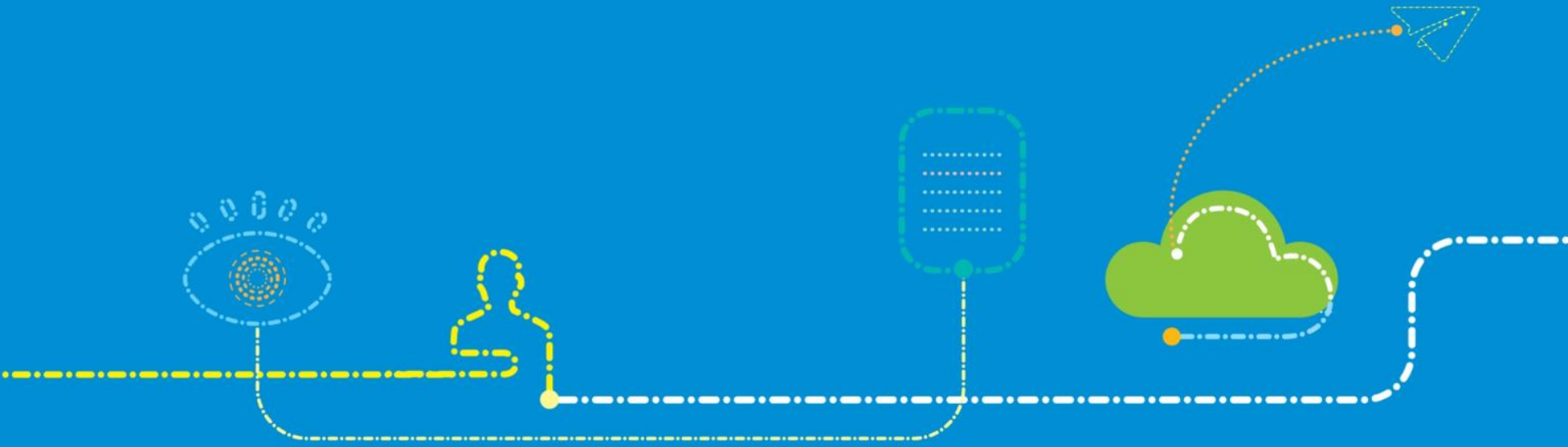
3GPP TSG RAN Meeting #93e
Electronic Meeting, September 13 – 17, 2021

RP-212390

ZTE
Tomorrow never waits

Source: ZTE, Sanechips, Samsung, Verizon
Agenda: 9.0.3

CA/DC Enhancements for Rel-18



Motivation

- FR2 - *a key enabler for 5G advanced*
  - FR2 will unlock wider bandwidth, higher throughput, lower latency and larger capacity
  - FR2 will become more widespread worldwide in Rel-18 timeline

- Although FR2 is supported from Rel-15, there are still lots of challenges in the FR2 deployment and the following enhancements will help realizing the full potential of FR2
  - Robustness improvements
  - Interruption reduction
  - Fast Failure recovery

NOTE: The enhancements proposed in these slides mainly focus on high layer aspects, and can be used in FR1 cells as well. CA enhancement for PHY are discussed separately in RP-212394.

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Interruption time reduction for SCG

- Minimizing the SCG interruption time (e.g. caused by SCG change, SCG failure) is eseential for the success of FR2
  - FR2 cell is usually used as SCG due to the limited coverage. And SCG change/failure may occur more frequently due to the smaller coverage and fluctuating radio conditions.
  - Since split bearer is not much helpful in case there is huge gap in throughput and latency between two legs, the data transmission will mainly be carried by SCG in case FR2 SCG is configured.
  - The data transmission interruption time is mainly determined by the interruption time in SCG (where the throughput is carried) instead of the interruption time in MCG (e.g. 0ms interruption for HO in MCG is not helpful when the main contributor to throughput is SCG).

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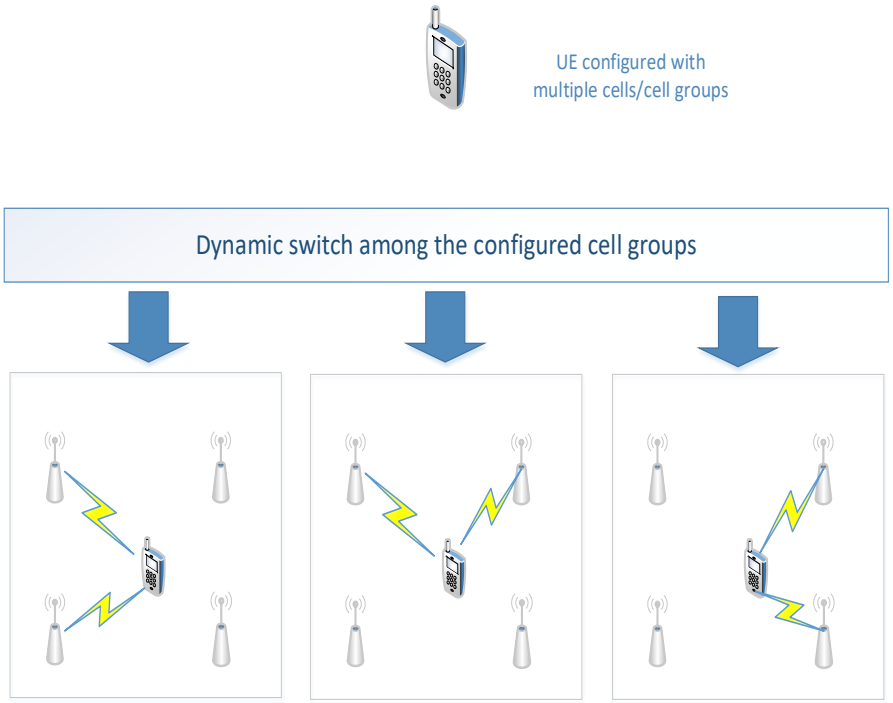
MR-MC – interruption reduction and robustness improvement

- To improve the robustness and interruption time, multi-connectivity with selective activation (e.g. by limiting the number of active CGs to two) seems to be a promised solution, which brings a good balance between the performance and complexity.
  - More than two cell groups can be configured on UE side, and up to two of them can be activated simultanously.
  - The configured cell group can be activated as either SCG or MCG.
  - The connection activation/deactivation/ switch can be triggered by either NW or by UE (e.g. based on preconfigured event).
  - DRB primary path switch and duplication activation/deactivation can be triggered by UE.



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Fast failure recovery

- Fast failure recovery through SCell
  - FR2 is expected to be used widely in indoor scenarios. In case of CA with multiple FR2 carriers are configured, fast failure recovery through SCell will be helpful to improve robustness of the whole system. With the fast failure recovery through SCell, in case PCell failure is detected, the SCell can be used to recover the connection and the RRC reestablishment procedure can be avoided.
- Fast role change in CA/DC
  - According to current specs, the SCell/SCG can not be reconfigured to PCell/MCG directly. Instead of that, SCell/SCG will be released and add back as PCell/MCG, which may lead to unnecessary delay and signaling overhead. To improve the interruption time, enhancement can be made to improve the role change procedure (e.g. avoid SCell/SCG release/addition, minimize the inter-node interaction, avoid unnecessary RACH procedure, etc).
  - Further details of fast role change for CA/DC can be found in RP-212391.

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SRS transmission in dormant state – interruption time reduction

- In Rel-16, SCell dormant state has been introduced to enable a fast SCell activation. However, UL SRS transmission is not allowed in dormant state, and reinitializing the best beam in FR2 relies on the RACH procedure
- Lack of UL SRS in dormant state is a bottleneck in achieving full potential of the SCell dormant state for FR2 cells and increases the latency in activation of the FR2 SCells
- Supporting SRS transmission in dormant state will help reducing the latency for activation of FR2 SCells.

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Scope of CA/DC enhancement

- Support MR-MC with up to two active legs [RAN2, RAN3]
  - Support the configuration of more than two cell groups.
  - Dynamic cell group activation/deactivation/switching mechanism.
    - The configured cell groups can be activated as either MCG or SCG.
    - Both NW triggered and UE triggered mechanism can be considered
    - Prioritize the fast activation/deactivation/switching among cell groups within one CU (i.e. without security key change, path switch) – other cases can be considered if time allows
  - UE capability management/coordination enhancement (e.g. only the activated cell group will consume UE capability)
- Support SRS transmission in dormant state [RAN2, RAN1]
- Fast failure recovery [RAN2, RAN3]
  - Fast failure recovery through SCell
  - Fast role change in CA/DC (e.g. avoid SCell/SCG release, minimize the inter-node interaction, avoid unnecessary RACH procedure, etc)

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Work split between CADC and mobility enhancements

- The important thing is to ensure the CA/DC enhancement can be part of Rel-18. We are open to discuss the grouping of features for each WI.
- Two alternatives on the table
  - 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 (e.g. within one cell group), and CA/DC enhancement cover the cell group level activation/deactivation/switching.

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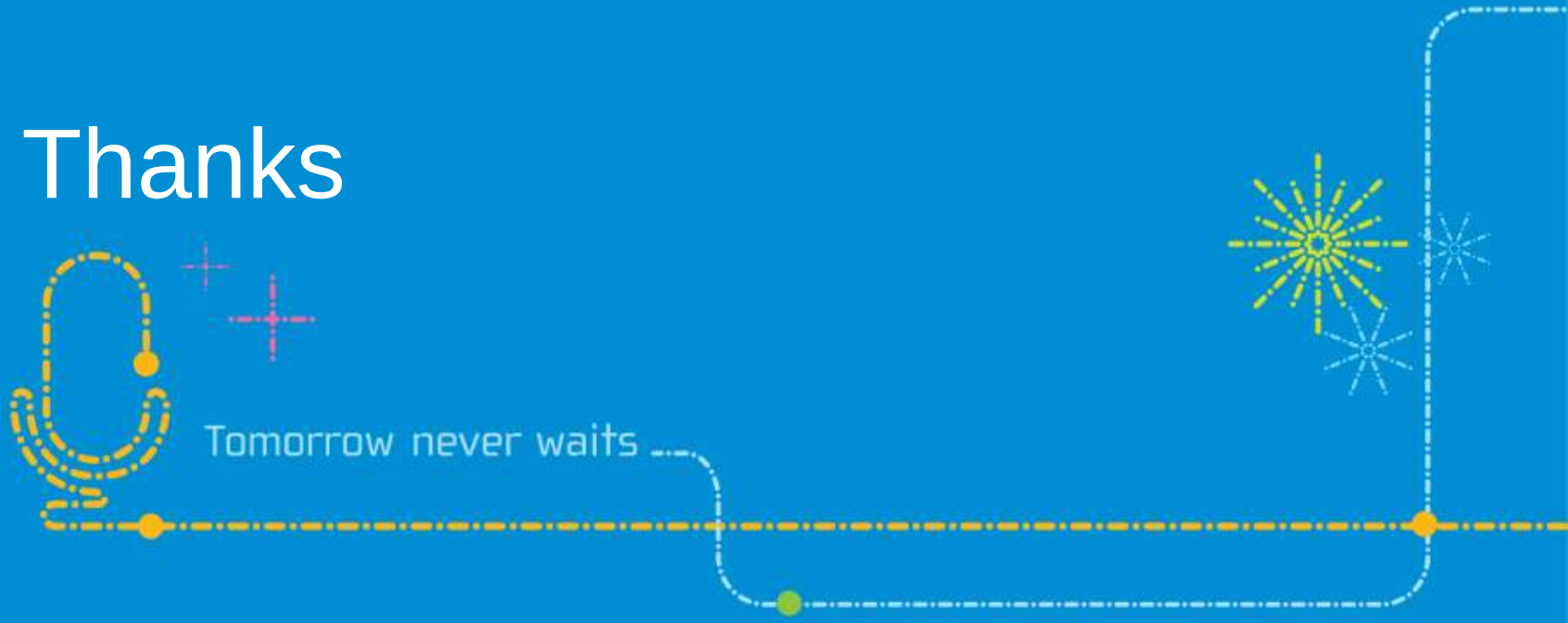
Thanks