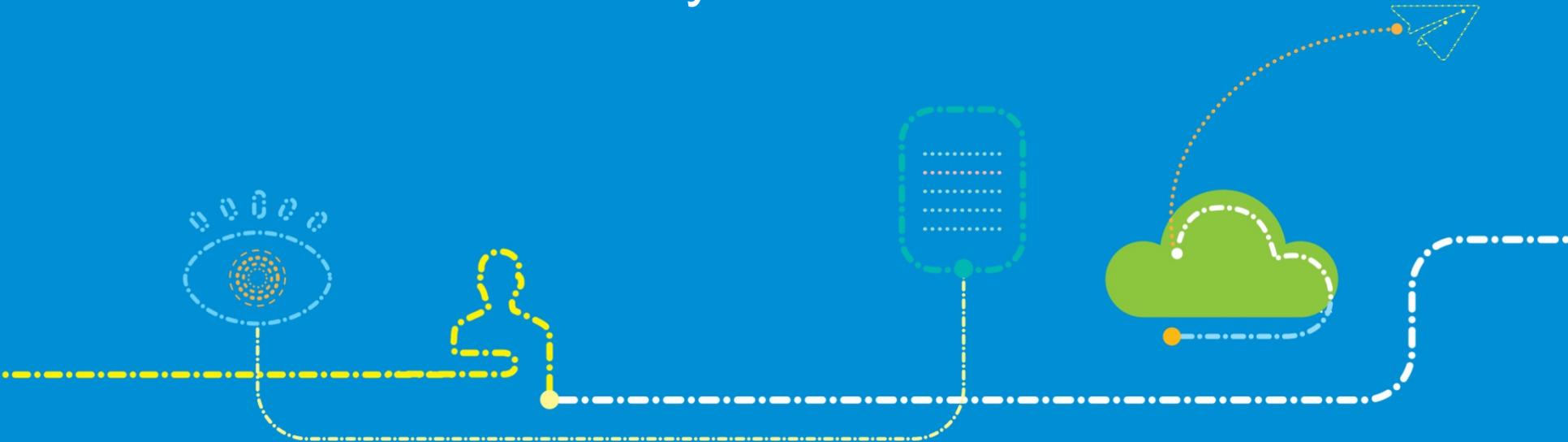


Source: ZTE, Sanechips  
Agenda: 9.0.3

# Discussion on Mobility enhancements



# Mobility enhancement

- Mobility management is a key part of any wireless communication system and is a key enabler for ubiquitous and always-on wireless connectivity
- Enhancements to mobility have always been part of each of the 3GPP release for 5G NR, however, new challenges and new requirements are always seen from deployments
- In Rel18, further enhancements to mobility are needed, and focus should be on the following three aspects:
  - Mobility enhancement for FR2 (e.g. improve robustness and interruption in FR2 mobility)
  - Mobility enhancement for new services (AR/VR) (e.g. avoid throughput gap during mobility).
  - Leftover issues from Rel-17

# L1/L2 mobility - Motivation

- The L3 triggered mobility seems too slow for FR2 in some cases, due to the use of “time to trigger” and “hysteresis”. Therefore, L1/L2 triggered mobility seems helpful as a complementary feature to the normal HO.
- Considering the requirement to act fast on the L1/L2 triggered mobility and the potential ping-pong issue, the study on L1/L2 triggered HO should focus on the scenarios where:
  - Only the change of L1/L2-low configuration (i.e. PHY, MAC, FFS on RLC) is required
  - Security key change is not needed
  - Radio bearer level configuration can be reused
  - Path switch and data forwarding are not required

# L1/L2 mobility - Scope

- The following scope is supported by majority companies for L1/L2 mobility in email discussion :
  - Configuration and maintenance for multiple candidate cells;
  - Dynamic switch mechanism among candidate serving cells for the potential applicable scenarios;
- During the discussions, it is not clear whether the multiple candidate cells can only be activated as PCell, or it can be activated as SCell as well in CA case.
  - To avoid unnecessary discussion in WI phase, further clarification is needed on this at plenary level.
- As one typical scenario in 5G advanced, FR2 cells may be aggregated as SCell with FR1 PCells, and the FR2 SCells are expected to carry majority of the throughput due to the much wider bandwidth, thus the interruption time reduction for SCell change/failure recovery is also important for 5G advanced.
- Therefore, we prefer to have a common framework for both L1/L2 mobility and CA enhancement and further clarify in the scope that:
  - The candidate cells configured for mobility can be activated as either PCell or SCell

# DAPS/CHO enhancements

- Leftover issues for CHO/CPAC:
  - DAPS+CA/DC
    - Successive CHO (CHO included in the legacy HO command or CHO command)
    - Successive CPAC (CPAC included in the legacy PSCell addition/change command)
    - NG-based CHO
    - Inter-RAT CHO
    - CHO/CPAC with inactive (Add CHO/CPAC configuration in the RRC resume)
    - Coexistence of CHO and DAPS
    - Coexistence of CHO and CPAC
  - CHO+MRDC
- Although we have a long release for Rel-18, it seems we still don't have enough time to address all the leftover issues above, and are support the majority view that CHO+MRDC and DAPS+CA/DC shall be prioritized.

# DAPS/CHO enhancements - DAPS+CA/DC (1)

- For the DAPS HO with CA/DC, in current specs, all the other serving cells have to be released before DAPS HO can be initiated.
- Considering the negative impact on the throughput during HO caused by such restriction, we see some benefit to support the DAPS HO with CA/DC and avoid the throughput gap during DAPS HO.
- However, considering the complexity for maintaining four connections simultaneously (i.e. source MCG/SCG and target MCG/SCG), the DAPS+DC shall be excluded from the scope.
- The enhancement on DAPS+DC should instead focus on the signaling optimization to avoid SCG release before the initialization of DAPS HO, but still up to two cell groups (i.e. MCG in source and target node) can be activated during DAPS HO.
- **Scope proposed for DAPS+DC**
  - Signaling optimization to enable DAPS HO with deactivated SCG (i.e. avoid SCG release before the initialization of DAPS HO).
  - The maximum number of active cell group during DAPS HO shall still be limited to two.

## DAPS/CHO enhancements - DAPS+CA/DC (2)

- For DAPS+CA, further discussion is needed to conclude whether active SCell can be maintained during DAPS HO
- Considering multiple active ULs may cause UL power reduction, which may lead to negative impact on the mobility robustness, we think a study phase is needed to identify the target scenarios (e.g. whether only one UL CC is allowed, whether only one PUCCH group is allowed in each gNB) and confirm the feasibility.
- **Scope proposed for DAPS+CA**
  - Study the feasibility to maintain CA SCell transmission in both source side and target side during DAPS HO, and identify the target scenarios (e.g. number of UL CC, PUCCH groups in each node).
  - Specify the necessary enhancements to support the signaling for the identified scenarios

# FR2 specific enhancements - DAPS V.S. MBB/RACH-less

- DAPS in FR2-FR2 V.S. MBB/RACH-less
  - It is possible that DAPS based solution may provide slightly better performance but this comes at the expense of extra complexity
  - Complexity has to be taken into account to ensure the feature can be implemented in the market.
  - If only few UEs can support this feature then the feature seems less useful.
  - Given that a the complexity analysis (especially from RAN4 perspective) needs to be performed, we prefer consider solutions (i.e. DAPS and MBB/RACH-less), and down select during the WI phase
- Scope proposed:
  - Study the feasibility of DAPS for FR2-FR2 and identify the corresponding impact [RAN4]
  - Down select between DAPS for FR2-FR2 and MBB/RACH less based on the input from RAN4, and specify the necessary signaling procedure accordingly [RAN2, RAN1]

# Scope for Mobility enhancement

- L1/L2 triggered mobility
  - Configuration and maintenance for multiple candidate cells. The candidate cells configured can be activated as either PCell or SCell [RAN2, RAN3];
  - Dynamic switch mechanism among candidate serving cells for the potential applicable scenarios. [RAN2, RAN1];
  - L1 enhancements, including inter-cell/mTRP beam management, L1 measurement and repindication and timing management (if needed, as a second priority) [RAN1, RAN2, RAN4]
- DAPS/CHO enhancement
  - CHO+MRDC [RAN2, RAN3]
  - DAPS+CA/DC
    - Signaling optimization to enable DAPS HO with deactivated SCG (i.e. avoid SCG release before the initialization of DAPS HO) [RAN2, RAN3]
      - Note: The maximum number of active cell group during DAPS HO shall still be limited to two. Study the feasibility to maintain CA SCell transmission in both source side and target side during DAPS HO, and identify the target scenarios (e.g. number of UL CC, PUCCH group in each node). Specify the necessary signaling procedure for the scenarios identified. [RAN2, RAN1, RAN3]
- FR2 specific
  - Study the feasibility of DAPS for FR2-FR2 and identify the corresponding impact. [RAN4]
  - Down select between DAPS for FR2-FR2 and MBB/RACH less based on the input from RAN4, and specify the necessary signaling procedure accordingly. [RAN2, RAN1]

# Work split between CA/DC and mobility enhancements

- MR-MC has been discussed in the CA/DC enhancement thread with majority support. Since it is a typical scenario that FR2 cells are configured as SCG which carry majority throughput, minimizing the SCG interruption time (e.g. caused by SCG change, SCG failure) seems essential for the success of FR2. Therefore, we think the MR-MC enhancement should be part of Rel-18.
- For the overlapping between MR-DC and Mobility enhancement, we are open to discuss the grouping of features the following two alternatives can be considered:
  - Alt1: Have a big WI to cover the enhancements identified in both mobility and CA/DC.
  - Alt2: Have separate WI for mobility enhancements and CA/DC
    - Alt 2-1: Mobility enhancements focus on PCell change procedure (i.e. HO), and CA/DC mainly focus on the SCG change enhancement
    - Alt 2-2: Mobility enhancement focus on the L1/L2 mobility within one DU, and CA/DC enhancement cover the cell group level activation/deactivation/switching (i.e. inter-DU).