submission

Variant of [RAN94e-R18Prep-10] Mobility Enhancements Version 0.0.4

RAN

3GPP TSG RAN Meeting #94-e **RP-212670**

Electronic Meeting, December 6-17, 2021

Source: **Mobility enhancements moderator (CMCC)**

Title: **Moderator's summary for discussion [RAN94e-R18Prep-10] Mobility enhancements**

Agenda item: **8A.2**

Document for: **Discussion and decision**

1 Introduction

As per the guidance from RAN#93 [1], the topic of Mobility Enhancements is one of the set of email threads for the email discussion during October 20th to 29th with the following general guidance:

a) The **goal** of the email discussion is to **focus on potential scope/areas for each potential WI or SI**, with **NO intention to update the set and the organization of the topics as endorsed in** RP-212608
   - Any further update/consolidation of the topics/structure is to be handled in RAN#94-e
   - Aim to identify whether a topic should be a **SI, or WI** (including possibly a study phase for some scope(s))
   - Aim to identify on the **leading WG** (including if any change compared with those in RP-212608) and the secondary WG(s)
   - Aim to identify on the potential **interaction with SA/CT**
   - Critical to keep all items under **rigorous check**; important to avoid "number counting" driven discussion, but focus on **tangible commercial interests** (near & longer terms)

Based on the September email discussion as concluded in [2] and additional consideration in [3] from the RAN Chair's Summary for RAN Release 18 as follows,

a) For "Mobility Enhancements",
   - Also including discussion on CA/DC related mobility aspects

this email discussion aims at consolidating the areas and objectives and formulating the SID/WID to be agreed in RAN#94 for the topic of Mobility enhancements in Rel-18 by taking above considerations into account as well as the September email discussion for CA/DC enhancements [4].

Please provide your proposals/comments with motivations and assessment, and avoid inputs simply indicating "support/not support".

2 Initial Phase

The goal for initial round is to collect proposals from companies for undiscussed/contentious objectives in different areas, which can be used for potential objectives convergence in the intermediate round.

2.1 General

Companies are invited to provide general comments on the SI/WI endorsement, leading and impacted WG of the topic of mobility enhancements, respectively.

2.1.1 Leading and impacted WG

This issue has been discussed in September email discussion and the conclusion is as follows [2],

Conclusion 1: RAN2 is the leading WG for mobility enhancement in Rel-18, while RAN1, RAN3 and RAN4 are impacted WGs.

Given that above conclusion 1 is already consensus, the moderator hence thinks it can be acknowledged without further discussions in this email discussion.

2.1.2 SI/WI?

Companies are invited to provide your views that the topic of mobility enhancements can be a WI in Rel-18. It should be noted that this topic has contained quite a few aspects which was leftover from Rel-17 and thus it seems straightforward to go with a WI. It is suggested to have the mobility WI. Please companies indicate your consideration here.

Feedback Form 1: Endorsement of a WI

1 – Ericsson LM A WI in Rel-18 is suitable as the scope is covering mainly leftovers from Rel-17 WIs.
2 – HuaWei Technologies Co. We share the similar view as the moderator that mobility enhancement should be a WI in Rel-18.
3 – InterDigital France R&D We think this should be a WI.

4 – MediaTek Inc.

We are not 100% sure that the scope is mainly “leftover of Rel-17”, but we agree that this should be a WI in Rel-18.

5 – Beijing Xiaomi Mobile Software

We support WI

6 – FGI

We support it to be a WI.

7 – Spreadtrum Communications

We support it to go with WI.

8 – China Telecommunications

We agree that this should be a WI in Rel-18.

9 – Lenovo (Beijing) Ltd

Most of the use cases included the scope are leftover from Rel-16 and Rel-17. We agree to have a WI for mobility enhancement.

10 – CATT

We agee that this should be a Rel-18 WI

11 – Samsung Research America

We are fine with WI

12 – NTT DOCOMO INC.

We agree to make it WI.

13 – KDDI Corporation

We are fine with WI

14 – Guangdong OPPO Mobile Telecom.

We think it should be a WI as the study contains quite a few R17 leftovers.

15 – LG Uplus

We are fine with WI

16 – vivo Mobile Communication Co.

We agree with Moderator that mobility enhancement should be a WI in Rel-18.

17 – SHARP Corporation

We are fine with WI.

18 – Fujitsu Limited

We agree with moderator's view. This can be WI in Rel-18.

19 – NEC Corporation

If main objectives are leftover from Rel-17, then Yes, it can be a WI. However, depending on additional objectives (which are something new), there should be an investigation phase, although it is not good to have a study phase within a WI.

20 – Nokia Germany

Mobility enhancements can be a work item in Rel. 18, even though we do not fully share the view this are all leftovers from Rel-17. E.g. some aspects for L1/L2 mobility may need to be studied.

21 – China Unicom

We support it to be a WI in Rel-18.

22 – ZTE Corporation

We agree that this should be a WI in Rel-18

23 – China Mobile Com. Corporation

We agree that the mobility enhancement should go with a WI.

24 – LG Electronics France

We support this as WI

25 – Futurewei Technologies

We are fine with it being a Rel-18 WI.

We also acknowledge that not all aspects are fully studied/settled, although some of them are left out from previous releases.

26 – Facebook

Fine with a WI

27 – Apple Hungary Kft.

WI is the better choice for us as well.

28 – Qualcomm CDMA Technologies

We also support the WI. There is no need for a SI phase.

29 – Intel Corporation (UK) Ltd

We agree that the WI is suitable based on the potential items discussed in the email discussion.

30 – Continental Automotive GmbH

A WI would be fine in our view.

2.2 Area 1: L1/L2 mobility enhancements

2.2.1 Remaining controversial aspects

The high-level objectives for L1/L2 based inter-cell mobility have been discussed and concluded to a good extent including applicable scenarios as intra-DU and intra-CU inter-DU cases, and the remaining contentious issue is the second-priority scenarios that can be revisited in this email discussion. Please companies provide your views on whether you support inter-CU and MR-DC cases. Noted that besides saying Yes or No, please provide the analysis of corresponding workload for supporting the scenario and also the potential probability of implementing it (tangible commercial interests).

1. inter-CU case
2. MR-DC case where the serving cell is changed within MCG or SCG

(note that in previous discussion some companies also mentioned cell group change, however this discussion was relevant to MR-MC and it is suggested companies to make clear proposals in 2.3)

Feedback Form 2: Applicable scenarios for inter-CU and/or MR-DC of L1/L2 mobility enhancements

1 – Ericsson LM

Regarding **inter-CU**, we think this can be removed since the impact will be large. For intra-CU inter-DU it is not even certain one can really benefit from the feature and a proper study would need to be done first. The reason is that in inter-DU it is not clear whether the procedure can really be done without a MAC reset, which would increase the interruption time which is aimed to be reduced with L1/L2 mobility. Could perhaps be considered in a later release which is not as full as Rel-18, after a proper study of its benefits. Or if the work in the WGs progresses well in Rel-18 for the basic scenarios, we could consider extending the WID later.

Regarding **MR-DC case**, i.e. L1/L2 mobility for a PSCell (intra-DU intra-CU) could be supported pending RAN2 understanding that the feature does not require much extra work, as most of the operations are on MAC level anyways (cell group). But, it could be supported if time allows.

2 – HuaWei Technologies Co.

a) inter CU case

This case will involve PDCP anchor relocation and introduces significant complexity including security key change, L2 reset procedures, PDCP re-establishment etc, which will make the L1/L2 mobility less attractive compared with L3 handover. Thus for inter-CU case, we think the gains to apply L1/L2 mobility

is limited and thus can be excluded at this stage.

b) MR-DC case

If the case refers to the serving cell change within MCG or SCG, i.e, no cell group change. Then we understand the L1/L2 aspects within MCG or SCG could be similar as CA case, and if this is the case this can be considered together with CA case without extra impact.

3 – MediaTek Inc.

R2 Chair: CA Is it really clear what is meant by support of CA scenario (there was significant divergence last time R2 discussed this)? Is it a Pcell Change (handover) where the configuration of Scells is kept?

MRDC: I have no strong opinion, but it seems that the effect of not supporting DC is that as soon as an anchor connection (MCG) is added on a lower frequency then the mobility for the higher frequency (SCG) would perform worse than if the UE was operating stand-alone on the higher frequency, but but in any case I think RAN2 would/could organize the discussion as suggested by Ericsson above, focus on Pcell first and then towards the end see if DC (maybe at least NR NR DC) could be supported with minimal additional impacts ..

4 – InterDigital France R&D

For inter-CU case, we think the complexity is high due to PDCP anchor relocation, and so the scenario should not be supported. For MR-DC, we think this can be supported, as it should not have significant impact given that main impact of L1/L2 mobility is at the MAC/PHY layers.

5 – MediaTek Inc.

Inter-CU case should be excluded due to significant procedural impact and limited gain.

6 – China Telecommunications

For **inter-CU** case, it is more complex compared with other scenario, as there may be many impact on the path switch and security key update, in addition, we may need to fix up the ping-pong issues, so we think it should be excluded.

For **MRDC** case, the SCG would be widely used to provide high data rate service, so we think we need to support L1/L2 mobility at least in some MRDC scenario to reduce data interruption, such as support switching between sPcell and SCell.

7 – FGI

Compared to MR-DC, inter-CU is more complex since it involves PDCP anchor relocation. We suggest to keep MR-DC rather than inter-CU, in case that we need to choose one of them.

8 – NTT DOCOMO INC.

For inter-CU, we believe the spec. impact is large on RAN2, as analyzed by HW, which should be avoided. Hence, L1/L2 mobility should be limited to intra-CU scenario in Rel-18 considering at least the workload.

9 – Spreadtrum Communications

a) Inter-CU case

We think it should not be supported considering its complexity and gain.

b) MR-DC case

In this case, due to that the serving cell is changed within MCG or SCG, which have limited impact on specification, it can be supported.

10 – Lenovo (Beijing) Ltd

L1/L2 mobility aims to speed up the mobility procedure for reducing latency. Therefore, inter-CU case can be for future release. For MR-DC, SCell change can be quickly changed within MCG or SCG. But we need to complete the cases of Intra-DU and Intra-CU first.

11 – Samsung Research America

We expect additional impact to support L1/L2-based mobility for inter-CU and MR-DC scenario on top of inter-DU mobility. But the additional impact might not be much. So we can consider inter-CU/MR-DC cases either, but with lower priority than intra-CU/inter-DU case.

In inter-CU case, a UE may be located at the boundary of two CUs and the UE can communicates with TRPs belong to different CUs/DUs. So similar to intra-CU inter-DU case, L1/L2-based mobility could be supported even in inter-CU mobility.

In MR-DC case, L1/L2-based mobility could be used for SN change. The SN change with L1/L2 signaling could reduce interruption time during SN change, especially in FR2.

12 – KDDI Corporation

Inter-CU : As many companies mention above, we also think working on Rel-18 is not feasible because of its significant procedural impact.

MR-DC case : Similar view with others, it seems to impact on MAC level any (cell group). So we are fine with including it in the objectives at this moment.

13 – Guangdong OPPO Mobile Telecom.

For inter-CU, we see no obvious gain by comparing with legacy L3 handover as the PDCP anchor relocation as well as key update are required for inter-CU scenario. We suggest to remove the inter-CU case from the scope.

For MR-DC, L1/L2-based mobility could be beneficial for interruption reduction for PScell/Pcell change, as there is no much extra work required for supporting it, we prefer keep it in the scope.

14 – vivo Mobile Communication Co.

For inter-CU, it will have significant impacts on the procedure and high layer behaviour, which leads complexity with less benefit. Thus, it should be excluded by now. Rel-18 should focus on a complete design for L1/L2 mobility. After that, more scenarios could be considered in later release.

For MR-DC case, we agree that Pcell/PScell change without CG change is same as CA case. We could include MR-DC in the scope, but during the WG discussion, it is better to firstly focus on PCell/PScell change. After that, we could extend the use case for L1/L2 mobility. Otherwise, too many scenarios may impact the design for general L1/L2 mobility procedure.

15 – SHARP Corporation

For Inter-CU case, the specification impacts will be large, so we think this can be excluded on this stage.

For MR-DC case, it is assumed the serving cell change is within CG, so we think it could be supported.

16 – CATT

We think inter-CU case can be dropped from the work scope due to its impact on many aspects such as PDCP and security procedure. The possible flexibility or gain with L1/L2 mobility is unclear when all these aspects are taken into account.

For MR-DC, we think it is better to first align companies' understanding regarding what this means/requires with L1/L2 mobility. For example, our understanding is that we should focus on serving cell(s) change only for MN or SN (more specifically PSCell change that does not involve MN, or PCell change that does not impact SN), instead of switching between MN/SN.

17 – Fujitsu Limited

Inter-CU should not be supported as it requires security key change and RRC reconfiguration is necessary.

18 – NEC Corporation

Generally speaking, considering the other potential objectives for Mob enh and expected available time, the scope should be carefully selected.in Rel-18 to complete the work on time.

1. inter-CU case

No. Therefore, inter-CU case should be precluded from the beginning, because the inter-CU would mean to violate the current concept of having RRC layers independent for different CUs. It is easily expect much more work than other cases. In Rel-18 at most intra-CU inter-DU should be sufficient.

2. MR-DC case

No. It is not yet very clear what kind of impact is there in the case of serving cell change via L1/L2 mobility. At this moment, the scope should not include this.

19 – Nokia Germany

In case of **inter-CU**, the UE may need to reconfigure PDCP and RRC when performing a cell change as they are hosted by another CU. Hence, the benefits of L1/2 inter-cell mobility compared to L3 mobility are not clear at this stage. We propose in the first phase of the WI to prioritize intra-DU and inter-DU intra-CU scenarios and to revisit it for inter-CU and/or MR-DC once we have progressed on L1/2 inter-cell mobility.

As for the potential probability of implementing the feature, it highly depends on its technical benefits. If L1/2 inter-cell mobility would reduce the interruption time substantially (compared to baseline HO/CHO) to meet the requirements of new vertical services, such as URLLC or XR/AR, yet without compromising mobility robustness, then the chances for implementing the feature would be higher. Otherwise, if the interruption reduction achieved by L1/2 inter-cell mobility is smaller than baseline HO/CHO but still high for these new services, then the feature would become less attractive as interruption time reduction during handover is not that critical for mobile broadband services.

20 – ZTE Corporation

Currently the objective says "(1) Configuration and maintenance for multiple candidate cells to allow fast application of configurations for candidate cells [RAN2, RAN3];"

Our understanding is that this objective limits this to intra-DU case hence. And this is fine from our perspective.

For inter-DU case, we think this will apply to multiple candidate **cell groups.** However, in this case, we think this area actually falls under the scope of CA/DC related mobility enhancements.

21 – China Unicom

In Inter-CU case scenarios, PDCP re-establishment, RLC and MAC layer need to be enhanced if the anchor point of PDCP is changed, thus the workload will be too high to handle in Rel-18. Thus we prefer it can be excluded R18.

22 – China Mobile Com. Corporation

Inter CU case is too complex with uncertain gains. We should focus on the L1/L2 for PCell first, and extend the work to MR-DC if time allows.

23 – LG Electronics France

We are okay to consider MR-DC scenarios but we want to exclude the inter-CU scenarios because the support for inter-CU scenarios is expected to give significant impacts on both user plane aspects and control plane aspects.

24 – Futurewei Technologies

Inter-CU scenario can be excluded in Rel-18 from use cases of L1/L2 mobility.

As long as MN and SN are intra-CU, there doesn't seem to be much difference in applying L1/L2 mobility from non-DC cases. To be on the safe side, we can start from NR-DC with MN and SN are intra-CU.

25 – Apple Hungary Kft.

It is our view to develop the L1/L2 mobility as a unified framework without differentiation between intra-CU/inter-CU etc as from the UE perspective, it would be a configuration. If the L1/L2 mTRP operation is possible with DUs from diff CU, then mobility should be possible. However, we do see the complexity on implementing mTRP with diff CU (in terms of latency etc…and also on sync/async which is the next question) From this perspective, we can first focus on the intra-CU case and consider this if time permits. It is our view that RAN2 should try to design the L1/L2 mobility framework in a unified manner applicable to all scenarios.

For the MR-DC case, it would be good to first understand the meaning of L1/L2 mobility within a CG, as the UE already has one MAC (CA model). If it is about PCell/PSCell change with L1/l2 we think the impact is minimal, and so can be included

26 – Qualcomm CDMA Technologies

Inter-CU

We agree with others that inter-CU requires PDCP anchor change which require L2/L3 involvement. Therefore, L1/L2 mobility will not bring any major benefit to the handover latency. This will also require RAN3 involvement. Actually, even inter-DU should be lower priority since that also requires a new inter-DU interface and L2 reset at the UE, which makes the benefits of L1/L2 mobility for this case very questionable.

MR-DC

L1/L2 solution for MCG can be easily re-used by SCG. Since this is a MAC and below operation and DC has separate MACs for MCG and SCG, there shouldn't be any major issues and the delta will be very small. Furthermore, cell changes of SN can be more frequent than MN which will have a broader coverage than SN. It would also be strange to have fast MN switching via L1/L2 but only support slower L3 mobility for SN. Therefore, it is quite important to have MR-DC, especially NR-DC, in the scope.

27 – Intel Corporation (UK) Ltd

We support to use L1/2 mobility for inter CU case and NR DC case. It can reduce the interruption time and improve the reliability in case of the cell switching for inter CU case and NR DC case.

The additional work load to support inter CU case should be negligible if the cell group change in 2.3 is supported since the solution for cell group change could be reused for inter CU case;

For NR-DC, if we only consider the cell change within MCG or SCG, there should not be additional work since the solution should be same if security key is not changed. And in case the security is changed for cell switching within MCG, additional work is to change the SCG (but this should be same as MCG change with SCG scenario);

3. Synchronized/non-synchronized

Companied are invited to provide your comments whether only synchronized scenario or both synchronized and non-synchronized scenarios can be applicable scenarios for L1/L2 mobility enhancement in Rel-18. Note that for non-synchronized scenario, TA management across serving cells will be involved. Still besides saying Yes or No, please provide the analysis of corresponding workload for supporting the scenario and also the potential probability of implementing it (tangible commercial interests).

Feedback Form 3: Applicable scenarios for synchronized/non-synchronized of L1/L2 mobility enhancements

1 – Ericsson LM

We do not see a reason to exclude any of synced or non-synched now. We can leave this to the WGs to decide. If they bump in to problems with one of the scenarios, plenary can intervene later. But spontaneously there should be no issue to support both.

2 – HuaWei Technologies Co.

We think both synchronized and non-synchronized scenarios can be considered in Rel-18.

We understand supporting different TA values across serving cells will help extending the applicable scenarios of inter-cell beam management, especially for inter-DU case.

3 – InterDigital France R&D

We think there should be no issue to support both unless the WGs indicate such during the WI.

4 – MediaTek Inc.

We think both synchronized and non-synchronized scenarios should be considered.

The applicability of Rel-18 enhancements would be quite limited if it supports only synchronize scenario, e.g. TA must be the same. Some extra works are needed for non-synchronized scenario, e.g. UE may need to acquire TA before handover to another cell triggered by L1/L2 signal. But this is what we can discuss in Rel-18.

5 – Beijing Xiaomi Mobile Software

We think it's better to support both scenarios.

6 – China Telecommunications

We think both synchronized and non-synchronized scenarios should be considered in Rel-18. The detailed impact of different TAs can be further discussed and studied during the WI phase.

7 – FGI

From deployment's perspectives, we should consider both synchronized scenario and non-synchronized scenario including TA management across serving cells.

8 – NTT DOCOMO INC.

Non-synchronized scenario is an important scenario for L1/L2 mobility considering time difference between two cells to a UE, which should be supported in addition to synchronized scenario. Otherwise, the use case of L1/L2 mobility is too limited.

9 – Lenovo (Beijing) Ltd

If we only focus on synchronized case, it could be restricted in intra-DU case. If Intra-CU/Inter-DU is considered, 'non-synchronized' should be considered. Therefore, we support both.

10 – Samsung Research America

We prefer to support the non-synchronized cells, especially for inter-DU scenarios in Rel-18. This implies that the TA of different cells is different (i.e. outside the CP range) and this would require special handling in RAN1.

11 – Spreadtrum Communications

We think at least synchronized scenario should be supported. For non-synchronized scenario, the issue on how to obtain TA should be studied. Since it can also get gain from L1/L2 mobility, it should extend to be supported.

12 – KDDI Corporation

Same view with others, both synchronized and non-synchronized scenarios should be included.

13 – Guangdong OPPO Mobile Telecom.

We think both synchronized and non-synchronized scenarios can be studied.

14 – vivo Mobile Communication Co.

We think measurement and corresponding report for both synchronized and non-synchronized scenarios should be considered for L1/L2 based inter-cell mobility. There is no reason to exclude one of them.

15 – CATT

We think both needs to be included.

16 – SHARP Corporation

Non-synchronized scenario is applicable for inter-DU case, so both synchronized and non-synchronized scenarios should be considered.

17 – Fujitsu Limited

Both scenario can be supported.

18 – Nokia Germany

The applicable scenarios should be for synchronized and non-synchronized DU scenarios. In case of inter-DU intra-CU change, the source and target cells are located in different physical DU entities and TA may not be the same for both cells. This may happen even in the case of intra-DU when the TRPs of the cells are not co-located

19 – ZTE Corporation

We agree with others that both should be considered.

20 – China Unicom

We support both synchronized/non-synchronized scenarios in R18.

21 – China Mobile Com. Corporation

We think both synchronized scenario and non-synchronized scenario should be supported for the availability of L1/L2 mobility in network deployment.

22 – LG Electronics France

Both synchronized and non-synchronized can be considered in Rel-18. We think TRP handling with different TA values may be the key issue in non-synchronized scenario.

23 – Futurewei Technologies

There is no need of imposing limitation on synchronization. And both synchronized and non-synchronized scenarios can be considered.

24 – Apple Hungary Kft.

mTRP for inter-freq was already discussed to be part of Rel-17, and it is our view that non-synchronized scenarios were part of the mTRP in that discussion. We see no reason to exclude non-synchronized scenarios for L1/L2 mobility, since as long as mTRP operation works, mobility would go hand in hand

25 – Qualcomm CDMA Technologies

We support including non-synchronized in the scope. Different TA will be necessary, at least for the inter-DU case. It is also restrictive to have all DUs to be synchronized, considering the actual deployments. Therefore, limiting to synchronized will exclude at least inter-DU scenario.

26 – Intel Corporation (UK) Ltd Asynchronized scenario is the typical scenario in current network deployment, and therefore should be supported. We agree that the TA management across serving cells should be considered, and this may also need to involve RAN1.
27 – Continental Automotive GmbH Both should be considered.

2.2.2 Initial WID draft of L1/L2 mobility enhancements

The moderator thinks the high-level objectives of L1/L2 mobility enhancements in the September email discussion can be served as baseline of the aspect of L1/L2 mobility enhancement in the WID of the topic of mobility enhancements in Rel-18 (if this topic is introduced in Rel-18). Based on the further offline comments to improve the description of the objectives, the revised WID of this aspects can be as follows,

****

To specify mechanism and procedures of L1/L2 based inter-cell mobility for mobility latency reduction,

(1) Configuration and maintenance for multiple candidate cells to allow fast application of configurations for candidate cells [RAN2, RAN3];

(2) Dynamic switch mechanism among candidate serving cells for the potential applicable scenarios based on L1/L2 signalling, in order to minimize the performance impact for mobility, [RAN2, RAN1];

(3) L1 enhancements, including inter-cell beam management, L1 measurement and reporting, beam indication, and timing management (~~if needed, as a second priority~~place holder, pending to the outcome of this email discussion) [RAN1, RAN2, RAN4];

NOTE: FR2 specific enhancements are not precluded, if any.

NOTE: the procedure of L1/L2 based inter-cell mobility are applicable to the following scenarios:

Prioritized scenarios:

- Standalone, CA

- Intra-DU case and intra-CU inter-DU case

- Both intra-frequency and inter-frequency

- Both FR1 and FR2

Second-priority scenarios only if time is allowed (placeholder, pending to the outcome of this email discussion) :

- MR-DC

- Inter-CU

****

Companies are invited to provide your comments to the tentative description of the L1/L2 mobility aspects, which can be part of the WID of mobility enhancement in Rel-18.

Feedback Form 4: Descriptions of objectives of L1/L2 mobility enhancements

1 – Ericsson LM

List of " mechanism and procedures ":

Regarding bullet 2 above we can be more specific:

(2) Dynamic switch mechanism among candidate serving cells for the potential applicable scenarios based on L1/L2 signalling, in order to minimize the interruption time for mobility, [RAN2, RAN1, RAN3];

Impact to following procedures should be considered:

- RRM measurements, BFR/BFD, RLM, Inactive state, re-establishment and co-existence with L3 mobility.

Scenarios:

The inter-DU scenario can be down-prioritized now in order to get a reasonable scope.

2 – HuaWei Technologies Co.

We are in general fine with the suggested description of the objectives of L1/L2 mobility enhancements. We understand above objectives of L1/L2 mobility is based on the conclusions from the pre-RAN#93 email discussions after a long discussion, which is stable and the wording update from the moderator looks good.

3 – MediaTek Inc.

RAN2 Chair: I am somewhat worried that companies have a diverged view on what is L1L2 mobility. I understand the purpose of L1L2 mobility is for UEs in configurations with multiple beams by multiple TRPs. When a UE moves through such network the main mobility mechanism is beam switching based on L1 measurements. When the UE passes from the coverage area of one cell to another cell, at some point a serving cell change need to be performed. Currently serving cell change is triggered by L3 measurements and is done by RRC signalling triggered Reconfiguration with Synch for change of PCell and PSCell (and release add for SCells when applicable), all cases with complete L2 (and L1) resets, and involving more latency, more overhead and more interruption time than beam switch mobility. I understand that the goal of L1L2 mobility is to be able to do serving cell change with such low latency overhead and interruption time that it is reasonable to trigger it frequently to not be an hindering factor for frequent beam switching in an area with multiple TRPs associated with different serving cells. I am wondering whether such explanation would fit e.g. in the justifications part of a WI.

4 – MediaTek Inc.

RAN2 Chair: The objective (3) L1 Enhancements is completely unclear. It says that it is just a place holder, Unless it can be clarified what to achieve what problem to address what characteristic to enhance etc I'd suggest to move this objective to a Note in the WID for now.

5 – InterDigital France R&D

We think further details should be added to describe the impacted procedures in RAN2 (e.g. RRM measurements, etc).

6 – Beijing Xiaomi Mobile Software

For now, we are OK with current objectives. More discussion is needed about the details.

7 – MediaTek Inc.

One potential challenge for L1/L2 mobility is the security issue. After signaling solution has been agreed on Stage-2 level in RAN2, we may need SA3 involvement. Not sure if this needs to be reflected in the WID, but at least there should be some aligned expectations between companies.

8 – China Telecommunications

We are fine with the description at this stage, and we can further check whether the MRDC scenario can be listed as the prioritized scenarios after the initial round discussion.

9 – FGI

We are fine with the description at this stage, but we can further check based on the initial round discussion.

10 – NTT DOCOMO INC.

We're fine with the first two bullets. For the third bullet on L1 enhancement, we should consider the interaction with L3 measurement and reporting. And we think following enhancements can be also added:

(4) TA enhancement for non-synchronized scenario [RAN1, RAN2];

(5) Other L1 enhancement, if needed, on BFD, RLM [RAN1, RAN2].

11 – Lenovo (Beijing) Ltd

For now, we are fine with the current discription.

12 – Samsung Research America

We would like to suggest the following descriptions of objectives:

1) Specify the L1/L2 based inter-cell mobility framework to be supported in inter-CU/MR-DC as well as intra-CU/inter-DU deployments.

User plane data handling and inter-node/ F1 and Xn signaling for L1/L2 based inter-cell mobility considering each DU has own layer 2 protocol stack. Reducing the interruption time when the random access toward the target cell upon L1/L2 based inter-cell mobility is required.

2) Identify and Specify features to facilitate L1 measurement/ reporting and triggering of L1/L2 based inter-cell mobility.

L1 measurement/ reporting mechanism for inter-cell mTRP is the baseline with enhancements to support inter-frequency operation e.g. measurement gap, etc.

3) Identify and specify features to facility beam indication for L1/L2 based inter-cell mobility based on The unified TCI framework introduced in Rel-17, and including support of multiple TA values.

13 – Spreadtrum Communications

We are fine. Further details should be discussed for each objective.

14 – KDDI Corporation

In general, we are fine with the proposed objectives, but we also tend to agree with InterDigital, we may want to add more detailed RAN2 impacted procedures. Since we think it will help further discussion.

15 – vivo Mobile Communication Co.

We are generally fine with the description of the objectives with some comments:

a. Whether L1/L2 measurement and dynamic switch is based on UL or DL signal is not mentioned in the objective. Does this mean both UL-based and DL-based are included in the objective, while it is up to WG to discuss further?

b. Inter-DU scenario should be deprioritized.

16 – SHARP Corporation

We are fine with the current description.

17 – Guangdong OPPO Mobile Telecom.

We are generally fine with the descriptions of objectives of L1/L2 mobility enhancements. And it can be futher updated after the initial round discussion, e.g. remove inter-CU case.

18 – CATT

We are genernally fine with the objecitves.

-for bullet 2, the R2 part of work should better be more specific

-for bullet 3, the ”inter-cell beam management, L1 measurement/reporting and beam indication” part, that what are the difference compared with the work already done in Rel-17.

19 – NEC Corporation

Regarding the scenarios, Prioritized scenarios are already too much. Second-priority scenarios should be removed and explicitly preclude those. The description “if time is allows” tended to cause a problem in the past releases.

20 – Nokia Germany

The expressions related to the motivation of L1/2 inter-cell mobility can clarified further/ as the wording may be vague/misinterpreted:

- “Mobility latency reduction” can be elaborated and replaced by “handover interruption reduction and fast/slimmer handover procedure.”
- “In order to minimize the performance impact for mobility” can be replaced by “in order to reduce the time and signalling overhead for re-initiating the preparation of the cells.”

We also somewhat share the concerns (from RAN2 Chair) about how third objective is formulated.

21 – ZTE Corporation

We think both DAPS+CA/DC will result in high complexity both from standardisation as well as implementation perspective. So, we don't think this can fit in Rel-18.

CHO+MRDC is slightly less complex but we given the CA/DC related mobility enhancements provide a more flexible set of solutions to solve similar issues as this, it seems this objective is redundant.

22 – ZTE Corporation

(Please ignore the previous comment - it is for question in section 2.3)!

As mentioned by RAN2 chair, the objective 3 needs a bit more discussion.

For instance, we wonder what is the scope of the "L1 measurement and reporting, beam indication" and what will the overlap between this objective and MIMO work for instance as this seems to require some beam level feedback.

23 – China Unicom

We think the current objectives with the update from the moderator are fine for us.

24 – China Mobile Com. Corporation

We are generally fine with the current WID draft and think details can be further discussed in the next round.

25 – VODAFONE Group Plc

The inter-DU scenario can be down-prioritized in order to get a more reasonable scope.

26 – Futurewei Technologies

We are generally fine with these objectives for L1/L2 mobility. And we agree with Ericsson and Nokia to make it clear that L1/L2 mobility intends to reduce HO interruption time.

27 – Qualcomm CDMA Technologies

For Objective 2, we can phrase as "in order to minimize interruption and improve performance for mobility". Agree with others that we can add more details for Objective 3. One suggestion would be:

L1 enhancements to support L1/L2 mobility more efficiently:

- TA management to support async and multiple-TA
- L1 measurement and reporting, e.g. event-triggered reporting, better support of async scenario

28 – Intel Corporation (UK) Ltd

The proposed scope from moderator looks good to us. Only small revision based on our feedback in previous questions.

To specify mechanism and procedures of L1/L2 based inter-cell mobility for improvement of mobility latency reduction and reliability,

(1) Configuration and maintenance for multiple candidate cells to allow fast application of configurations for candidate cells [RAN2, RAN3];

(2) Dynamic switch mechanism among candidate serving cells for the potential applicable scenarios based on L1/L2 signalling, in order to minimize the performance impact for mobility, [RAN2, RAN1];

(3) L1 enhancements, including inter-cell beam management, L1 measurement and reporting, beam indication, and timing management (~~if needed, as a second priority place holder, pending to the outcome of this email discussion~~) [RAN1, RAN2, RAN4];

NOTE: FR2 specific enhancements are not precluded, if any.

NOTE: the procedure of L1/L2 based inter-cell mobility are applicable to the following scenarios:

Prioritized scenarios:

- Standalone, CA
- Intra-DU case and intra-CU inter-DU case
- Both intra-frequency and inter-frequency
- Both FR1 and FR2

~~Second-priority scenarios only if time is allowed (placeholder, pending to the outcome of this email discussion) :~~

- N~~M~~R-DC
- Inter-CU

29 – Continental Automotive GmbH

Priorities: Standalone, CA and FR1/FR2.

30 – Verizon UK Ltd

Supportive of the objective. One particular aspect we are interested in is PCell/SCell role switch which allows us to use low band as SCell and mid-band as PCell for capacity consideration.

2.3 Area 2: DAPS/CHO related enhancements

Regarding the potential area of DAPS/CHO enhancements, it was the controversial part during the September email discussions and the suggested conclusion from the moderator was CHO+MRDC and DAPS+CA/DC will be considered in Rel-18 as the baseline (i.e. conclusion 4 below), which are also CA/DC related mobility aspects.

Conclusion 4: As the baseline, CHO+MRDC and DAPS+CA/DC will be considered in Rel-18. Other items (i.e., DAPS+CHO/CPAC ,CHO + CPC) will be further discussed online.

Given that CA/DC related mobility aspects have been merged into this email discussion, and CHO+MRDC and DAPS+CA/DC also fall in the area of CA/DC related mobility, it seems necessary to re-open the discussion on the justification for the suggested enhancements and to re-consider whether some further down scoping in this area is required. Therefore, companies are invited to provide your views on the suggested proposals of CHO+MRDC and DAPS+CA/DC (and which can be down-prioritized/skipped in Rel-18), and any additional proposal to consider in Rel-18 for DAPS/CHO related enhancements. Besides providing proposal itself, please also indicate the justification, using scenario and corresponding analysis on the potential workload.

Feedback Form 5: DAPS/CHO related enhancements

1 – Ericsson LM

After further consideration, we think that DAPS enhancement is not very urgent and would require non-negligible time to specify. Hence, we think it could be postponed to a later release as there might be a need to reduce the scope of this WI.

However, the CHO+MRDC bullet on the other hand is small and could fit in.

2 – HuaWei Technologies Co.

We understand the baseline of CHO+MRDC and DAPS+CA/DC is the compromise given the divergent views among companies, provided that there are some additional issues to consider from CA/DC topic, we think the overall working load needs to be taken into account. If we need to down select further on these two, we prefer DAPS with CA/DC as a couple of operators have such requirements.

3 – InterDigital France R&D

We think the DAPS enhancements are not critical, but would require significant time for specification. On the other hand, the CHO+CPC item should be quite small and can be included with minimal impact on time budget. This item was actually already discussed in previous releases, and so companies should have a good idea of the work already.

4 – MediaTek Inc.

We may focus on CHO+MR-DC first. DAPS+CA/DC may not be that easy from UE implementation point of view: DAPS is a kind of "short-term DC" which puts one "leg" of UE on target cell, and UE may not have enough "legs" to support both DAPS and DC simulataneously.

5 – Beijing Xiaomi Mobile Software

We think DAPS+CA/DC may not be easy to specify and implement. Therefore, we think other objectives should be prioritized, such as CHO+DC, CHO+DAPS.

6 – China Telecommunications

Regarding to DAPS and CHO related enhancement, our preference is DAPS+CA/DC and DAPS+CHO/CPAC, in addition, we would like to support CHO+MRDC if time allows.

We think mobility enhancement need to ensure consistent data rate with low interruption during handover procedures in R18, so we think support of DAPS+CA/DC and DAPS+CHO/CPAC are more important.

For DAPS+CA/DC, it can reduce the data interruption in DC/CA scenarios and providing consistent data service for XR or Cloud gaming service to the user. For DAPS+CHO/CPAC, it can enhance performance especially in URLLC scenarios by supporting low data interruption and high reliability simultaneously.

7 – FGI

We may consider CHO+MR-DC, as it is part of Rel-17 leftover, to be the first priority. However, as the demand from operators, XR and URLLC scenarios, DAPS+CA/DC can also be studied.

8 – Lenovo (Beijing) Ltd

Even CA/DC related mobility aspects have been merged into this email discussion, the conclusion of CHO+MRDC and DAPS+CA/DC should not be impacted. In legacy, once CHO and DAPS are configured, the corresponding SCG should be removed, which will impact the performance especially for high rate service. Therefore, CHO+MRDC and DAPS+CA/DC should be considered for e.g. 4k, 8k service.

9 – Samsung Research America

FR2-FR2 mobility would be improved with Rel-18 L1/L2 mobility. On the other hand, UEs with less capabilities could not still achieve their targeting mobility performance. Thus, we would like to suggest to study simple solutions such MBB (Make-Before-Break) and RACH-less in Rel-18.

10 – Spreadtrum Communications

Since the DAPS+CA/DC is hard to be supported with the limitation of UE capability, it should be down prioritized.

11 – KDDI Corporation

We share the view with Ericsson, we are also fine to postpone DAPS enhancement and work on only CHO+MRDC to reduce the scope of WI.

12 – Guangdong OPPO Mobile Telecom.

We prefer to focus on CHO+MRDC.

For DAPS + CA/DC, we think it can be removed as the spec impact will be large and we also see additional UE complexity for implementing it.

13 – NTT DOCOMO INC.

If we need to narrow down the choice between the town, DAPS+CA/DC is preferable.
DAPS+CA/DC is more likely to be useful in IIoT and XR, but can be discussed further.

14 – CATT

CHO+MRDC and DAPS+CA/DC are result of compromise based on previous discussions. There were more items on the table. We see benefits in both directions, as they extend the applicabile scenairos of existing mobility enhancements, especially for the cases with higher data rate and user experience are needed.

15 – vivo Mobile Communication Co.

For CHO enhancement, considering real 5G deployment, mobility robustness improvement with CHO enhancements, e.g. CHO+MR-DC could be focused first in Rel-18.

For DAPS enhancement, we are not sure whether DAPS enhancement is needed if L1/L2 based inter-cell mobility has been specified, considering the less chance for the deployment of DAPS. Thus, DAPS enhancement, e.g. DAPS+MR-DC with high complexity should be deprioritized.

16 – Fujitsu Limited

CHO+MRDC should be prioritized than DAPS + CA/DC

17 – NEC Corporation

We are fine to down-prioritized "Other items" in Rel-18. Whether they should be even skipped or not should be decided depending on the whole objective in the Mob enhancement WI.

18 – Nokia Germany

CHO+MR-DC

In Rel. 17, RAN3 is expected to complete the specification of CHO in MR-DC where the target PCell can provide a CHO configuration consisting of target MCG and target SCG configuration. If this work is not completed in Rel. 17, it needs to be performed in Rel. 18.

However, this is not enough as the random access to the target SCG will be still performed by the UE when CHO execution condition, evaluated using target PCell measurement, is met. As such, the radio link quality of the target PSCell is not checked before performing the random access to target PSCell which may result in a failure. Rel. 18 can work on extending the CHO procedure in MR-DC to improve the robustness of the random access to the target SCG.

Solution to reduce handover interruption time in FR2-FR2 HO

DAPS has been challenged in Rel. 16 by RAN4 for FR2-FR2 HO. In addition, implementing DAPS specified for Rel. 16 seems to be quite challenging for the UE vendors. As such, it is necessary to define in Rel. 18 a feasible solution (which can be implemented by UE vendors) to reduce handover interruption time for FR1 and FR2 scenarios.

One potential alternative solution is make-before-break and/or RACH-less HO or enhanced version of RACH-less HO where the target cell does not necessarily need to have the same TA as the source cell (or TA = 0). One example for enhanced RACH-less HO is Single Active Protocol Stack (SAPS) which was discussed in Rel. 16 where:

1) the UE is configured first to perform random access to the target cell while receiving from the source cell and

2) then UE performs RACH-less HO execution upon receiving a command from the source cell.

In contrast to DAPS, SAPS is not as complex as DAPS as the UE operates with one PDCP entity comprising one security and header compression layer, i.e., most DAPS complications come from DAPS PDCP entity comprising two security and header compression layers.

Solution to reduce handover interruption and improve robustness at the same time

Given the outage is not caused only by handover interruption time reduction but also by mobility failures, it is sensible to consider the inter-working of new handover procedures (Make-before-break, (enhanced) RACH-less) or DAPS HO (if new handover procedures are not introduced) with CHO.

DAPS for CA/DC

The motivation for DAPS for CA is to provide high throughput (by keeping SCells during PCell HO) while reducing handover interruption which is needed for many services such as AR/XR, cloud gaming, 4K Ultra-HD streaming.

In MR-DC deployment, e.g., EN-DC, SN (FR2) is expected to offer much higher system bandwidth than MCG (FR1) and it is reasonable to assume that SN will provide the aforementioned services (e.g., AR/XR). However, SCG radio link is subject to interruption if a PCell handover or PSCell change is triggered which may have impact on user experience.

As such, it would be useful to consider mobility solutions that:

1) Allow the UE to exchange user packets with SCells in CA while performing a handover procedure minimizing interruption time compared to baseline handover.

2) Reduce the handover interruption time for the bearers anchored at SN during PCell or PSCell change.

However, given that implementing DAPS is complex for the UE vendors, such enhancements could be specified for other handover procedures such as Make-before-break, RACH-less HO and/or enhanced RACH-less. Thus, the support for such enhancements in CA/DC can be discussed (if time allows in Rel. 18) after specifying the new handover procedure reducing the handover interruption for FR1 and FR2.

CHO enhancements for FR2

FR2 enhancements for CHO were not considered in Rel. 16. In addition, CHO feature has been adopted as a mobility solution in many verticals (NTN, IAB, etc.), and as such the enhancements would be also useful there, especially considering commercial interest for CHO.

Below are some of the enhancements that can be considered in Rel. 18 (other RAN3 enhancements related to Xn/F1 signaling are not excluded too):

One of the enhancements for CHO in FR2 (and FR1) is to improve the likelihood of performing CFRA in CHO (to be on a par with baseline HO). As there is a time between the CHO preparation and execution, the CFRA resources that are available at the UE may no longer be valid at CHO execution and the UE may fallback to CBRA. For this, solution could be defined such as updating CFRA resources or changing the beam selection during RACH.

Other CHO enhancement could be defined for multi-panel UEs in FR2 where the cells that are detected on panels that are different from the serving one can be prepared early enough to be used as fallback in case of blockage on the serving panel. For this, new measurement reporting triggering is needed to trigger early preparation on non-serving cell. In addition, Maximum Permissible Exposure (MPE) handling in baseline HO and CHO can be considered if time allows in Rel. 18.

19 – ZTE Corporation

We think both DAPS+CA/DC will result in high complexity both from standardisation as well as implementation perspective. So, we don't think this can fit in Rel-18.

CHO+MRDC is slightly less complex but we given the CA/DC related mobility enhancements provide a more flexible set of solutions to solve similar issues as this, it seems this objective is redundant.

20 – China Unicom

When considering the benefits of network, DAPS +CA/DC can provide high-quality network for 4K/8K type live broadcast, VR, XR service, which can bring huge benefits to vertical industries. Thus we prefer DAPS with CA/DC.

21 – China Mobile Com. Corporation

Considering the overall workload of R18 and complexity of DAPS, DAPS related enhancement is not that essential in this release. Furthermore, we don't see the commercial deployment of CHO+CPC. We should just prioritize CHO+MRDC which is the R17 leftover.

22 – LG Electronics France

We can deprioritize DAPS-related enhancements because the DAPS enhancements are simply too complicated and the necessity of further enhancement is not clearly identified.

Mobility robustness and mobility performance are very important KPIs. So, we see the need to prioritize conditional mobility-related enhancements including CHO+MRDC and CHO+CPC. In addition, we think further enhancements to CPA/CPC, not necessarily coupled with CHO, can be also considered in this objective.

23 – VODAFONE Group Plc

It seems that enhancements of DAPS will be difficult to implement in devices, so we would prefer to focus on CHO+CPC (which may be simple to specify/implement) and CHO+MR-DC.

24 – Futurewei Technologies

TR 26.928 and TR 26.998 study the QoS requirement to support AR/XR applications, with the following outcomes:

"motion-to-photon latency: Less than 20 ms, and preferably even sub 10ms for AR as you may observe movement against the real world."

"pose-to-render-to-photon latency: 50-60ms for render to photon is desired in order to avoid wrongly rendered content with late warping applied."

"More flexible 5QIs and QoS support in 5G System for generalized split rendering addressing differentiated latency requirements in the range of 10ms to several 100ms and with bitrate guarantees."

Hence, there is no need of DAPS which targets at 0ms interruption time.

Given the high requirement on UE capabilities, complex standardization works, and no clear use cases, DAPS related enhancement should be removed from Rel-18 scope.

25 – Facebook

We think DAPS + CA/DC is an important feature due to the need to maintain high data rate during HO for XR related applications.

26 – Apple Hungary Kft.

We also think CHO+MR-DC is a better option to address first before DAPS+CA/DC and are ok to prioritize CHO+MR-DC.

27 – Qualcomm CDMA Technologies

We think MR-DC + CHO will require less work, can be done completely within RAN2/RAN3, and is a more useful and practical feature for actual product support and deployments. As experience has shown in Rel-16, DAPS will require significant amount of RAN2 as well as RAN1/RAN4 time. Any DAPS solution with more than two active legs is not practical for most UEs. We would prefer to remove or down-prioritize DAPS enhancements. If it is included, it can be limited to CA intra-band only which can still work with two RF chains.

CHO enhancements for FR2 are quite important. Some discussion happened in Rel-16 Mobility WI but there was no time for these. It is known that mobility robustness is more challenging for FR2, where frequent ping-pongs can happen. Therefore, enhancements to configuration and trigger of CHO to make the mobility more efficient and robust for FR2 should be included.

Also agree with Nokia that RACH-less HO, at least the Rel-13 LTE version, can be introduced easily and can be a more useful solution than DAPS in some cases.

28 – Intel Corporation (UK) Ltd

As mentioned in last RAN plenary, there are some limitations on Rel-16 DAPS/CHO solutions:

- DAPS handover 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, introducing additional delay, before sending HO command;

DAPS+CA/DC can be used for XR scenario, i.e. maintain the throughput during handover. DAPS+CA will not add additional UE requirement on how many legs the UE shall support, compared with DAPS (2 legs). For DAPS+DC, 3 or 4 legs are required depend on the use cases. If the UE can only support 3 legs, then we can consider the scenario that MCG changes without SCG change, and/or SCG change without MSG change. The scenario should target to high end UEs that who can support XR;

- Scenario: To support consistent data rate with low interruption during handover;

DPAS+CHO can be used for scenario as below, i.e. reduce the handover latency and support high reliability simultaneously.

- Scenario 3: To support low interruption + reliability simultaneously during handover;

Therefore we consider following objective for Rel-18:

- **Objective: To improve the reliability and reduce the latency during handover, specify the support of DAPS+CHO [RAN2, RAN3];**
- **Objective: To support consistent data rate with low interruption during handover:**
  - **Specify the support of DAPS+CA and DAPS+DC [RAN2, RAN3, RAN4];**
  - **Specify the support of simultaneous UL PUSCH transmission for user data [RAN2, RAN1];**

2.4 Area 3: CA/DC related mobility (previously from CA/DC discussions)

According to the summary for CA/DC enhancements in [4], the following aspects are proposed for further discussion:

Proposal 3 (non-controversial): For CA/DC enhancement, continue RAN discussions on the following potential enhancements to determine whether or not to include as part of Rel-18.

- *Cross carrier operation enhancement (RAN1, RAN2)*
  - *For example, multi-cell scheduling with single DCI, FR2 SCell scheduling for PUSCH on FR1 PCell, cross carrier HARQ*
- ***Multi-RAT Multi-Connectivity, MR-MC (RAN2, RAN3, RAN1):***
  - *For example, enhanced simultaneous UL transmissions and DL receptions with multiple cell group management*
- *FR2-specific aspects (RAN2, RAN4)*
  - ***For example, SCell/SCG setup delay reduction with early measurement enhancement***

Among the proposals, the moderator thinks the following two aspects are related to mobility, while the others seems to be independent CA/DC enhancements, unrelated to mobility.

1. "MR-DC with selective activation of the cell groups" where multiple cell groups can be configured by RRC for a UE, but only (up to) two cell groups can be active simultaneously, as the two cell groups which are active at a time could be typically related to the UE movement.

2. SCell/SCG setup delay reduction with early measurement enhancement, as the main intention is to reduce the SCell/SCG setup latency after mobility.

Hence, the intended work-split is to include above aspects in this discussions and leave the others to CA/DC enhancement thread. Companies are invited to provide your views on the justifications and how this should work for "MR-DC with selective activation of the cell groups" and "SCell/SCG setup delay reduction with early measurement enhancement", respectively. Regarding the second aspect of SCell/SCG delay reduction, please also indicate your view on which WG would be affected/lead the work (e.g. RAN2 vs RAN4) if it is introduced in Rel-18.

Feedback Form 6: MR-DC with selective activation of the cell groups

1 – Ericsson LM

There is overlap with this proposal and what CPAC can do already today, hence we do not see the justification to do this.

This objective would also require significant amount of work which we think would require a complete WI

on its own, meaning that it cannot fit in Rel-18.

2 – InterDigital France R&D

MR-DC with selective activation should be considered as part of CPAC enhancements in this WI, considering support of multiRAT connectivity in the next release

3 – MediaTek Inc.

The proposed ”MR-DC selective activation of the cell groups” may apply methods developed for L1/L2 mobility, e.g. MR-DC with more than 1 SCG configuration but only one SCG is activated at a time, using some kind of fast switching mechanism. If this topic is to be discussed in Rel-18, it can be mentioned in L1/L2 mobility objective, instead of a separate objective. Or we can do this in later Releases.

4 – China Telecommunications

MR-DC with selective activation of the cell groups has been widely discussed under CA/DC enhancements topic in the RAN#93e email discussion. Many companies showed great interests in this objective. For dense deployment scenarios in the future network, when UE is moving across multi high frequency SNs (e.g. FR2 or up to 100GHz), frequent SCG changes may reduce the user experience. Preconfiguring multi cell groups can help maintain the data rate and service continuity of the UE. Selective activation of the preconfigured cell groups can help reduce latency comparing to SCG changes, which can also further improve the robustness and user experience.

Therefore, we are supportive to specify the mechanism of MR-DC with selective activation of the cell groups in Rel-18. However, considering that it may require many efforts to specify the selective activation solution, we think there should be a separate WI to and not merge it to the mobility enhancement WI.

5 – FGI

The scenario, MR-DC with selective activation of the cell groups, attracts attention especially in FR2 case (e.g., the SCG operates in FR2) because frequent switch would cause much overhead. Thus, a preconfiguration approach with selective activation of cell groups would be beneficial to reduce the overhead. Considering the UE mobility in MR-DC, selective activation of the cell groups would also reduce interruption and improve consistent data rate. Thus, this ”MR-DC with selective activation of the cell groups” may be studied in this L1/L2 mobility topic.

6 – Lenovo (Beijing) Ltd

In legacy for SCG change, source network determines if the SCG change should performed or not based on the measurement report. The source node transmits the handover request to target node if determining to perform SCG change. After the source node receives the response from target node, the source configures UE to perform SCG change. The above procedure involves a long delay. If FR2 is applied, the SCG change will often happen.

In order to achieve lower latency compared to legacy L3 PSCell change, SCG change based on multiple SCG configuration in advance could better facilitate frequent and dynamic SCG change. It can get more benefits for the case that FR2 is used in SN.

7 – Samsung Research America

We prefer to support “MR-DC with selective activation of the cell groups”, which could be a useful feature, especially in FR2.

8 – KDDI Corporation

We share the view with MediaTek. The objective "Dynamic switch mechanism among candidate serving cells" potentially include "MR-DC selective activation of the cell groups". It depends how to design "Dynamic switch mechanism", reusing the current activation/deactivation mechanism for managing serving cells, or introducing something new independent from the past feature.

9 – Guangdong OPPO Mobile Telecom.

We think the enhancement of MR-DC with selective activation of the cell groups are not critical, and would require significant work for specify. Considering the large WI scope, we prefer to discuss it in later Releases.

10 – LG Uplus

We think, "MR-DC with selective activation of the cell groups" would be beneficial when we use FR1(low band)+FR1(mid band)+FR1/2(mid or high band) as some of mid/high band coverage are not quite aligned with low band.

11 – CATT

We see benefits of "MR-DC with selective activation of the cell groups".

Compared with existing SCG change procedure it reduces the latency. And, compared with the CPAC, configurations of multiple SNs can be stored upon SN change. But we believe for Rel-18 the activation of SN in this work should focus on RRC-based procedure, but not mixed with L1/L2 mobilitiy work for the sake of simplicity.

12 – vivo Mobile Communication Co.

We share the same view as Ericsson MR-DC with selective activation of the cell groups is quite similar as CPAC. Meanwhile, we need to consider whether it is needed if L1/L2 based inter-cell mobility has been specified, especially in MR-DC case. Before digging into the details, we need discuss what/how is the benefit for this, on top of existing CPAC and L1/L2 based inter-cell mobility.

13 – NEC Corporation

Given that both "MR-DC with selective activation of cell groups" and "MR-MC with more than two cell groups" are to be in Rel18, we prefer to have these in the same WI. This is because it is really difficult to separate each other, as both incudes additional CG configurations and interaction between at least two CGs. Otherwise, either of two should be selected first in Rel-18.

14 – Nokia Germany

MR-DC with selective activation of the cell groups

First, there is a need to clarify whether Cell Group refers to MCG or SCG or both are covered.

Case 1: Cell Group refers to MCG

In Rel. 16, a CHO configured UE has to release the CHO configurations when performing the random access to the target cell. Herein, the UE does not have a chance to perform a handover to another cell without re-initiating the CHO preparation which delays the handover execution and increases the signaling overhead.

So there are two ways on how to perform selective activation of MCG (down-selection can be discussed in the WI):

1) UE keeps the CHO configuration after the cell change is performed. The network or the UE can trigger the execution of the conditional reconfiguration for any of the prepared MCGs. Herein, the CHO execution is still subject to interruption time as the UE needs to apply the corresponding RRC Reconfiguration to reconfigure the existing MCG protocol stack.

2) Alternatively, the UE receives the configuration of more than one MCG and instantiates another protocol stack for the non-active MCG. The network or the UE can trigger at any time the switch to another MCG. Herein, the UE does not have to reconfigure the existing MCG protocol stack which can result in faster switch than approach 1. To reduce the complexity at the UE side, it would be desirable to limit the number of cell groups to two.

Note: Although this is discussed for MR-DC, it seems that it can be well applied for standalone scenario. As such, we propose to consider the standalone scenario in case CG is MCG.

Case 2: Cell Group refers to SCG

Similar discussion as Case 1 but replacing CHO by CPC that is defined in Rel. 17 and MCG by SCG.

15 – ZTE Corporation

We support the objective about "MR-DC with selective activation of the cell groups". We think this is useful. We don't think CPAC based solutions can provide similar gains as this because the once the target PCell is activated, the delta configuration in the CPAC container is released (even if it is kept this will still be invalid because the delta configuration will be invalid because it is based on source configuration and this forces to use full configuration – which results in high signallling overhead). The proposed enhancements will avoid the above problems and will allow mobility back and forth between two configured cell groups. Thus, we see that there are benefits for this beyond what is possible today with CPAC like solutions.

16 – China Mobile Com. Corporation

Considering the UE complexity in MR-MC and that we don't have urgent commercial needs for MR-MC, maybe this can be postponed to the next release.

17 – LG Electronics France

Selective activation of cell groups is not attractive for mobility, because the expected gain is not clear. This can be better discussed in CA/DC WI enhancements.

18 – Futurewei Technologies

We see some synergy between "MR-DC with selective activation of the cell groups" and other MR-DC enhancements considered in this WI for latency reduction. We are fine with including it.

19 – Apple Hungary Kft.

Multiple CGs with selective activation is a good feature to be added to this WI, as we see potential usecases in small-cell FR2 based deployments. In our view the objective (1) can be clarified such that this can be included as well (Dynamic switch mechanism among candidate serving cells" to be re-worded as " Dynamic switch mechanism among candidate serving cells including activation of the cell groups".

20 – Qualcomm CDMA Technologies

Multiple SCG configurations and fast switching between them can be very useful to improve the benefits of DC (e.g. high throughput, lower latency, load balancing). This feature can be introduced without significant changes and leverage the earlier work on CPAC. So we support this objective.

21 – Intel Corporation (UK) Ltd

MR-DC with selective activation of cell groups can be used to support Low interruption upon switching of PCell, switching of PSCell and switching between sPCell and Scell, switching between Pcell and PSCell, etc; which can improve the mobility performance for MR-DC case for both interruption and reliability perspective. We would suggest to focus on NR DC in Rel-18, otherwise we may have to update LTE.

The basic framework for L1/2 mobility discussed above can also be used for NR-DC enhancements, i.e. to have preconfigured target/candidate cell (group) configuration, and then the UE will do the switching (e.g. bi-direction) based on network request, e.g. L1, L2 or RRC signalling or preconfigured condition. It can reduce the latency, and also improve the reliability.

To reduce the UE complexity, we considered fast cell group switching with only two activated cell groups at a time, i.e. although multiple legs have been configured for the UE, but only MCG and one activated SCG are used. Rest cell groups are not activated although have been configured.

The potential objective is:

To specify mechanism and procedures of NR-DC with selective activation of cell groups for improvement of mobility latency reduction and reliability:

(1) Configuration and maintenance for multiple candidate cell/cell groups to allow fast application of configurations for candidate cell/cell groups [RAN2, RAN3];

(2) Dynamic switch mechanism among candidate cell groups for the potential applicable scenarios based on L1/L2 or L3 signalling, in order to minimize the performance impact for mobility, [RAN2, RAN1];

NOTE: At most two cell groups are activated at a time.

Applied scenarios:

- Switching of PCell between MCGs;
- Switching of PSCell between SCGs
- Switching between sPCell and SCell;
- Switching between PCell and PSCell;

22 – Verizon UK Ltd

We support the objective about "MR-DC with selective activation of the cell groups".

We can also accept two cell groups are activated at a time.

Applied scenarios:

- Switching of PCell between MCGs;
- Switching of PSCell between SCGs

- o Switching between sPCell and SCell;
- o Switching between PCell and PSCell;

Feedback Form 7: SCell/SCG setup delay reduction with early measurement enhancement

1 – Ericsson LM

Enhancements to early measurement reporting is discussed as TEI17 in RAN2, RAN plenary can for now assume that this will be solved in Rel-17. Can be discussed later depending on what is the final outcome of the Rel-17 discussions, i.e. if further optimizations are really required.

2 – HuaWei Technologies Co.

It is a bit unclear on the exact impacts to support so. In RAN2 we already support early measurement mechanism. If the target is to specify additional RAN4 RRM requirements, this seems more suitable to discuss together with other RAN4 topics and make decision in next March per the guidance in RP-212608. anyway it would be good that proponents can clarify the potential impacts with applicable scenarios first.

3 – InterDigital France R&D

We can wait for the conclusion of discussion in TEI17 to determine if SCell/SCG setup delay reduction should be further discussed.

4 – MediaTek Inc.

We may wait for conclusions from TEI17.

5 – Beijing Xiaomi Mobile Software

Wait for TEI17 conclusion.

6 – China Telecommunications

Wait for TEI17 conclusion.

7 – FGI

Wait for TEI17 conclusion.

8 – Lenovo (Beijing) Ltd

we are fine with the intention but wait for TEI17 conclusion.

9 – Samsung Research America

Wait for TEI17 conclusion.

10 – Spreadtrum Communications

Wait for the conclusion in TEI17.

11 – KDDI Corporation

We are fine to wait the conclusion of discussion in TEI17.

12 – NTT DOCOMO INC.

We are positive about setup delay reduction, but we'll wait for the conclusion of TEI17.

13 – Guangdong OPPO Mobile Telecom.

We can wait for TEI17 conclusion.

14 – vivo Mobile Communication Co.

Agree to wait for TEI-17 conclusion.

15 – SHARP Corporation

We can wait for the conclusion of discussion in TEI17.

16 – CATT

Fine to wait for TEI17 conclusion.

17 – MediaTek Inc.

(MTK2) The purpose of enhancements discussed in TEI17 may not be exactly the same as this one. But anyway the impacts and targeted scenarios are unclear. We need better clarifications before adding this to Rel-18.

18 – NEC Corporation

We can wait for TEI17 conclusion.

19 – Nokia Germany

MTK is right and the enhancements decided in TEI17 may not be the same.

In our view, especially FR2 related enhancements for SCell/SCG setup delay reductions with early measurement enhancements are important in Rel-18 and related to UE mobility.

Radio conditions may change rapidly in FR2 beam based deployments even with low and moderate UE speeds and therefore, FR2 idle mode measurements reported in connected mode may not be that accurate considering the longer measurement delays. This means that for FR2 deployments idle mode measurements reported in connected mode may indicate wrong cell to be used for SCell activation. Therefore, it would be important to define enhanced procedures and criteria for FR2 deployments to achieve fast and accurate CA/DC activation while balancing UE power consumption like we have early measurements for FR1. Also the current RAN4 UE requirements for FR2 CA and DC cell identification, measurements and measurement reporting delays are rather relaxed causing significant degradation in user throughputs in FR2 related CA and DC deployments. Therefore, FR2-related UE cell identification, measurement and measurement reporting enhancements are also important in Rel-18

20 – ZTE Corporation

We are positive about setup delay reduction, but we are also okay to wait for the conclusion of TEI17 as preferred by companies above.

21 – China Unicom We may wait for conclusions from TEI17.
22 – China Mobile Com. Corporation Wait for TEI17 conclusion.
23 – LG Electronics France We can wait for TEI17 conclusion
24 – Futurewei Technologies This may wait for TEI17 conclusion.
25 – Apple Hungary Kft. This has been discussed /designed extensively and we also have further discussion as part of TEI-17. We do not see the need to have this again in Rel-18
26 – Qualcomm CDMA Technologies Agree with others on the SCG setup and latency part. However, we are supportive of FR2-specific enhancements for CA and DC, such as performing measurements during deactivated or dormant SCell or PSCell to reduce beam set up time and open to other FR2-specific proposals.
27 – Intel Corporation (UK) Ltd Agree with others, wait for the conclusion from TEI17 discussion.

2.5 Summary of initial phase

Regarding the endorsement of either a SI or WI

Around 30 companies joined the discussion, and it can be seen that company's views are quite aligned with each other. Almost all companies agree to have a WI for mobility enhancements in Rel-18 based on the potential scopes in previous email discussions. Thus it can be concluded that mobility enhancements will be a WI and there is no need to discuss this again in the next round.

Initial Phase Conclusion 1: mobility enhancements will be a WI for mobility enhancements in Rel-18, RN2 is the leading WG while RAN1, RAN3 and RAN4 are impacted WGs.

Regarding the area of L1/L2 mobility enhancements

Scenarios

Around 26 companies joined the discussion.

Regarding whether to support inter-CU, almost all the companies (24 out of 26) don't support inter-CU case in the scope of mobility enhancements due to extra complexity with gains questionable. Based on the feedback, it is suggested to not consider inter-CU in the scope of L1/L2 mobility for Rel-18.

There is one company asked whether CA case applies to PCell with SCells kept, from the moderator's observation from previous rounds of discussion, the CA case is a generic case and includes both PCell and SCell changes. This will be further clarified in the draft objective descriptions in the intermediate round.

Initial Phase Conclusion 2: Inter-CU scenario is not supported in L1/L2 mobility for Rel-18.

Regarding whether to support MR-DC, with the clarification that it is referred to the serving cell change only within the CG, there seems support to consider MR-DC in the scope assuming there is no significant efforts to extend support for this case. The main impact is at PHY/MAC layer which could be similar between CA and cell change within one CG case. Some companies further indicate the justification for support this scenario is that in case SCG is operating at a higher frequency, the serving cell changes within SCG can be even more frequent compared with MCG which will have a broader coverage. On the other hand there are also considerable number of companies indicating the concerns on too many scenarios and it would be desirable to consider fundamental functions first, and extend the feature to support MR-DC if time allows. It is therefore suggested to prioritize standalone and CA cases, and extend the support for MR-DC if time allows with only minimal spec impact.

Initial Phase Conclusion 3: MR-DC with cell changes within one CG can be a second-priority scenario to be supported in L1/L2 mobility if time allows, if specified the scenario uses same principle as PCell change with minimal spec changes.

Regarding whether to support non-synchronized scenario, all the companies have the same understanding that both synchronized and non-synchronized scenarios should be supported in the scope. Otherwise, the applicability of L1/L2 mobility would be quite limited. This may happen for either inter-DU or even in case of intra-DU. Some extra work are nevertheless needed for non-synchronized and it can be discussed in Rel-18. Consequently the timing management should be kept in the objective.

Initial Phase Conclusion 4: Both synchronized and non-synchronized scenario are supported in the aspects of L1/L2 mobility enhancement for Rel-18 mobility enhancements, and therefore TA management to support non-synchronized scenario should be included in Rel-18 mobility enhancement.

Draft WID

Around 29 companies joined the discussions.

It seems companies are in general fine with the initial description of the objectives for the area of L1/L2 mobility. There are also quite a few specific comments with respect to each objective. In summary:

- For objective 2, some companies think further details should be added to describe the impacted procedures in RAN2, e.g. RRM measurement.
- For objective 3, some companies think we can add more details to clarify what is the enhancements and what to achieve with objective 3, and TA management should be added based on initial round discussions.
- For scenarios, some companies also indicate that the bullet should be updated based on initial round discussions.
- For the motivation and justifications, there are some wording suggestion to improve the expressions related to the motivation of L1/L2 mobility enhancement. RAN2 Chair (MediaTek) also provide a good overall description of L1/L2 mobility enhancement for Rel-18 that can be considered as base for inputs to the justifications.

According to the above comments, the draft justification and objectives will be further updated for the intermediate round, companies are invited to provide further comments in the next round to refine the scoping

Initial Phase Guidance 1: Companies are invited to provide further comments in the intermediate round for the aspects of L1/L2 mobility enhancements including justifications and objectives.

Regarding the area of DAPS/CHO enhancements

Around 28 companies joined the discussions.

Support DAPS+CA/DC (only/prefer) (6): HW, CTC, DCM, CUC, Facebook, Intel

Support CHO+MR-DC (only/prefer) (14): Ericsson, IDT, MTK, Xiaomi, KDDI, vivo, Fujistsu, CMCC, LGE, VDF, Apple, QC, Spreadtrum, OPPO

Support Both (4): FGI, Lenovo, CATT, NOKIA

None (3): NEC, ZTE, FW

Others (4): DAPS+CHO (Xiaomi), CHO+CPC (InterDigital), MBB/RACH-less (SS, NOK, QC),

Similar to the previous email discussions, company views are still diverging in this area and there is still no consensus on which objective(s) can be supported in the scope. There is more companies suggesting to only consider or prioritize the objective of CHO+MR-DC because DAPS+CA/DC would cause high requirement of UE capability. However there are also support of DAPS+CA/DC as it is important in Rel-18 to support high throughput and low latency traffic, e.g. XR. Given the situation, the moderator think. Both directions have got similar number of support from operators.. There are also a few companies proposing other enhancements but the support is limited.

According to the current situation and considering the work load, it is suggested not to discuss this area any further as the situation keeps the same. If to include various aspects that companies proposed, the scope of mobility enhancements may be too large.

On the other hand several companies mentioned in 2.4 discussion that CHO+MRDC may be one candidate solution to support selective activation of the cell group, from moderator's observation these two discussions are difficult to be separate clearly. Thus it is suggested that in the intermediate round this section is closed, and CHO+MRDC can be further discussed together with selective activation of CGs.

Initial Phase Guidance 2: CHO+MRDC will be further discussed considering the selective activation of CGs, and other proposals proposed here are not considered in Rel-18 at this stage.

Regarding the area of other CA/DC related enhancements

Around 22 companies joined the discussion.

MR-DC with selective activation of the cell group

Support (12): IDT, CTC, FGI, Lenovo, SS, KDDI. LGU+, ZTE, FW, Apple, QC, Intel, Verizon; among the above 5 companies clearly mentioned L3 mechanism can be considered, e.g. CHO+MRDC.

Not support (7): ER, Oppo, vivo,, CMCC, LGE

Neutral(2): MTK, NEC (either fine to have it, or to have it in future release)

There is not clear majority to support this objective in the scope of Rel-18 mobility enhancement. The opposing companies think the current CPC/CPAC can already support so. Even for the proponents of this objective, it seems the views on the detailed mechanism is different: some companies think the dynamic switching mechanism of L1/L2 mobility can be reused, and thus there is no need to have a separate objective with another approach of "dynamic switch between CG"; some companies thinks this objective should focus on RRC-based procedure, and thus should not mixed with L1/L2 mobility. It is also worth mentioning that during L1/L2 mobility discussion, inter-CU is already excluded and from moderator's observation, the same complexity will be introduced if we now consider inter-CU case for the DC case. Given the situation, moderator thinks it is necessary to further achieve the common understanding whether the L1/L2 mobility approach or L3 approach is more realistic for MR-DC with selective activation of the cell group in the intermediate round.

Initial Phase Guidance 3: Companies are invited to provide more detailed comments further on whether selective activation of the cell group can be fully supported by existing CPC/CPAC without any enhancements; and if not, whether Rel-18 should further optimize L3 mechanism, e.g. CHO+MRDC or L1/L2 mobility to support selective activation of cell groups.

SCell/SCG setup delay reduction with early measurement enhancements

There seems the majority thinks this objective is relevant to what is discussing in TEI17 in RAN2 although some companies hold different understanding. Therefore almost all the companies think it is not urgent to make a decision for now. Thus moderator think this objective is postponed until Rel-17 TEI17 discussion becomes clearer. This seems no need to be further discussed in the next round.

Initial Phase Conclusion 5: SCell/SCG setup delay reduction with early measurement enhancements is postponed (can be revisited at a later phase once TEI17 relevant discussion is concluded).

3 Intermediate Phase

3.1 Area 1: L1/L2 mobility enhancements

3.1.1 Justifications

L1/L2 mobility is for UEs in configurations with multiple beams. When a UE moves through such network the main mobility mechanism is beam switching based on L1 measurements. When the UE passes from the coverage area of one cell to another cell, at some point a serving cell change need to be performed. Currently serving cell change is triggered by L3 measurements and is done by RRC signalling triggered Reconfiguration with Synch for change of PCell and PSCell, as well as release add for SCells when applicable, all cases with complete L2 (and L1) resets, and involving more latency, more overhead and more interruption time than beam switch mobility. The goal of L1/L2 mobility enhancements is to be able to do serving cell change via L1/L2 signalling with such low latency overhead and interruption time.

Companies are invited to provide your comments to the suggested justifications above in the aspects of L1/L2 mobility enhancements in the Rel-18 mobility scope.

Feedback Form 8: Justifications of L1/L2 mobility enhancements

1 – Nokia Germany

We agree that the main benefit for L1/2 inter-cell mobility would be to reduce handover interruption time and to reduce the signalling overhead associated with the cell change.

2 – ZTE Corporation

A light-weight reconfiguration is useful as already highlighted by the moderator (especially for the intra-DU mobility where L1/L2 reconfiguration is required).

Note: Some companies mentioned that Current CHO like mechanisms may provide an alternative to this. However, the CHO like mechanisms are not sufficient as once the target PCell is activated, the delta configuration in the CHO container is released (even if it is kept this will still be invalid because the delta configuration will be invalid because it is based on source configuration and this forces to use full configuration – which results in high signallling overhead).

3 – Apple Hungary Kft.

We agree with the summary: aim is to reduce interruption time as well as signaling overhead, with L1/L2.

4 – InterDigital France R&D

We agree with the motivation, although we think the motivation does not need to be limited to UEs configured with multiple beams.

5 – China Unicom

We agree with the justifications, and both interruption time and signalling overhead reduction are the main issues to be solved by L1/L2.

6 – Qualcomm CDMA Technologies

Also agree with the justifications. In addition, the benefit is not just limited to multi-beam scenario and L1/L2 mobility will be applicable to FR1 as well.

7 – NTT DOCOMO INC.

Agree with the justifications on low latency, overhead, and interruption time. And agree with QC that L1/L2 mobility is also applicable to FR1.

8 – MediaTek Inc.

We agree that handover interruption reduction is the main justification for L1/L2 mobility enhancements. The description of problems with RRC-based mobility may be further elaborated:

- For L1/L2 inter-cell mobility, L1 reset is likely to happen since the serving cell is changed. L2 reset is needed for inter-DU cases due to protocol stack relocation, regardless of whether the handover is triggered by L1/L2 or L3 signaling. In other words, L1/L2 reset does contribute to mobility interruption, but it may not be fully avoidable with R18 L1/L2 mobility. We may mention that synchronization also contributes to mobility interruption.

- The goal of L1/L2 mobility is clear: We want to have inter-cell mobility as fast as intra-cell mobility. However, if we simply replace RRC-based handover command with L1/L2 signaling, the mobility interruption may not be reduced much if the UE reconfiguration and synchronization steps are still needed.
- We may explain more about the targeted scenario. Cell changes with typical handover interruption time (75ms) occupy a small portion of overall operation time for UE moving in a network with normal inter-site distance. However, for UEs moving in a network with ultra-dense deployment (e.g. in FR2), more frequent cell change is expected and handover interruption becomes a problem. User experience degrades more if the application requires low latency and high data rate.

9 – Lenovo (Beijing) Ltd

We agree with the motivation of low latency overhead and interruption time.

10 – KDDI Corporation

We are fine with the current justification.

11 – Guangdong OPPO Mobile Telecom.

Also agree with the justifications, and the signalling overhead can also be reduced with L1/L2 mobility.

12 – FGI

We agree with the justification is to enhance the serving cell change via L1/L2 signaling with lower latency overhead and interruption time. However, we wonder whether the scope is limited to UEs with multiple beams.

13 – Ericsson LM

We have no issues with the proposed justification.

14 – Intel Corporation (UK) Ltd

We are fine with the justifications from Moderator.

15 – Samsung Research America

We agree the draft justification from rapporteur.

We would like to slightly update the wording of the draft:

"The goal of L1/L2 mobility enhancements is to be able to do serving cell change via L1/L2 signalling with such low cell-switching latency, low signaling overhead and low interruption time. "

16 – Spreadtrum Communications

We agree with the justification.

17 – NEC Corporation

We are fine with the justification above.

18 – HuaWei Technologies Co. We agree with the suggested justifications and also agree with others it is not limited to multi-beam cases.
19 – CATT We are generally fine with the justifications.
20 – China Telecommunications We are fine with the justifications, and agree that the goal of L1/L2 mobility enhancements is to reduce signaling overhead and interruption time.
21 – vivo Mobile Communication Co. We agree that L1/L2 based mobility enhancement is beneficial to reduce the interruption during switch, handover latency, and signaling overhead.
22 – Fujitsu Limited We agree with the justification.
23 – LG Electronics France a) The current justification can be taken as a baseline. On top of this, reflecting MTK's clarification seems to make the justification more clear. b) Multi-beam constraint can be removed from the justification since L1/L2 mobility can be applicable to single beam scenarios as well.
24 – China Mobile Com. Corporation We are fine with the current justification.

3.1.2 Objective descriptions

The suggested objective descriptions in the aspects of L1/L2 mobility enhancements are as follows based on initial round discussions, Companies are invited to provide your detail comments to the suggested description of each bullet in order to formulate the WID of the mobility enhancements.

To specify mechanism and procedures of L1/L2 based inter-cell mobility for mobility latency reduction:

1. Configuration and maintenance for multiple candidate cells to allow fast application of configurations for candidate cells [RAN2, RAN3];
2. Dynamic switch mechanism among candidate serving cells for the potential applicable scenarios based on L1/L2 signalling, in order to minimize the performance impact for mobility <u>in terms of interruption time and signaling overhead</u> [RAN2, RAN1];
3. L1 enhancements, including inter-cell beam management, L1 measurement and reporting, beam indication, and for non-synchronized scenario to handle TA management [RAN1, RAN2, RAN4];

Feedback Form 9: Bullets with respect to objectives

1 – MediaTek Inc.

RAN2 Chair: We were also tasked to determine the potential impact in other groups. Given that in the previous system it was not allowed to transfer neighbor cell measurements or signaling to change serving cell without security protection I think it is reasonable to understand whether security objectives and/or SA3 involvement is required for this WI? or whether we should adopt a plan to consider such aspects at a later time (next release?) if deemed needed? Any views?

2 – Nokia Germany

We are fine with the listed objectives for L1/2 inter-cell mobility, however, we still would like to clarify further the wording:

- "Mobility latency reduction" can be replaced by "handover interruption reduction and fast/slimmer handover procedure."
- "In order to minimize the performance impact for mobility in terms of interruption time and signaling overhead" can be replaced by "in order to reduce the time and signalling overhead for re-initiating the preparation of the new target cells." I.e. we find the term 'performance impact for mobility' unclear, so it is suggested to remove/replace it.

3 – ZTE Corporation

For the objective, we would like clarify that the candidate cells can be activated as PCell or SCells (i.e., both options should be supported in a dynamic manner).

- We think the reduction of SCell interruption time is equally important as PCell (since a lot of traffic in today's networks is offloaded to SCell and interruption to SCell would have significant impact on overall KPIs)
- We think the above will provide more flexibility on the network side and will minimise the interruption time and signalling overhead when the PCell quality degrades (i.e., a preconfigured SCell can quickly be activated as PCell in this case)
- This also allows a common framework for mobility and CA

4 – Qualcomm CDMA Technologies

We agree with ZTE that SCell change should not be excluded and was never the intention in Rel-17. Objective #2 can be shortened to state what needs to be done. We don't need to put "why"; the reasoning is more appropriate for the Justification section. So we can simply have "Dynamic switch mechanism among candidate serving cells (for both SpCell and SCells) based on L1/L2 signalling [RAN2, RAN1];

5 – InterDigital France R&D

We are fine with the objectives taking into account the comments from Qualcomm and ZTE that SCell change can be considered and justification is not needed in this section.

6 – NTT DOCOMO INC.

Generally fine with the objectives. For the 2nd bullet, we agree with QC and suggest following revisions:

- Delete the 2nd half sentence 'in order to …' which is more like justificaitons.
- Clarify that the dynamic switch among candidate serving cells include serving cell change for SpCell and SCell. We see it is included in scenarios in the following session, but it is better to also clarify it here.

7 – MediaTek Inc.

We are fine with the enhancements listed. However, Items 2 & 3 seem to overlap. For example, isn't inter-cell beam management (a part of) the dynamic switch mechanism? This makes the purpose of Item 3 unclear. Also, beam management and indication are likely to involve L2 signal (MAC CE), and should not be listed only under "L1 enhancements". We suggest the following revision:

Identify the bottlenecks of mobility procedures that causes long mobility interruption, and specify support for mobility interruption reduction, in the presence of beam management and with intra-CU mobility focus, considering following aspects:

- Configuration and maintenance of multiple candidate cells, allowing faster application of L3 configurations [RAN2, RAN3]
- Mechanism for UE to switching among candidate serving cells, based on L1/L2 signalling, so as to minimize the performance impact for serving cell change compared to beam change without serving cell change [RAN2, RAN1]
- Optimisations to minimise interruption due to UL synchronization to target cell, in case where timing advance values are not the same in source and target cells [RAN2, RAN1]
- CU-DU interface signalling improvements, if identified [RAN3]
- Core requirements associated with above items, if specified [RAN4]

8 – Lenovo (Beijing) Ltd

We agree with the objectives. and also agree that serving cell includes PSCell and SCell.

9 – KDDI Corporation

We are fine with the current objectives.

10 – FGI

We agree with Qualcomm and ZTE's comments on describing PCell and SCells directly.

11 – Ericsson LM

The updated objectives look good. However, at least if the inter-DU case should be included, RAN3 would likely be impacted.

But as we have indicated before, we think the inter-DU case should be removed/down prioritized to reduce workload.

12 – Intel Corporation (UK) Ltd

We are fine with the objectives from Moderator. Regarding the suggestions from Qualcomm and ZTE on describing Pcell and SCells, we think sPCell is more suitable if MR-DC is considered, i.e. Qualcomm's proposal looks good to us, as

Dynamic switch mechanism among candidate serving cells (for both SpCell and SCells) based on L1/L2 signalling [RAN2, RAN1];

13 – Samsung Research America

We agree the draft objectives from rapporteur.

On the other hand, TA management can also apply to the "synchronized case" when the TRPs are synchronized, by the differential RTT between the TRPs and the UE exceeds the CP length.

Hence, we would like to slightly update the wording of the draft (i.e. delete "non-synchronized"):

"To specify mechanism and procedures of L1/L2 based inter-cell mobility for mobility latency and signaling overhead reduction:

Configuration and maintenance for multiple candidate cells to allow fast application of configurations for candidate cells [RAN2, RAN3];

Dynamic switch mechanism among candidate serving cells for the potential applicable scenarios based on L1/L2 signalling, in order to minimize the performance impact for mobility in terms of interruption time and signaling overhead [RAN2, RAN1];

L1 enhancements, including inter-cell beam management, L1 measurement and reporting, beam indication, and ~~for non-synchronized scenario to handle~~ TA management [RAN1, RAN2, RAN4];"

14 – Spreadtrum Communications

We agree with the objectives.

15 – NEC Corporation

We agree with the objectives above. Further clarifications are also fine.

16 – HuaWei Technologies Co.

The objectives for L1/L2 mobility enhancements look good to us. We also support to explicitly add both PCell and SCell to bullet 2. Regarding security, we understand the L1 measurement and signaling is quite similar as what we discussed in Rel-17 for inter-cell beam management. We understand SA3 is the group to investigate potential security issues, and no need to add anything here right now.

17 – China Unicom

Regarding dynamic switching among Pcells/Scells, CA(including serving cell change for PCell and SCell) has been considered for L1/L2 enhancement in the prioritized scenarios in the next question. But we also agree with Qualcomm and InterDigital 's view that bullet 2 can be simplified without justifications parts included.

18 – CATT

We think the current bullet #2 is not very clear/specific regarding what needs to be enhanced. In this sense it is perhaps better to just say 'Specify dynamic switch mechanism among candidate serving cells for the potential applicable scenarios based on L1/L2 signalling'

19 – China Telecommunications We are fine with the objectives, and for the second bullet, we agree with Qualcomm and ZTE's suggestions on clarifying that the candidate cells can be PCell or SCells.
20 – vivo Mobile Communication Co. Regarding main bullet, it is not just "for mobility latency reduction", but also "for interruption reduction, signaling overhead reduction". Regarding 2nd bullet, we would like to check the intention for "for the potential applicable scenarios". Maybe it could be removed. Regarding 3rd bullet: non-synchronized scenario are not just related to TA handling, but also related to measurement and measurement report. Thus, it is better to indicate non-synchronized scenario as separately, e.g. "consider non-synchronized scenarios"
21 – Guangdong OPPO Mobile Telecom. We are fine with the objectives.
22 – LG Electronics France a) We are fine with the listed objectives. b) To keep the scope reasonable, we would like to exclude inter-DU scenario. c) Security aspects of L1/L2 mobility should be somehow addressed from the beginning of the work item as MTK indicated. FFS how to do this. d) We are OK with considering SCell change, i.e. not limited to PCell change.
23 – Fujitsu Limited We agree with ZTE on SCell and agree with Samsung to delete "for non-synchronized scenario" in bullet 3. We are fine with the other descriptions.
24 – China Mobile Com. Corporation We are fine with the current objectives and also open to the further clarification that candidate serving cells can be both PCells and PSCells.

NOTE: FR2 specific enhancements are not precluded, if any.

NOTE: the procedure of L1/L2 based inter-cell mobility are applicable to the following scenarios:

Prioritized scenarios:

- Standalone, CA(including serving cell change for PCell and SCell)

- Intra-DU case and intra-CU inter-DU case

- Both intra-frequency and inter-frequency

- Both FR1 and FR2

Second-priority scenarios only if time is allowed:

- MR-DC with serving cell changes within one CG

Feedback Form 10: Bullets with respect to applicable scenarios

1 – Nokia Germany

Overall, we are fine with the listed scenarios but we have the following comments, for companies' consideration:

- As described in the answer to the first question in this section, the main objective of L1/2 inter-cell mobility is to reduce handover interruption time in intra-DU or inter-DU intra-CU cases. However, there is no solution that reduces the interruption time in inter-gNBs or inter-CU FR2 HO. Herein, solutions such as Make-before-break, and/or (enhanced) RACH-less HO can help to reduce handover interruption time in FR2.
- In addition, given that the radio conditions are challenging in FR2 (as was commented by many), enhancements for CHO in FR2 (improving mobility robustness) can be as well useful in Rel. 18.
- All aforementioned enhancements for FR2 can be still considered in Rel. 18, especially that many of them have been already discussed in Rel. 16 (so the discussion will not have to start from scratch). As such, we propose to add one objective that is related to CHO enhancements and interruption time reduction for inter-gNBs and inter-CU cases in FR2. Otherwise, NR has no mobility improvements for FR2, other than L1/L2 mobility, applicable just to a specific scenario

2 – ZTE Corporation

- Standalone, CA(including serving cell change for PCell and SCell)

For the above objective, again, we think this covers the case where the candidate cells can be activated as PCell or SCells as highlighted above.

- Intra-DU case and intra-CU inter-DU case

For the "intra-CU inter-DU case", this seems to overlap with the objective below for the "MR-DC with selective activation of the cell groups". Since, inter-DU case, multiple CGs will be configured and one of them will be activated (i.e. very similar to the selective activation for MR-DC case below).

3 – Qualcomm CDMA Technologies

We don't think SCG should be second priority. It has minimal specification delta compared to MCG and is practically as important as MCG. On the other hand, inter-DU will require substantial work, including a new interface by RAN3, and the benefit of using L1/L2 signaling for switching between DUs is questionable. So, if anything, inter-DU should be second priority and SCG should move to the first group.

4 – Continental Automotive GmbH

We support mobility enhancements for:

- Both intra-frequency and inter-frequency
- Both FR1 and FR2

5 – InterDigital France R&D

We are fine with the applicable scenarios.

6 – NTT DOCOMO INC.

We think MR-DC should be also included in the first-priority scenarios. L1/L2 mobility can happen within one cell group. We donot see much difference for the L1/L2 mobility procedures in MCG and SCG.

7 – MediaTek Inc.

We are fine with the scenarios. However, some scenarios may imply the need of corresponding objectives. For example, if inter-DU is to be supported, we may need to consider CU-DU signaling enhancements, as shown in the draft objectives above.

8 – Lenovo (Beijing) Ltd

We are fine with the current use cases.

9 – KDDI Corporation

We are fine with the current bullets.

10 – Guangdong OPPO Mobile Telecom.

We are fine with the applicable scenarios.

11 – FGI

The scenarios look good to us.

12 – Ericsson LM

We would have preferred to remove the inter-DU case so as to reduce the size of this item. Also, the gains of this scenario are expected to be less compared to intra-DU.

But OK, we see that the moderator has decided to not remove this scenario. However, we still believe that the size of inter-DU is significant and we would like to at least give this second priority so as to make sure the basic framework (intra-DU) is progressed in the WGs before starting to look at more complex scenarios. To discuss both of these at the same time may complicate the discussions in the WGs.

13 – Intel Corporation (UK) Ltd

It would be good to clarify whether MR-DC contains (NG) EN-DC. If (NG) EN-DC or NE-DC is considered, there maybe additional impact on LTE specification which should be avoided. Therefore we suggest to change “MR-DC” to “NR-DC”.

14 – Spreadtrum Communications

We aren fine with the orders of the applicable scenarios.

15 – NEC Corporation

We are fine with these scenarios.

16 – HuaWei Technologies Co.

We are fine with the applicable scenarios. We understand the intra-CU inter-DU case is mainly for standalone and CA cases, this can be further clarified.

17 – China Unicom All the applicable scenarios are fine for us.
18 – CATT For the senarios, we think MR-DC can be put to 1st level priority with the limitation that the dynamic switching is intra-DU. For the inter-DU, it can be of lower prioirty due to extra complexity.
19 – China Telecommunications Generally, we are fine with the applicable scenarios, but for the MR-DC scenario with serving cell changes within one CG, we think it should be listed as the first priority, because it is similar with CA scenario and there is no significant extra effort to support this scenario.
20 – vivo Mobile Communication Co. We think inter-DU case should also be deprioritized.
21 – China Mobile Com. Corporation We are fine with current applicable scenarios.

3.2 Area 2&3: MR-DC enhancements

Companies are invited to provide clarification to this objective in order to achieve common understandings among companies so that we can decide if/how to merge this objective in the scope of Rel-18 mobility enhancements.

For selective activation of cell group

1. Whether current CPC/CPAC can already support this (please provide technical analysis instead of simply saying Yes or No)
2. If the answer is No, whether the Rel-18 enhancements to support selective activation of cell group is based on L3 enhancements, e.g. CHO+MRDC, or should be included under L1/L2 mobility?
3. If L1/L2 mobility is the target, is inter-CU case considered?

Feedback Form 11: MR-DC with selective activation of the cell groups

1 – Nokia Germany *[As we have no better place in NWM to comment on that aspect, we want to share the same as has been sent via e-mail (RAN reflector): regarding the removal of 'SCell/SCG setup delay reduction with early measurement enhancements' - the decision was based on the suggestion a similar topic will be addressed as a part of TEI17. However, could the authors of this statement or the discussion rapporteur share any solid TDoc reference, please, as when looking at the recent submissions to RAN2#116, we were unable to find any relevant paper which would confirm this statement?]*

Regarding the MR-DC with selective activation of cell groups, we would like to first highlight the two following points:

- Cell group can refer either to MCG or SCG.
- The concept of fast selective activation of cell group applies also for single connectivity scenario, i.e. UE is not configured with SCG and fast selective activation is applied for MCG.

As such, we propose to 1) consider both MCG and SCG and 2) include standalone scenario in case selective activation is applied for MCG.

Answers to the questions:

1- In Rel. 16/17, a CPC (or CHO) configured UE has to release the CPC (or CHO) configurations when performing the random access to the target cell. Herein, the UE does not have a chance to perform another cell change without having the network re-initiating the CPC (CHO) preparation which delays the cell change execution and increases the signaling overhead. As a summary, CPC (CHO) does not support selective activation of cell group.

2. As the change of SCG (or MCG) can happen between two different SN (or MN) nodes hosting completely different protocol stacks (with different PDCP), selective activation of cell group should be based on L3 enhancements.

2 – ZTE Corporation

As highlighted during the initial round, we don't think CPC/CPAC features cover the target enhancements because once the target PCell is activated, the delta configuration in the CPC/CPAC container is released (even if it is kept this will still be invalid because the delta configuration will be invalid because it is based on source configuration and this forces to use full configuration – which results in high signallling overhead).

Instead of a L1/L2 mobility command, event triggered mobility between pre-configured CGs based on some UE based criteria can also be used. This avoids the signalling latency for sending the L1/L2 signalling (as it avoids the need for additional coordination between the network nodes).

3 – InterDigital France R&D

We do not think current CPC/CPAC can support selective activation, since selective activation considers a UE being able to switch back and forth between cell groups (without deleting a previous configuration). We also think the motivation of selective activation may be different than CPAC and may lead to criteria at the UE for activation which are not limited to measurements only. We think selective activation should be based on L3 enhancements, since it should be able to handle the inter-CU and inter-SN cases.

4 – Qualcomm CDMA Technologies

The response to #1 is No. In addition to the release of the target after CPC as mentioned by others, there are limitations for the configuration of triggers for CPC where we only support certain measurement events. The proposed scheme here can allow the NW to make more complicated decisions, including reasons for load balancing. For 3), this should use L3 signaling as a baseline. L1/L2 signaling can also be considered if we do introduce L1/L2 mobility for inter-DU.

5 – MediaTek Inc.

1. No. CPC/CPAC does involve configuration of candidate PSCells and target PSCell selection. However, the selection of target PSCell is done by UE based on pre-configured conditions. Our understanding about the "selective activation" here is that the selection is done by network. It is more like SCell activation/ deactivation in conventional CA, but now this mechanism is applicable to PSCell.
2. If introduced, this should be under L1/L2 mobility.
3. No. For inter-CU, we can always use RRC-based approach.

6 – Lenovo (Beijing) Ltd

In CPAC, upon UE accessing to the new cell group, it will release the configuration of the previous cell group, and NW node(s) needs to coordinate and generate the CPAC configuration again if the connection to the new cell degrades. In selective activation of cell group, more than 2 cell groups can be configured to UE in advance while max 2 cell groups are active. UE/NW may decide dynamically to activate some cell group without releasing the configuration of other "inactive" cell groups, such that UE/NW may decide to activate the "inactive" cell group again without NW reconfiguration. L3 based selective activation is baseline. It needs further study if the same signaling for L1/L2 mobility can be reused for NW to activate a certain cell group. If L1/L2 is applied, inter-CU is not considered.

7 – KDDI Corporation

1. We think that CHO and CPCA works well for inter CU scenario, but it is not the case for intra CU scenario, since the mechanism requires RRC reconfiguration every time after changing the cell. If we make it L1L2 signaling, then it would be beneficial especially for the case where FR2@Scell in terms of signaling overhead and interruption delay caused by L3 signaling.
2. Can we make it to be discussed in the initial phase of the WI? We guess that CHO+MRDC may have some uniqueness derived from using multiple RAT, but the both CHO+MRDC and CPC/CPAC should share the same procedure in a high level way.
3. Only intra CU is considered, we think it should be aliened the scenarios in the previous 3.1.2 Objective descriptions.

8 – FGI

We think the current CPC/CPAC cannot support the selective activation of cell group. In addition to comments mentioned by other companies, we note that in legacy, only intra-SN CPC without MN involvement is supported. The selective activation of cell group is more flexible, which may involve selective activation of SCG(s) and MCG. L3 based study on the selective activation of cell group can have higher priority than L1/L2 based study. It seems that inter-CU case is ruled out based on the conclusion of the initial phase, so we may not consider the inter-CU case.

9 – Ericsson LM

To start with: there seem to be many different views of what "selective activation of cell group" really is. This is of course a bad sign since that confusion will likely carry over to the WG discussions which will need a lot of time to be resolved.

We believe that with CPC the network can configure a candidate SCG-configuration which the UE shall apply upon meeting certain conditions. We think that this addresses the scenario that "selective activation of cell group" is intended to address. Of course, one can optimize (as with anything), but we think that CPC provides a sufficiently good solution for this. Again, we see that the detailed proposals for what "selective activation of cell group" actually is, differs quite a lot among proponents (= bad sign).

It is not clear to us to see what benefits (if anything significant) would be of adding the, quite large, feature of ”selective activation of cell group” over CPC.

10 – Intel Corporation (UK) Ltd

Regarding the question from moderator:

1. current CPC/CPAC cannot support this since the UE will remove all CPC configurations after the execution of CPC. But here, MR-DC with selective activation of cell group is to consider bi-direction switching and controlled by network in order to further reduce the latency and signalling overhead;

2 Yes, It can be based on L3 enhancements. But we do not see the relationship with CHO+MR-DC. They are quite different topic. In addition, it cannot be put under L1/L2 mobility since based on the discussion on L1/2 mobility, companies only consider the switching based on L1/2 signalling without the need of security changes, etc. But here we have to consider the change of security key.

A scenario is different:

- The enhancement for CHO+MR-DC is to keep SN when performing CHO for MCG. It can only improve the reliability for MCG change.

- But here is to consider to support Low interruption and improve the reliability upon switching of PCell, switching of PSCell and switching between sPCell and Scell, switching between Pcell and PSCell, etc;

It would be good to only consider NR-DC in order to avoid the impact on LTE, and also reduce the scope.

Solution is different:

- As mentioned above, we would like to consider bi-direction switching in order to reduce latency and increase reliability which is also different from CHO+MR-DC since for CHO+MR DC, the configuration will be released upon successful CHO. Bi-direction switching cannot be supported;

The objective could be

- To specify mechanism and procedures of NR-DC with selective activation of cell groups for improvement of mobility latency reduction and reliability:

o Configuration and maintenance for multiple candidate cell/cell groups to allow fast application of-configurations for candidate cell/cell groups [RAN2, RAN3];

o Dynamic switch mechanism among candidate cell groups for the potential applicable scenarios based on L3 signalling, in order to minimize the performance impact for mobility, [RAN2, RAN1];

o NOTE: At most two cell groups are activated at a time.

o Applied scenarios:

- Switching of PCell between MCGs;
- Switching of PSCell between SCGs
- Switching between sPCell and SCell;
- Switching between PCell and PSCell;

11 – Samsung Research America

The R17 CPC/CPAC can provide remarkable performance, e.g. the network can already configure multiple candidate PSCells, and UE can dynamically select a most suitable PSCell, with the configured condition. However, after changing SCG(SN), UE and network should perform another configuration for new CPC/C-PAC, and it results in SCG(SN) switching latency. And if SCG(SN) change frequently occurs, especially on FR2, the signaling overhead and the service break would increase.

The selective activation of cell groups is able to continue SN service with such low SCG(SN) change latency, low signaling overhead and low interruption time. As UE and network will keep the configuration of multiple cell groups even after changing SCG(SN) with the selective activation of the cell groups, ~~a~~ the fast SCG(SN) switching and the reliable SN connection can be achieved. Owing to supporting the context keeping even after SCG(SN) change, some signaling enhancement for RRC and RAN interfaces shall be required based on Rel.17 CPC/CPAC.

Similarly, the fast MCG switching can be also considered by keeping configuration of multiple MCGs after PCell change.

In this sense, the enhancement for MR-DC with selective activation of the cell groups can include:

- Fast SCG switching
- Fast MCG switching

We think the prioritized scenario needs to be the Fast SCG switching. And further, the Fast MCG switching can be supported if time is allowed or in later release.

The activation of cell groups can be supported by L3 signaling or L1/L2 signaling. If L1/L2 signaling is used of the CG activation, it may be related with the outputs of L1/L2-based mobility enhancements in MR-DC and inter-CU handover.

12 – NEC Corporation

1. We do not think current CPC/CPAC can support this or similar mechanism. For example, inter-SN PSCell change can trigger with releasing source SCG and adding new/target SCG in sequence.

2. Selective activation of cell group may be achieved based on a certain precondition, but it is not similar to CHO/CPAC. Considering its possible dynamicity, L1?/L2 mobility may fit rather than CPAC.

Note that we think selective activation should not be applied to MCG. If such selective activation of MCG is really necessary, it is questionable how legacy UEs can survive without it on the same cell or frequency band?

3. No. Inter-CU case should be precluded from L1/L2 mobility in Rel-18 as commented in the initial round.

13 – HuaWei Technologies Co.

1. As several companies indicated in the previous round discussion, we think inter-SN CPC/CPAC has already fulfill the requirement of selective CG activation for MR-DC with configuration of two candidate SCG as the motivation is the same, i.e. to address the SCG change for FR2 scenario. If anything enhancements should be done on top of R17 CPC/CPAC, e.g. to resolve the signaling overhead reduction, we think this can be discussed and addressed in the scope of objective of CHO+MRDC.

2. We share the similar view as other companies on the applicability of L1/L2 mobility approach. As we discussed for inter-CU case, PDCP anchor relocation and L2 reset are difficult to be avoided and thus using L1/L2 mobility would create more complexity. We understand this is why inter-CU case is excluded. Due to the same reason, we don't see it is feasible to apply to MR-DC for inter-CU or inter-SN cases. And if any optimization needs to be done, we think L3 enhancements should be the case.

14 – China Unicom

As we expressed in the initial round, we prefer not to include inter-CU case with high implementation complexity and great impacts to other working groups in R18.

15 – CATT

For question 1 – our answer is No. The reasons as previously commented include that legacy CPC/CPAC, upon execution, will release the configurations of the SCG. Also, as has been pointed out by others, they are triggered by UE, not the network.

For question 2 – we think selective activation of cell group should be based on L3 to avoid extra complexity if mixing with L1/L2 dynamic swithing.

For question 3 – our answer is No due to its complexity.

16 – NTT DOCOMO INC.

1: If the execution condition is met, the configuration for the candidate cell will be released. Therefore, It can't support selective activation of cell group, which is supposed to select cells dynamically and fast.

2:The basic understanding is L3, but in inter-DU case, L1/L2mobility is also possible.

17 – China Telecommunications

For Q1, we think the answer is NO. In the current CPC/CPAC mechanism, the UE has to release the CPC/C-PAC configurations after attempting a CPC/CPAC execution. The UE cannot try to perform a CPC/CPAC towards another cell or active another cell group based on the original configurations. The network has to re-coordinate with target candidate nodes to prepare the CPC/CPAC, which causes more delay and signaling overhead. Therefore, we think the current CPC/CPAC cannot support selective activation of cell groups.

For Q2, we think L3 based procedure shall be considered for selective activation of cell groups. In this way, the legacy procedure can be maximally reused instead of mixed with L1/L2 mobility which may make it even more complex.

18 – vivo Mobile Communication Co.

a. In current CPAC, candidate cell will be released after CPAC, while MR-DC with selective activation of the cell groups need to maintain all the configurations of potential CGs. They are similar, but current CPAC cannot full support it without any change.

b. We think it could be based on L2/L3 signaling.

c. It is better to first prioritized the intra-DU case. After we have a general design for L1/L2 mobility, it could be extended to other scenarios.

19 – Fujitsu Limited

For 2 and 3, CHO+MRDC should not be included under L1/L2 mobility since it is L3 mobility. And for CHO+MRDC (as L3 mobility), inter-CU case could be considered.

20 – LG Electronics France

The objective of CHO+MR-DC is quite different from selective CG activation. We should avoid mixing up these.

- We would like to include the support for CHO+MR-DC as an objective, in order to increase data tput during CHO
- We would like to support selective CG activation in the context of CPAC in order to reduce signaling and to increase connection robustness.

21 – China Mobile Com. Corporation

Q1: No. For CPC/CPAC, the UE will not keep the configuration of other candidates after successfully accessing which means that the dynamic activation is impossible without pre-configured candidates. And the execution condition should not be limited to measurement events and direct and fast indication from NW is more reasonable.

Q2: L3 enhancement is needed, however CHO+MRDC is not enough. As for L1/L2 mobility, it is not preferred especially for the complexity and effectiveness of the inter-CU case.

Q3: This is already excluded from the scope of Rel-18 mobility enhancement. We don't see sufficient reason to bring it back.

For CHO+MRDC

1. What are specific enhancements and corresponding specification impacts to be potentially specified?
2. What are impacted WGs?

Feedback Form 12: Impacts analysis on CHO+MRDC

1 – Nokia Germany

Answer to Q1: In Rel. 17, RAN3 is expected to complete the specification of CHO in MR-DC where the target PCell can provide a CHO configuration consisting of target MCG and target SCG configuration. If this work is not completed in Rel. 17 (up to RAN3 how to address it), it needs to be performed in Rel. 18.

However, this is not enough as the random access to the target SCG will be still performed by the UE when CHO execution condition, evaluated using just the target PCell measurement, is met. As such, the radio link quality of the target PSCell is not checked before performing the random access to target PSCell which may result in a failure. Rel. 18 can work, e.g. on extending the CHO procedure in MR-DC to improve the robustness of the random access to the target SCG.

Answer to Q2: The impacted WGs are RAN2/3/4.

2 – ZTE Corporation

If the target scenarios include inter-CU MRDC case, then this may need some additional work on the Xn interface.

Impacted groups are RAN2 and RAN3 (if inter-CU MRDC case is included).

3 – InterDigital France R&D

Any leftovers on this topic from Rel17 can be addressed in this WI. Both RAN2 and RAN3 are impacted.

4 – Qualcomm CDMA Technologies

CHO + CPC and CHO + CPA should be introduced. In addition, assuming it does not finish in Rel-17, configuring SCG in CHO should be added. Other possible enhancements are configuring CPA in legacy HO command or CHO command by the target. These will impact, just like CHO and CPAC in Rel-16 and Rel-17, RRC and Xn signaling. Thus, RAN2 and RAN3 are the impacted WGs.

5 – MediaTek Inc.

1. At least target PCell should be allowed to provide a CHO configuration including both target MCG and target SCG configurations. Moreover, we need to clarify if conditions for PSCell need to be defined, and if yes, how it is used together with conditions for PCell (e.g. does handover execution require both conditions to be met?)
2. Impacted WGs: RAN2, RAN3, (RAN4)

6 – Lenovo (Beijing) Ltd

1. CHO includig target's MCG and SCG configuration can be supported.
2. CHO can be configured to UE when UE has MR-DC in source gNB.

7 – KDDI Corporation

1. In high level impacts, RRC configuration, Measurement Report and Interface between the network nodes are impacted.
2. RAN2, RAN1 and RAN3.

8 – Guangdong OPPO Mobile Telecom.

1. CHO+CPA/CPC should be considered for CHO+MRDC.
2. Both RAN2 and RAN3 will be impacted.

9 – Ericsson LM

We think that it would be possible, by applying the current conditional-execution framework, to allow that an SCG is (conditionally) added upon CHO execution. I.e. the UE performs CHO towards a target cell and for that target, the UE is conditionally adding an SCG (with its own conditions), meaning that the SCG may be added at CHO execution, or later when the associated conditions become fulfilled. There is a limitation today that in a field description in RRC which prohibits the network to configure conditions to refer to two different measurement objects (e.g. PCell and PSCell). If that limitation is lifted, there is likely not so much more that needs to be done to allow CHO+MR-DC, i.e. this will be a small change.

Impacted WGs would be mainly RAN2, and perhaps secondary RAN3.

10 – Intel Corporation (UK) Ltd

Based on previous discussion, seems companies are considering to maintain the SN when performing CHO for MCG. This should mainly impact RAN3. RAN2 impact should be limited. Considering there is no relationship between selective activation of cell group and CHO+MR-DC, the CHO+MR-DC can be considered as low priority, and only work on it if TU is sufficient.

11 – Samsung Research America

We have assumed providing a CHO configuration consisting of target MCG and target SCG configuration. So the specification impact would be restricted, i.e. most of current signaling structure and process framework can be reused. One potential direction is to optimize the signaling when combining CHO for MCG and SCG, e.g. supporting the target MN and the target SN configuration in the RRC Handover message and adding additional indicator for CHO+MR-DC in the Xn Handover related messages.

Even though the expected impact is less, the enhancements would be required in RAN2 and RAN3.

12 – FGI

We may firstly consider the leftover in Rel-17. Moreover, the CHO configuration for target MCG and target SCGs is suggested to be considered.
The impacted WGs would be RAN2 and RAN3.

13 – Spreadtrum Communications

We may continue to consider the leftover from Rel-17 . If inter-CU case is considered, mainly impacted WGs would be RAN3 and RAN2.

14 – NEC Corporation

1. There can be two scenarios: a) CHO + SCG addition, b) CHO with/without SCG change. For example, upon CHO is executed, pre-configured SCG configuration is applied.

2. RAN2 and RAN3. In terms of cell identification/synchronization, RAN4 should be also involved.

15 – HuaWei Technologies Co.

1. From our understandings, Rel-17 already supports inter-SN CPC/CPAC and CHO with SCG configuration. In the last meeting of RAN2, RAN2 has agreed to support the CHO with SCG configuration in Rel-17 and sent the LS to RAN3 and if RAN3 can complete the work, this can be used as the baseline for future optimization.

We think in the existing framework of Rel-17 CHO with SCG configuration, the network can only configure one PSCell for each candidate PCell. The quality of the configured PSCell may be not good enough or the configured PSCell may not be the best candidate PSCell when the UE access the candidate PCell. It will impact the throughput of the UE. Therefore if this requires further optimization, the Rel-18 CHO+MR-DC can consider CHO configuration including the CPAC configuration. However we don't see it is quite essential for Rel-18, which can be second priority if time allows.

2. The impacted WGs are RAN2, RAN3 and RAN4

16 – China Unicom

We are open to specify CHO+MR-DC in R18, but if it is agreed, RAN2 and RAN3 will be the impacted WGs.

17 – CATT

For question 1 – firstly the configuration of both MCG and SCG should be allowed in CHO configuration. Furthermore, the whole procedure should ensure that when UE switch MCG+SCG, the connections to both are of good quality, to avoid unnecessary interruption and signaling overhead.

For question 2 – R2 and R3 are impacted.

18 – China Telecommunications For Q1, in order to support CHO+MRDC, target MCG/SCG configuration containing in a CHO configuration shall be supported at least. Xn and RRC signaling might need some enhancements. For Q2, the impacted WGs include RAN2 and RAN3.
19 – vivo Mobile Communication Co. a. We think the potential enhancement for CHO+MR-DC could be: CHO configuration includes both MCG/SCG configurations. b. The impact WG would be WG2/WG3/WG4.
20 – China Mobile Com. Corporation Q1: CHO configuration could include both MCG and SCG configurations. Q2: RAN2 and RAN3 would be impacted WGs.

3.3 Summary of Intermediate phase

Regarding the area of L1/L2 mobility enhancements

JustificationAround 23 companies joined the discussion.

Regarding the description of justification of L1/L2 mobility enhancements, all the companies agree the motivation is to reduce the interruption time and to reduce the signaling overhead and latency. There seems quite a few companies who think the motivation should not be limited to FR2 and should be also applicable to FR1, as the applicable scenarios were already agreed to include both FR1 and FR2. Thus the moderator suggests the justification can be further reworded to make it more generic, i.e. remove "L1/L2 mobility is for UEs in configurations with multiple beams". Furthermore, there is one company suggesting more detailed description of the problems with L3 handover but this is observed not essential. Having said above, it is suggested that we can conclude the justification of L1/L2 mobility enhancements in the Rel-18 mobility enhancements as follows:

Intermediate Phase Proposal 1: The justification of the area of L1/L2 mobility enhancements are updated as follows, which is to be included in the draft WID of Rel-18 mobility enhancements.

~~L1/L2 mobility is for UEs in configurations with multiple beams.~~ When a UE moves through such network the main mobility mechanism is beam switching based on L1 measurements. When the UE passes from the coverage area of one cell to another cell, at some point a serving cell change need to be performed. Currently serving cell change is triggered by L3 measurements and is done by RRC signalling triggered Reconfiguration with Synch for change of PCell and PSCell, as well as release add for SCells when applicable, all cases with complete L2 (and L1) resets, and involving more latency, more overhead and more interruption time than beam switch mobility. The goal of L1/L2 mobility enhancements is to be able to do serving cell change via L1/L2 signalling with such low latency, low overhead and low interruption time.

Objectives

Around 23 companies joined the discussion.

Regarding the objective descriptions, all the companies are basically fine with the suggested objectives. There seems a support to clarify the serving cell change for both SpCell and SCell in the objectives. In addition, several companies think the description of objective 2 can be further simplified by removing the justification part. These two aspects are further updated consequently. One company asked whether security needs to be addressed and one company responded the investigation of potential security issue needs to be first discussed in SA3. In this case we don't need to mention it at this stage and can leave it to SA3. One company also commented to address the overlapping between bullet 2 and 3, it is observed that the objective is already written in a neutral way and detailed solutions can be discussed further. Currently bullet 3 also involves RAN2, and hence nothing is precluded. There is also two companies commenting on removing "non-synchronization", however this seems not discussed before and it is premature to remove it. Thus it is kept as is, companies can provide further comments in the final round. Several companies suggest to add RAN3 and RAN4 as involving groups, and the objectives are updated to reflect this.

Regarding the applicable scenarios, the majority of companies are fine with the listed scenarios where only three companies still think intra-CU inter-DU should be deprioritized. Given that it has been discussed over several times, the moderator doesn't see the situation has changed and thus suggest to keep the conclusion as it is. There are some companies indicating MR-DC should be put to the high priority scenarios as it is quite similar than CA. In case no much additional spec work is needed for MR-DC, it is seen that there is no need to differ prioritized scenarios anymore and the objectives are updated accordingly. One company commented on whether MR-DC refers to all options. From previous rounds of discussion, it is observed that the major requirement is for NR-DC. To avoid changes to LTE side especially for L1/L2 layers, the objectives are suggested to be further restricted to NR-DC and companies are invited to comment whether this is agreeable. One company asks the clarification of whether intra-CU inter-DU includes DC case. In previous rounds of discussion, this seems rather to consider standalone and CA cases and thus it is suggested to focus on these scenarios. Companies can continue to comment whether this is agreeable as well.

Thus, the moderator thinks we can conclude the objectives of L1/L2 mobility enhancement as follows:

Intermediate Phase Proposal 2: The objectives of L1/L2 mobility enhancement are updated as follows, which is to be included in the draft WID of Rel-18 mobility enhancements.

To specify mechanism and procedures of L1/L2 based inter-cell mobility for mobility latency reduction:

1. Configuration and maintenance for multiple candidate cells to allow fast application of configurations for candidate cells [RAN2, RAN3];

2. Dynamic switch mechanism among candidate serving cells (including SpCell and SCell) for the potential applicable scenarios based on L1/L2 signalling~~, in order to minimize the performance impact for mobility in terms of interruption time and signaling overhead~~ [RAN2, RAN1];

3. L1 enhancements, including inter-cell beam management, L1 measurement and reporting, beam indication, and for non-synchronized scenario to handle TA management [RAN1, RAN2, RAN4];

4. CU-DU interface signaling to support L1/L2 mobility, if needed [RAN3];

5. Core requirements associated with above items, if specified [RAN4].

NOTE: FR2 specific enhancements are not precluded, if any.

NOTE: the procedure of L1/L2 based inter-cell mobility are applicable to the following scenarios:

~~Prioritized scenarios:~~

- Standalone, CA and the NR-DC case with serving cell change within one CG ~~(including serving cell change for PCell and SCell)~~

- Intra-DU case and intra-CU inter-DU case (including Standalone and CA)

- Both intra-frequency and inter-frequency

- Both FR1 and FR2

Intermediate Phase Guidance 1: Companies are invited to provide further comments in the final round phase to consolidate the justifications and objectives of L1/L2 mobility enhancements.

Regarding the area of MR-DC enhancements

MR-DC with selective activation of the cell groups

Around 20 companies joined the discussions.

Support/Prioritize L3 based (13): Nokia, ZTE, InterDigital, Lenovo, FGI, Intel, Samsung, Huawei, CATT, NTT DOCOMO, China Telecommunications, vivo (L2/L3 signalling), Fujitsu

Support both L3 based and L1/L2 based on different scenarios (3): Qualcomm, MediaTek, KDDI

Neither (1): Ericsson

It is seen that the majority assumes the MR-DC with selective activation of the cell groups can have further L3 enhancements. The majority of companies think extending L1/L2 based mobility to inter-CU/inter-SN cases are not desirable, and more companies tend to believe it should be addressed on top of Rel-17 CPC/CPAC. The main missing part is to allow subsequent CPC/CPAC after changing SCG without having the network re-initiating the CPC/CPAC configuration and preparation. This seems acknowledged by quite a few companies as the potential benefit of reducing the signaling overhead and interruption time compared with Rel-17 CPC/CPAC, which is good for frequent SCG change case especially on FR2. Trying to figure out a potential way forward, the moderator would like to propose the follows.

Intermediate Phase Proposal 3: The objective of MR-DC with selective activation of the cell groups can be considered as L3 enhancements in Rel-18. If specified, the enhancements are based on Rel-17 CPC/CPAC mechanisms, allowing subsequent CPC/CPAC after changing SCG without reconfiguration and re-initiation on the CPC/CPAC preparation by the network.

Intermediate Phase Guidance 2: Companies are invited to provide further comments in the final round phase to consolidate the justifications and objectives of MR-DC with selective activation of cell groups.

CHO+MRDC

Around 19 companies joined the discussions.

CHO including target MCG and target SCG (if not supported in Rel-17) (7): Lenovo, ER, Intel, Samsung, NEC, CATT, China Telecommunications

CHO including target MCG and candidate SCG for CPC/CPAC (7): Nokia Qualcomm, MediaTek, OPPO, FGI, Huawei, vivo

Some companies feedback is not very clear and more sort of neutral. Some companies proposed to consider target MCG and candidate SCG for CPC/CPAC, and no company really question the need to complete CHO including target MCG and target SCG if not supported in Rel-17. This is also regarded as the baseline for future optimization by several companies, e.g. the robustness of SCG change and the throughput can be further improved by including the CPC/CPAC configuration in the CHO configuration. Two companies tend to think the further optimization may not be critical or prioritized. Thus it is suggested to conclude as follows:

Intermediate Phase Proposal 4:

CHO+MRDC can be considered in Rel-18. If specified, the objectives are:

1. To prioritize CHO including target MCG and target SCG if it cannot be completed in Rel-17;

2. To specify CHO including target MCG and candidate SCG for CPC/CPAC if time allows, and bullet 1 is used as the baseline.

Intermediate Phase Guidance 3: Companies are invited to provide further comments in the final round phase to consolidate the justifications and objectives of CHO+MRDC.

In general, with all these above objectives, the scope still seems a bit too large. So companies are invited to provide your thoughts on whether both selective activation of cell groups and CHO+MRDC are essential to be included in Rel-18. This would also impact the TU estimation.

Intermediate Phase Guidance 4: Companies are invited to provide further comments in the final round phase whether any preference to prioritize among MR-DC with selective activation of cell groups and CHO+MRDC, and TU estimation can also be provided by companies.

4 Final Phase

4.1 Area1: L1/L2 mobility enhancements

4.1.1 Justification

~~L1/L2 mobility is for UEs in configurations with multiple beams.~~ When a UE moves through such network the main mobility mechanism is beam switching based on L1 measurements. When the UE passes from the coverage area of one cell to another cell, at some point a serving cell change need to be performed. Currently serving cell change is triggered by L3 measurements and is done by RRC signalling triggered Reconfiguration with Synch for change of PCell and PSCell, as well as release add for SCells when applicable, all cases with complete L2 (and L1) resets, and involving more latency, more overhead and more interruption time than beam switch mobility. The goal of L1/L2 mobility enhancements is to be able to do serving cell change via L1/L2 signalling with such low latency, low overhead and low interruption time.

4.1.2 Objectives

To specify mechanism and procedures of L1/L2 based inter-cell mobility for mobility latency reduction:

1. Configuration and maintenance for multiple candidate cells to allow fast application of configurations for candidate cells [RAN2, RAN3];

2. Dynamic switch mechanism among candidate serving cells (including SpCell and SCell) for the potential applicable scenarios based on L1/L2 signalling~~, in order to minimize the performance impact for mobility in terms of interruption time and signaling overhead~~ [RAN2, RAN1];

3. L1 enhancements, including inter-cell beam management, L1 measurement and reporting, beam indication, and for non-synchronized scenario to handle TA management [RAN1, RAN2, RAN4];

4. CU-DU interface signaling to support L1/L2 mobility, if needed [RAN3];

5. Core requirements associated with above items, if specified [RAN4].

NOTE: FR2 specific enhancements are not precluded, if any.

NOTE: the procedure of L1/L2 based inter-cell mobility are applicable to the following scenarios:

~~Prioritized scenarios:~~

- Standalone, CA and the NR-DC case with serving cell change within one CG ~~(including serving cell change for PCell and SCell)~~

- Intra-DU case and intra-CU inter-DU case (including Standalone and CA)

- Both intra-frequency and inter-frequency- Both FR1 and FR2

Companies are invited to provide further comments to the suggested draft WID in the aspects of L1/L2 mobility enhancements above in order to consolidate the justifications and objectives of L1/L2 mobility enhancements in the Rel-18 mobility enhancements scope.

Feedback Form 13: Draft WID in the aspects of L1/L2 mobility enhancements

1 – Ericsson LM In general this looks fine. But again, we would prefer to not overload the WGs, and hence remove the inter-DU-case as mentioned several times before. We think that L1/L2 mobility would be done for the purpose of reducing interruption time, and partly to reduce signalling overhead. We think it is fair to capture this, i.e. not remove the wording from bullet 2.
2 – HuaWei Technologies Co. We think the justification and objectives are in good shape. We have one wording suggestion on the justification. It seems the second sentence “When a UE moves through such network the main mobility mechanism is beam switching based on L1 measurement” is the consequence of the first sentence (removed already) “L1/L2 mobility is for UEs in configurations with multiple beams”. So it should also be removed. The remaining part looks good.
3 – Apple Hungary Kft. We are willing to accept this for progress.

4 – InterDigital France R&D

We are ok with the current text. We think, however, the first sentence "When a UE moves….." should also be removed as it is related to the sentence previous to that which was also removed.

5 – Futurewei Technologies

Since NR-DC with serving cell change within one CG is added to the first bullet of scenarios, what's added in the 2nd bullet - "including standalone and CA" - seems unnecessary and confusing. The limitation of intra-DU and intra-CU inter-DU should also apply to serving cell change within CG in NR-DC case.

6 – KDDI Corporation

We are ok with the current text.

7 – MediaTek Inc.

We have the following concerns about the Objective, as expressed in the intermediate round:

1. The separation between Item 2 & 3 must be reconsidered: These items need to be merged as follows:

- "Inter-cell beam management, L1 measurement and reporting, beam indication" should be under Item 2 (dynamic switch), and resulting from discussions on dynamic switch. This should be led by RAN2, i.e. RAN2 decides dynamic switch mechanism using L1/L2 mobility, and triggers RAN1 discussions on L1 measurements and signaling.

- Item 3 should keep *only* the TA management part, and this item should also be RAN2-led. Also we don't need to list RAN4 here since RAN4 work is indicated by Item 5.

2. We don't understand why "in order to minimize the performance impact for mobility in terms of interruption time and signaling overhead" has been removed. It is important to properly define the problem to solve i.e. the purpose of this objective, not just its technical scope (certainly, the justification will set the framework of this work, and the objective states "mobility latency reduction" – but that is still too vague).

8 – Qualcomm CDMA Technologies

We are fine with the Justification and Objectives.

9 – NTT DOCOMO INC.

We are fine with the justification and objectives for L1/L2 mobility.

10 – Spreadtrum Communications

We are ok with the current justification and objectives.

11 – Guangdong OPPO Mobile Telecom.

We are fine with the current justification and objectives.

12 – Intel Corporation (UK) Ltd

The updates from Moderator looks good to us. Only small suggestion, the L1/2 mobility is bi-direction switching, and therefore it can also improve the reliability. We may update the justification as. i.e. add "high reliability" for below parts:

The goal of L1/L2 mobility enhancements is to be able to do serving cell change via L1/L2 signalling with such low latency, low overhead, high reliability and low interruption time.

13 – China Unicom

The current justification and objectives looks fine for us.

14 – Lenovo (Beijing) Ltd

We are fine with the current description.

15 – vivo Mobile Communication Co.

We are fine with the most of the current motivations and objectives

1. Regarding 2nd bullet, we think "in order to minimize the performance impact for mobility in terms of interruption time and signaling overhead" should be kept, as it is the guidance for RAN2 design on the dynamic switch mechanism.

2. Regarding 3rd bullet, we were not proposing to remove "non-synchronization" in the intermediate phase. As we discussed above, non-synchronized scenario is not just related to TA handling, **but also related to measurement and measurement report**. Thus, we suggest to change it like "L1 enhancements for both synchronized and non-synchronized scenarios, including inter-cell beam management, L1 measurement and reporting, beam indication, and TA management".

3. Regarding 3rd bullet, there seems no need to include "RAN4", as we already have 5th bullet.

4. Regarding "inter-DU case", we think we should first prioritize the intra-DU case during WG discussion. But we are fine to compromise to accept the current wording.

16 – LG Electronics France

This objective looks fine in general with the following comments:

1) We prefer to remove bullet 4; bullet4 unnecessarily increases load for non-essential enhancements.

2) We prefer to merge bullet 1 and 2 such that it is modified (no strong view though)

'Dynamic switching of serving cell via L1/L2 signaling from multiple candidate cells to minimize interruption time and signaling overhead [RAN2, RAN1, RAN3]'

17 – China Telecommunications

Generally, we are fine with the current text, and we also think the first sentence "When a UE moves…" should also be removed.

18 – NEC Corporation

Regarding the CU/DU aspects, we tend to agree with Moderator summary "One company asks the clarification of whether intra-CU inter-DU includes DC case. In previous rounds of discussion, this seems rather to consider standalone and CA cases and thus it is suggested to focus on these scenarios. Companies can continue to comment whether this is agreeable as well". It seems straight forward to describe as follows, or remove the parenthesis:

- Intra-DU case and intra-CU inter-DU case (only Standalone including CA)

19 – Nokia Germany Overall it looks OK to us. One question regarding the considered DC scenarios: As candidate serving cell could be an SpCell or SCell in SCG, L1/2 inter-cell mobility can be also applied to EN-DC, NGEN-DC in addition to NR-DC option which is listed in the description? Is it the correct understanding? Can this be expressed explicitly?
20 – CATT We are generally fine with the objective. But we have some concern on the scenairo, i.e., we think inter-DU case has complexity in some aspects, e.g., interface imapct, and also other potential L2 impacts that might compensate the gain quickly. So we'd propose to prioritize intra-DU case (if not possible to do drop inter-DU).
21 – SHARP Corporation We are fine with the current text.
22 – China Mobile Com. Corporation We agree with the current version of the WID.
23 – FGI The current version looks good.
24 – Verizon UK Ltd It looks fine.

4.2 Area 2: MR-DC with selective activation of cell groups

4.2.1 Justification

In Rel-17 CPC/CPAC, a CPC/CPAC configured UE has to release the CPC/CPAC configurations when performing the random access to the target PCell. Hence the UE doesn't have a chance to perform subsequent CPC/CPAC without reconfiguration and re-initialization on the CPC/CPAC from the network, which will delay the cell change and increase the signaling overhead, especially in the case of frequent SCG change operating on FR2. Therefore, MR-DC with selective activation of cell groups is aimed to allow allowing subsequent CPC/CPAC after changing SCG, without reconfiguration and re-initialization on the CPC/CPAC preparation from the network, which can reduce the signaling overhead and interrupting time for CPC/CPAC.

4.2.2 Objectives

To specify mechanism and procedures of MR-DC with selective activation of the cell groups via L3 enhancements:

- to allow subsequent CPC/CPAC after changing SCG without reconfiguration and re-initiation of CPC/CPAC [RAN2, RAN3, RAN4];
- Rel-17 CPC/CPAC mechanism is used as the baseline.

Companies are invited to provide further comments to the suggested draft WID in the aspects of MR-DC with selective activation of cell groups above in order to consolidate the justifications and objectives of MR-DC with selective activation of cell groups in the Rel-18 mobility enhancements scope.

Feedback Form 14: Draft WID in the aspects of MR-DC with selective activation of cell groups

1 – Ericsson LM

We note that this is a significantly smaller item than the previous versions of the proposed solutions for ”selective activation of cell groups”. However, the alternative to the current objective is that the network provides a new CPC configuration after the UE has executed the (first) CPC which works with current specs. So there seem to be no need for further enhancements in our view. Of course, one can always optimize anything, but there seem to be not so much additional gain of this. From a specification point of view this objective **may** (may) be small, but to actual implement this in a product the complexity would likely be very large as there would need to be a lot of coordination between nodes.

2 – InterDigital France R&D

We are fine with the current text.

3 – Futurewei Technologies

If ”selective activation of cell groups” is limited to only CPC/CPAC, the usefulness of this feature may be significantly reduced, while it introduces complexity in the network’s configuration of CPC/CPAC to accommodate future uncertain PCell/PScell selection by UE.

4 – KDDI Corporation

We are ok with the current text.

5 – MediaTek Inc.

In Justification, do you mean “… performing the random access to the target PSCell”?

6 – HuaWei Technologies Co.

It is generally fine, however we want to point out if we configure too many candidate sets of CPAC configuration, this would require frequent/complicated coordination between the gNB nodes. So we think it is better to limit the number of the candidate sets to two.

Another consideration is whether all MR-DC options can be supported. CPAC currently only supports EN-DC and NR-DC, and therefore we think if this is to be specified, it is sufficient to only apply to EN-DC and NR-DC.

We also agree with MTK it should be ”PSCell”.

7 – Qualcomm CDMA Technologies

We share the same concern with Ericsson and FW. We are going for a very complicated solution (there was a reason why we decided to release CPC after cell changes) while there is a much simpler way for selective activation. So the usefulness of this feature in the actual deployments will be questionable. A sub-bullet

can be added as ”based on legacy SN addition and change procedures” or CPAC based solution can be listed as an example only.

8 – NTT DOCOMO INC.

We are fine with the draft WID above.

9 – Intel Corporation (UK) Ltd

We would prefer not link the MR-DC with selective activation with CPC/CPAC.

Our impression is, companies mentioned the problem of CPC/CPAC in second round because the question is whether CPC/CPAC can cover MR-DC with selective activation.

But as we mentioned , the solution is quite different, similar to L1/L2 mobility, we should consider the dynamic switching based on network signalling, but currently CPC/CPAC is based on execution condition, and bi-direction switching based on network signalling cannot be achieved. Therefore we suggest to have similar objectives as L1/L2 mobility instead of CPC/CPAC baseline:

The objective could be

- To specify mechanism and procedures of NR-DC with selective activation of cell groups for improvement of mobility latency reduction and reliability:

o Configuration and maintenance for multiple candidate cell/cell groups to allow fast application of-configurations for candidate cell/cell groups [RAN2, RAN3];

o Dynamic switch mechanism among candidate cell groups for the potential applicable scenarios based on L3 signalling, in order to minimize the performance impact for mobility, [RAN2, RAN1];

o NOTE: At most two cell groups are activated at a time.

o Applied scenarios:

- Switching of PCell between MCGs;
- Switching of PSCell between SCGs
- Switching between sPCell and SCell;
- Switching between PCell and PSCell;

10 – Spreadtrum Communications

We are fine with the current justification and objectives.

11 – Lenovo (Beijing) Ltd

CPAC=CPA and CPC. Therefore, we can reword as follow:

- to allow subsequent CPC/CPA after changing SCG without reconfiguration and re-initiation of CPC/CPA [RAN2, RAN3, RAN4];
- Rel-17 CPC/CPA mechanism is used as the baseline.

12 – LG Electronics France

This objective looks fine.

13 – vivo Mobile Communication Co.

CPAC enhancement is one alternative for MR-DC with selective activation of the cell groups. Other alternatives for dynamic switch based on L3 signaling could be also considered. Thus, we suggest to modify it to a more general objective, e.g. "Dynamic switch among candidate cell groups based on L3 signalling, considering CPA/CPC mechanism or legacy SCG change/addition.

14 – China Telecommunications

We are fine with the Justification and Objectives, and we share similar views with HW that the solution should only applied for NRDC and ENDC scenarios.

15 – NEC Corporation

We are fine with the objectives.

16 – Nokia Germany

We have few comments:

- There is no need to limit the cell group to SCG as the fast selective activation mechanism may apply to MCG as well.
- If cell group can be MCG, there is no need to limit the scenario for MR-DC as it can be applied as well for standalone scenario/single-connectivity.
- The current description of the objective builds on top of CPAC procedures where the UE evaluates a condition for triggering the cell change. This should not exclude at this stage the option where the network triggers the cell change. So we prefer to reformulate the objective in a more general way in order not to restrict the scope of possible solutions to condition-based only change.

17 – CATT

We are generally fine with this considering the overall work load.

18 – ZTE Corporation

We are generally fine with the justification and the objectives.

For the bullet point: "intra-CU inter-DU case (including Standalone and CA)":

- We want to clarify that this refers to the configuration and maintenance for multiple candidate cell groups rather than candidate cells, since the target cell is controlled by another DU, so, it should be candidate cell group instead of cell.
- If this is the correct understanding, then we support this. And we prefer to extend the support to candidate cell group for SCG, since similar framework can be used for both cases.

So, we propose the following modifications:

1. Configuration and maintenance for multiple candidate cells***/cell groups*** to allow fast application of configurations for candidate cells [RAN2, RAN3];

2. Dynamic switch mechanism among candidate serving cells***/Cell groups*** (including SpCell and SCell) for the potential applicable scenarios based on L1/L2 signalling [RAN2, RAN1];

19 – SHARP Corporation We are fine with the current text.
20 – China Mobile Com. Corporation We are generally fine to go with this version, but still question commercial needs and concern the complicated inter node coordination.
21 – FGI The current version looks good.
22 – Verizon UK Ltd Agree with ZTE.

4.3 Area 3: CHO+MR-DC

4.3.1 Justification

Currently CHO and MR-DC cannot be configured simultaneously. This limits the usefulness of these two features when MR-DC is configured. If it is not completed in Rel-17, Rel-18 should specify mechanisms for CHO and MR-DC to be configured simultaneously. However, it may not be enough as the radio link quality of the configured PSCell may not be good enough or may not be the best candidate PSCell when the UE access the target PCell. Thus it will impact the throughput of the UE and Rel-18 CHO+MRDC can consider CHO including target MCG and multiple candidate SCG for CPC/CPAC to further improve the CHO performance.

4.3.2 Objectives

1. To specify CHO including target MCG and target SCG if it cannot be completed in Rel-17; [RAN2, RAN3, RAN4]

2. To specify CHO including target MCG and candidate SCG for CPC/CPAC if time allows [RAN2, RAN3, RAN4]

- CHO including target MCG and target SCG is used as the baseline.

Companies are invited to provide further comments to the suggested draft WID in the aspects of CHO+MRDC above in order to consolidate the justifications and objectives of CHO+MRDC in the Rel-18 mobility enhancements scope.

Feedback Form 15: Draft WID in the aspects of CHO+MRDC

1 – Ericsson LM Agree

2 – InterDigital France R&D

We are fine with the current text.

3 – Futurewei Technologies

This looks fine.

4 – KDDI Corporation

We are ok with the current text.

5 – MediaTek Inc.

We are fine with current text.

6 – HuaWei Technologies Co.

It looks fine.

7 – Qualcomm CDMA Technologies

We can accept this if we remove ”if time allows”. We all know that de-prioritization even before a WI is approved or starts effectively removes the objective from the WI.

8 – Intel Corporation (UK) Ltd

As commented by other companies, RAN2 only needs to remove the restriction from the field description. The main work should be done in RAN3. And so far, in Rel. 17, RAN3 is working on this.

So the leading group should be RAN3 instead of RAN2.

9 – Spreadtrum Communications

We are fine with the current text.

10 – China Unicom

We agree with this.

11 – Guangdong OPPO Mobile Telecom.

We are fine with the justification and objectives.

12 – Lenovo (Beijing) Ltd

The combination of the above objectives can be considered. namely, CHO including target MCG and target SCG and candidate SCG for CPC/CPAC can be supported. If the channel quality of configured target SCG is not good enough, UE may trigger CPAC.

Minor change because CPAC=CPA+CPC

To specify CHO including target MCG and candidate SCG for CPC/CPA if time allows [RAN2, RAN3, RAN4]

13 – LG Electronics France

This objective looks fine in general but we have comments.

We prefer to remove 'if time allows', because further down-scoping of bullet 2, if really needed, can be done in work item phase.

14 – vivo Mobile Communication Co.

We are fine with the justification and objectives by removing "if time allows", as we anyway need to discuss the down-scope before or during WI phase, like we have the below "potential down-selection and TU estimation".

15 – China Telecommunications

We are fine with the Justification and Objectives.

16 – NEC Corporation

We are basically fine, but would like to suggest changing the bullet 2 as follows, given that "if time allows" is kept. Otherwise ("if time allows" is to be removed), the bullet 2 can be second priority (like other discussions).

2. To specify CHO including target MCG and candidate SCG for CPC/CPAC if time allows after completing the objective 1 [RAN2, RAN3, RAN4]

17 – Nokia Germany

We suggest deleting "if time allows" from the second objective as the amount of work is not expected to be high given it is leftover from Rel. 16 mobility enhancement WI and Rel. 17 MR-DC WI. Moreover, there is high chance that objective 1 is addressed and completed already in Rel. 17.

Within the first objective, we understand the impact is actually limited to RAN3, based on the Rel-17 analysis and the LS exchange between RAN2 and RAN3. Thus, likely RAN2 and RAN4 can be removed from the affected groups?

18 – CATT

We are fine with this part.

19 – ZTE Corporation

If the configuration and maintenance of multiple cell groups is allowed as part of the above objectives in section 4.1.1, then we don't think this objective is needed anymore. We prefer common framework to address this issue in general.

It is not clear why we take CPC/CPAC as baseline will save the complexity.

20 – SHARP Corporation

We are fine with the current text.

21 – China Mobile Com. Corporation

We are fine with the current justification and objectives.

22 – FGI The current version looks good.
23 – Verizon UK Ltd Looks fine.

4.4 Potential Down-selection and TU estimation

To consider the overall load, companies are invited to provide further comments whether any preference to prioritize among **selective activation of cell groups** and **CHO+MRDC**, and TU estimation can also be provided by companies.

Feedback Form 16: Down-selection and TU estimation

1 – Ericsson LM The updated version of ”selective activation of cell groups” is significantly smaller now. We think that it would require 0.5 TUs throughout the release. Same goes for the CHO+MRDC-objective, also 0.5 TUs throughout the release. We think the CHO+MRDC-objective is more commercially important and hence we prefer that.
2 – InterDigital France R&D We see selective activation of cell groups as being more relevant for mobility as it is more about latency reduction and less about reduction of signaling overhead, and we therefore prefer to prioritize it over CHO+MRDC. That being said, we think both can be handled in the WI as they are not significantly large topics.
3 – Apple Hungary Kft. Between the CHO+MRDC and multiple SCG activations (CPC/CPAC after SCG change), we think CHO+MRDC is more practical in both usage and deployment (primarily because the CPC/CPAC after SCG is more in optimizing faster PSCell change which would not work if the configuration needs to be changed - which is more often than not). However, we do see cases in FR2 where CPC/CPAC after SCG change can be useful), so if it comes to down selection, CHP+MRDC would be prefer to address in Rel-18 before the CPC/CPAC after SCG change.
4 – Futurewei Technologies both aspects can be included in the WI.
5 – Samsung Research America The selective activation of cell groups can be prioritized rather than CHO + MRDC. Regarding TU estimation, we have assumed that it is reasonable to have 2 TUs per meeting for overall R18 mobility topics.

6 – KDDI Corporation

We prefer to prioritize activation of cell groups over CHO + MRDC, if down-selection is needed.

7 – MediaTek Inc.

If down-selection is needed, our preference is to prioritize ”selective activation of cell groups”

8 – HuaWei Technologies Co.

We think Area 2 and Area 3 are small enhancements, but from commercial point of view CHO+MRDC may be more beneficial and the work for CHO+MRDC is more manageable.

Regarding the TU, we think 2 TU per RAN2 meeting is the rough estimation, and 0.5 TU per RAN2 meeting for these small enhancements as we think L1/L2 mobility would require sufficient time to progress.

9 – Qualcomm CDMA Technologies

For us, L1/L2 mobility and CHO + MRDC are more important and useful features. However, we don’t need to do any prioritization before the WI starts and makes some progress. The TU allocation should assume that all objectives will be fulfilled.

10 – Intel Corporation (UK) Ltd

Based on current scope, L1/L2 mobility, selective activation of cell groups and CHO+MRDC, 2 TUs are needed in RAN2. If down selection is needed, we would prefer to prioritize MR-DC with selective activation.

11 – Spreadtrum Communications

We prefer to prioritize selective activation of cell groups over CHO + MRDC.

12 – Lenovo (Beijing) Ltd

Currently, we can keep both. if we have to select, we prefer to keep CHO + MRDC.

13 – LG Electronics France

We estimate the two small objectives, MR-DC with selective activation of cell groups and CHO+MR-DC requires less than 1 TU in total becaue intended behaviors are rather straightforward, and hence we do not think any prioritization between these two is necessary and hence we can keep both.

14 – China Telecommunications

The current scope of **selective activation of cell groups** and **CHO+MRDC** are quite small, and we think both aspects can be included in the R18 WI.

15 – vivo Mobile Communication Co.

1. Regarding TUs, we think about 2TUs per-meeting in RAN2 is needed for mobility enhancement WI. With this TU estimation, we think both selective activation of cell groups and CHO+MR-DC could be included, with the above mentioned scopes.

2. If Down-scope is really needed, we think CHO enhancement should be prioritized considering the commercial deployment.

16 – NEC Corporation We assume down-selection is realistic considering expected available TUs and whole objectives in this WI. We prefer to include CHO+MRDC, then selective activation can be considered in Rel-19.
17 – Guangdong OPPO Mobile Telecom. We think CHO+MRDC should be prioritized over selective activation of cell groups in R18 mobility enhancement WI.
18 – CATT Given the current scope (reduced a lot) it seems no strong need to do deprioritization. Roughly speaking this looks like a 2TU R2-led project.
19 – Nokia Germany We are fine to have both objectives in Rel. 18 WI. We believe both are small enough to be manageable to be addressed in Rel-18. Any discussion on the potential down-scoping may happen already when WI is progressing and it is known at what pace the related decisions are made.
20 – ZTE Corporation If the configuration and maintenance of multiple cell groups is allowed as part of the above objectives in section 4.1.1 then we think this additional work is not needed anymore.
21 – Nokia Germany We would like to share one more comment regarding the scope of WI in general, not related to these two objectives mentioned prior to this feedback form. Apologies for being urgent here, but this is still about ”SCell/SCG setup delay reduction with early measurement enhancements”. We would like to reserve the right to re-discuss this objective (beyond this e-mail discussion), as in our understanding it was removed based on vague motivation (i.e. that it will be addressed in TEI17). Thus, let’s consider it again once November’s WG meetings are over. Thanks for understanding.
22 – China Mobile Com. Corporation Considering commercial needs, we prefer to prioritize the CHO+MRDC. Since L1/L2 mobility is the most important enhancement in Rel-18, we think sufficient TUs should be reserved for it and selective activation of cell groups can be considered in Rel-19.
23 – FGI We think at least 2 TUs are reserved for Rel-18 mobility enhancements to cover the three areas.
24 – Verizon UK Ltd We think both aspects should be included in the WI.

4.5 Summary of Final Phase

Regarding the draft WID in the aspects of L1/L2 mobility enhancements

There is a wide support to accept the suggested justification and objectives. It is observed that there are some editorial comments to remove the first sentence as it is related to the previously removed sentence, which seems fine to all. There are also some comments to remove RAN4 from the bullet 3 as bullet 4 has already includes RAN4 for all the objectives and it seems also acceptable to all. Two companies keep commenting to deprioritize intra-CU inter-DU but no sufficient support.

There is also one company commenting to revise the structure between bullet 2 and 3 as expressed before, but also no much support can be seen.

One company raised a question regarding the considered DC scenarios, the moderator thinks it would be a starting point to support NR-DC only, but if there is no delta to apply to SCG for EN-DC and NGEN-DC, this can be further discussed in the normative phase.

Given the situation, it seems the draft WID is stable and companies are willing to accept this for progress. Thus it is suggested to conclude the draft WID in the aspects of L1/L2 mobility.

It is suggested that the following justification and objectives of the L1/L2 mobility enhancements can be included in the draft WID of Rel-18 mobility enhancements.

Justification:

~~When a UE moves through such network the main mobility mechanism is beam switching based on L1 measurements.~~ When the UE passes from the coverage area of one cell to another cell, at some point a serving cell change need to be performed. Currently serving cell change is triggered by L3 measurements and is done by RRC signalling triggered Reconfiguration with Synch for change of PCell and PSCell, as well as release add for SCells when applicable, all cases with complete L2 (and L1) resets, and involving more latency, more overhead and more interruption time than beam switch mobility. The goal of L1/L2 mobility enhancements is to be able to do serving cell change via L1/L2 signalling with such low latency, low overhead and low interruption time.

Objectives:

To specify mechanism and procedures of L1/L2 based inter-cell mobility for mobility latency reduction:

1. Configuration and maintenance for multiple candidate cells to allow fast application of configurations for candidate cells [RAN2, RAN3]

2. Dynamic switch mechanism among candidate serving cells (including SpCell and SCell) for the potential applicable scenarios based on L1/L2 signalling [RAN2, RAN1]

3. L1 enhancements, including inter-cell beam management, L1 measurement and reporting, beam indication, and for non-synchronized scenario to handle TA management [RAN1, RAN2~~, RAN4~~]

4. CU-DU interface signaling to support L1/L2 mobility, if needed [RAN3]

5. Core requirements associated with above items, if specified [RAN4]

NOTE: FR2 specific enhancements are not precluded, if any.

NTOE: The procedure of L1/L2 based inter-cell mobility are applicable to the following scenarios:

- Standalone, CA and NR-DC case with serving cell change within one CG

- Intra-CU case and intra-CU inter-DU case (applicable for ~~ncluding~~ Standalone and CA)

- Both intra-frequency and inter-frequency

- Both FR1 and FR2

Regarding the draft WID in the aspects of MR-DC with selective activation

According to the feedback, companies are aligned on the proposed direction that this objective is based on L3 enhancement, and quite a few companies are fine with justifications and objectives which is based on CPC/CPAC. Some companied commented to correct "PCell" to "PSCell" in the justification, which is one typo to be fixed.

However, there are still some contentious solution-wise discussions. On one hand, some companies think this objective should not be limited to CPC/CPAC, e.g. remove the last bullet of "Rel-17 CPC/CPAC mechanism is used as the baseline". Otherwise, it could limit the usefulness of this feature. On the other hand, some companies still think it is complicated solution even based on CPC/CPAC, e,g, in terms of the complexity of network node coordination, where two companies additionally commented to further limit the scenarios to EN-DC and NR-DC. Given the situation, it is suggested to take the justification and the direction of L3 enhancements as the conclusion and whether it should be based on Rel-17 CPC/CPAC and whether it is limited to EN-DC and NR-DC only can be further discussed.

It is concluded that MR-DC with selective activation can be considered based on L3 enhancements.

It is suggested that the following justification and objectives of MR-DC with selective activation can be considered as baseline in the Rel-18 mobility enhancements.

Justification:In Rel-17 CPC/CPAC, a CPC/CPAC configured UE has to release the CPC/CPAC configurations when performing the random access to the target PSCell. Hence the UE doesn't have a chance to perform subsequent CPC/CPAC without reconfiguration and re-initialization on the CPC/CPAC from the network, which will delay the cell change and increase the signaling overhead, especially in the case of frequent SCG change operating on FR2. Therefore, MR-DC with selective activation of cell groups is aimed to allow allowing subsequent CPC/CPAC after changing SCG, without reconfiguration and re-initialization on the CPC/CPAC preparation from the network, which can reduce the signaling overhead and interrupting time for CPC/CPAC.

Objectives:To specify mechanism and procedures of MR-DC with selective activation of the cell groups via L3 enhancements:- to allow subsequent CPC/CPAC after changing SCG without reconfiguration and re-initiation of CPC/CPAC [RAN2, RAN3, RAN4];

TBD: whether Rel-17 CPC/CPAC mechanism is used as the baseline~~.~~

TBD: whether to limit MR-DC to EN-DC and NR-DC. ~~-~~

Regarding the draft WID in the aspects of CHO+MRDC

It seems all the companies agree with the justification and objectives in general. There are several companies commenting to remove "if time allows" as the down-selection can be discussed later. Thus it is suggested to do so. Two companies think RAN3 should be the leading group as the major impact is in RAN3, with minimal or even zero impact on RAN2. The moderator think this analysis is valid and thus updated it to RAN3-led.

It is suggested that the following justification and objectives of the CHO+MR-DC can be included in the draft WID of Rel-18 mobility enhancements.

Justification:

Currently CHO and MR-DC cannot be configured simultaneously. This limits the usefulness of these two features when MR-DC is configured. If it is not completed in Rel-17, Rel-18 should specify mechanisms for CHO and MR-DC to be configured simultaneously. However, it may not be enough as the radio link quality of the configured PSCell may not be good enough or may not be the best candidate PSCell when the UE access the target PCell. Thus it will impact the throughput of the UE and Rel-18 CHO+MRDC can consider CHO including target MCG and multiple candidate SCG for CPC/CPAC to further improve the CHO performance.

Objectives:

1. To specify CHO including target MCG and target SCG if it cannot be completed in Rel-17; [RAN3, RAN2]

2. To specify CHO including target MCG and candidate SCG for CPC/CPAC ~~if time allows~~ [RAN3, RAN2]-CHO including target MCG and target SCG is used as the baseline.

Regarding down-selection and TU estimation

It seems there are diverging views among companies regarding whether down-selection is needed, and it is also half-half if down selection occurs. There is also some TU estimation from companies, in general the discussion is not mature enough to conclude. It is suggested to further discuss these aspects in RAN#94.

In summary it is suggested to use the WI draft discussed above as the baseline for RAN#94e WI discussion.

5 Conclusions

Conclusion 1: mobility enhancements will be a WI for mobility enhancements in Rel-18, RAN2 is the leading WG while RAN1, RAN3 and RAN4 are impacted WGs.

Conclusion 2: the draft WI is updated according to the offline discussion and it is suggested to use this as the baseline for RAN#94e discussion and decision.

Conclusion 3: SCell/SCG setup delay reduction with early measurement enhancements is postponed (can be revisited at a later phase once TEI17 relevant discussion is concluded).

6 References

[1] RP-212657 Additional Guidance on RAN Rel-18 Email Discussion during October 20th to 29th

[2] RP-211653 Moderator's summary for discussion [RAN93e-R18Prep-03] Mobility Enhancements

[3] RP-212608 RAN Chair's Summary for RAN Release 18

[4] RP-211664 Moderator's summary for discussion [RAN#93e-R18Prep-14] Additional RAN1/2/3 candidate topics, Set 1