of simultaneous transmission/reception:
    - Only one cell group activated at a time;
  - Following scenarios are considered:
    - Switching of PCell, PSCell;
    - Switching between sPCell and Scell;
    - Switching between PCell and PSCell;
    - More than two cell groups, e.g. three;
  - Switching mechanism
    - L1/L2/L3
- Note: main difference from RANP email discussion 03 is:
  - MR-DC should be considered, and the term “fast cell group switching” is used instead of “L1/L2 based mobility” in order to cover more scenarios (L3 based), mechanisms (MR-DC, CA/DC in email disc#14);

Further enhancements on DAPS

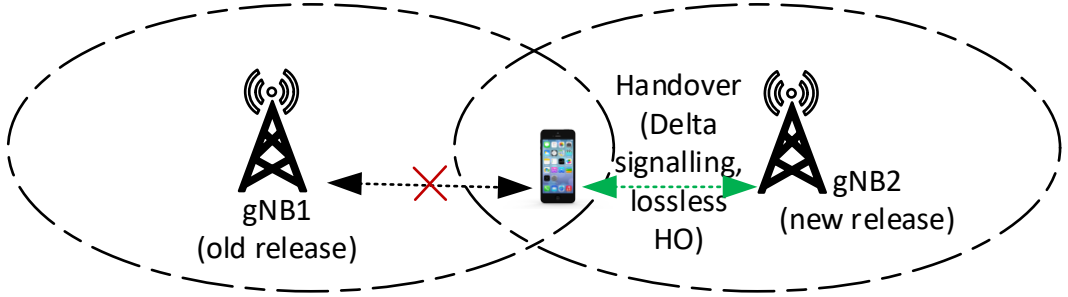
- DAPS was introduced in Rel-16 to reduce the latency for PCell change, however:
  - Cannot support consistent data rate with low interruption (e.g. XR requirement): Data rate is decreased during DAPS handover due to release of CA, DC and without simultaneous UL data transmission;
  - Handover Failure Ratio may be increased since DAPS cannot work together with CA, DC, EHC, UDC, and CHO/CPC and the source has to release the configuration before sending HO command;

- Objectives on further DAPS enhancements
  - Specify solution on the release of configuration during DAPS handover;
  - Specify solution to support simultaneous UL PUSCH transmission for user data;
  - Specify solution to support following combinations:
    - DAPS+CA/DC;
    - DAPS+CHO;
- Note: main differences from RANP email discussion 03 are:
  - We propose to include DAPS+CHO in Rel-18 since it can be applied for URLLC requirement;
  - We propose to remove the restriction on simultaneous UL PUSCH transmission for user data since there is no blocking issue;
  - We propose to consider to release the configuration during DAPS handover since it will impact the performance significantly.

Handover enhancement for mixed deployment

- Motivation (use cases and market opportunity):
  - Allow mixed deployments of nodes of different releases for both MN and SN
  - Deployments that cannot be coordinated to ensure all nodes are of same release
  - Private networks, network sharing, makes it quite likely that HO between nodes of different releases will happen
  - We already allow MN and SN to be potentially of different releases
- Today handover between nodes of different releases requires the use of "Full Configuration". Limitations of this approach:
  - During HO/SN change between nodes of different releases
    - Data loss due to PDCP release
    - Large HO command size
      - NR RRC reconfiguration messages can be large
      - Too large to fit in one message – segmentation is not so straightforward for HO
      - Additional delay, increasing chances of HO failure

- Objectives for handover enhancement for mixed deployment
  - Specify the solution to support lossless HO and delta signalling for HO between nodes with different releases;
  - Note: this was not in the conclusion of email discussion#03.



Summary

Priorities for R18 work (listed in priority order)

- Interruption reduction and reliability improvement for cell group change:
  - Fast cell group switching within MCGs, SCGs, between MCG and SCG or between Pscell and Scell;
  - Further enhancements on DAPS, e.g. to support DAPS+CA/DC, DAPS+CHO and simultaneous UL data transmission for user data;
- Handover enhancement for mixed deployment
  - To support lossless HO and delta signalling for HO between nodes with different releases;

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