3GPP TSG RAN Release 18 Workshop RWS-210531

Electronic Meeting, 28th June – 2nd July 2021

Agenda Item: 4.1

Source: Discussion Moderator (Lenovo)

Title: Email discussion summary for [RAN-R18-WS-eMBB-Lenovo]

Document for: Information

---

1 Introduction

This discussion document is for capturing any questions and comments and the subsequent answers related to Lenovo/Motorola Mobility contributions under the 4.1 agenda item - eMBB-driven Functional Evolution.

1. RWS-210283 Mobility Enhancement in Rel-18

2. RWS-210263 Considerations on SON related enhancements in Rel-18

3. RWS-210258 Multi-carrier scheduling for Rel-18

---

2 Round 1 Questions/Comments

2.1 RWS-210283 Mobility Enhancement in Rel-18

Feedback Form 1:

1 – Beijing Xiaomi Mobile Software Regarding the L2/L1 inter-cell mobility, does this result in L3 handover?
2 – ZTE Corporation Does the proposal 1 imply that the UE should maintain the connection with source MN+SN and target MN+SN simultaneously?
3 – InterDigital Germany GmbH Do you see a single WID for DCCA and Mobility in R18 or do you see separate WIDs?
4 – China Telecommunications Thanks for the proposals, we are also interested in mobility enhancement in R18, we share similar views on majority of your proposals. Regarding to Coexistence of CHO and CPAC, it is still under discussion in RAN2 *Further Multi-RAT Dual Connectivity Enhancements WI*, we think we need to confirm whether it is can be supported in RAN2 in R17.

5 – vivo Mobile Communication Co.

Thanks for the good contribution. We have several questions on it:

1. we wonder the use case for DAPS+MR-DC, which will be a challenge for UEs.
2. regarding CHO+CPAC, we would like to check any enhancement in your mind, as it is being discussedin Rel-17?

6 – ITRI

Thanks for the proposals. We see the necessity of supporting coexistence of CHO and CPAC in Rel-18. We would like to know whether the CHO and CPAC could be executed at the same time or the CHO execution has higher priority than CPAC execution.

7 – Nokia Corporation

We share your view that mobility and CA/DC enhancements are important area for Rel-18 enhancements. We also see many similar enhancements needs as you.

What are the enhancement that need to be studied/specified given that SCG activation and de-activation procedures are supported in Rel. 17.

Do you propose to have more than one SN active at a time, i.e., extending DC to Multi-connectivity with three links?

In our view L1 centric mobility should be studied first to identify the potential gains.

8 – Lenovo (Beijing) Ltd

Response to Xiaomi:

The general procedure of the L2/L1 inter-cell mobility is as follows. UE receives the configuration for serving cell change. UE just stores the configuration and continues to perform the beam measurement and RRM. Once UE receives the activation indication from L2/L1 signaling, UE switches to the configured candidate cell. The above procedure is a fast switching, which is suitable for e.g. FR2 deployment. Therefore, it is different from L3 handover.

2.2 RWS-210263 Considerations on SON related enhancements in Rel-18

Feedback Form 2:

1 – CATT

In general, we support to continue the discussion on SON/MDT with more featured considered. One comment on MRO enhancements for CPAC: Since the discussion on MRO for mobility enhancement is still ongoing, we could wait for the conclusion of Rel-17 WI before adding this bullet in Rel-18 WI scope.

2 – China Mobile International Ltd

We also think SON/MDT enhancement in Rel-18 should be continued and our paper could be found in RWS-210336. Similar observation as lenovo, the scope could include SONMDT enhancement for MRO and for some new features, e.g., IAB, NTN, etc.

3 – China Telecomunication Corp.

Thanks for the good contribution for SON.

Generally, for the listed potential R17 MRO related leftovers, we are fine to continue them in R18 if not completed in R17. We are interested in the MRO for voicefallback since improving the user experience of voice is important for operators.

What's LENOVO's view on the SON of RAN slicing in R18?

4 – Huawei Tech.(UK) Co.. Ltd

Thank you for the contribution.

Could you clarify the SON enhancements for IAB Topology and Routing Optimization?

The contribution consider SON for V2X, any reason to not consider MDT for V2X?

5 – Samsung Electronics Co.

We also forseen further SON/MDT enhancement in Rel-18 is needed. Some questions:

1) Among SON for MBMS, IAB, V2X, NTN mobility, which is the priority order for Lenovo ?

2) MDT for MBMS is specificed in LTE but not used in reality. For MDT for NR MBS, do you forseen the new scenarios for applicaton ?

2.3 RWS-210258 Multi-carrier scheduling for Rel-18

Feedback Form 3:

1 – ZTE Corporation

We have the following questions for clarification.

Could you clarify motivation to limit the number of carriers to 4 or 8?

Are you referring to a DCI scheduling multiple carriers including both FR1 and FR2, or each DCI can only be used to schedule multiple FR1 carriers or FR2 carriers?

Similar comments for licensed and unlicensed carriers, are you referring to a DCI scheduling multiple carriers including both licensed and unlicensed carriers, or each DCI can only be used to schedule multiple licensed carriers or multiple unlicensed carriers?

2 – MediaTek Inc.

Thanks for the quality contribution. We support enhancing multi-carrier scheduling in Rel-18. For FR1, this enhancement is useful to reduce the control overhead when aggregating the carriers with small bandwidth. ForFR2, wethinkitisalsoimportanttoresolvethefundamentalconflictbetweenfullCAscheduling flexibility and high UE blind decoding complexity when aggregating large number of CCs to exploit the wide FR2 frequency resource.

3 – vivo Communication Technology

Thanks for the nice contribution. We are supportive to study multi-cell joint scheduling in general in Rel18 as we proposed in RWS-210165 (https://nwm-trial.etsi.org/#/documents/4689). We have some question for Lenovo's proposal as below

1. When you say multi-carrier scheduling, do you intend to say multi-cell scheduling (i.e. cell=carrier),or multi-carrier scheduling within a single serving cell (where a serving cell includes multiple carriers)

2. Do you think the carrier being jointly scheduled should be limited within a certain frequencyrange?3. What is the benefit for 2-step DCI for joint scheduling?

4 – CATT

Thanks for the contribution and we have the following questions for clarification.

1) For "Via link level simulation/symbol level simulation, ...", is it the correct understanding that the intention is to determine the number of carriers that can be scheduled by a single DCI based on evaluation results?

2) Do you support a single DCI to schedule multiple CCs across FR1 and FR2?

3) What is the motivation to support two-stage DCI? Is it dependent on the number of CCs scheduled by a single DCI?

5 – Huawei Tech.(UK) Co.. Ltd

We agree that control channel overhead reduction via single PDCCH scheduling multi-carriers is meaningful, especially for the scattered FDD spectrum. The benefits and gain have been evaluated in Rel-17. It can be supported together with DL/UL and for more carriers case, e.g., 3 carriers. In addition to PDCCH, by treating these neighbor scattered spectrum as a single cell, other common signalling overhead and procedure simplification benefits also can be achieved.

3 Round 1 Answers from Lenovo/Motorola Mobility

3.1 RWS-210283 Mobility Enhancement in Rel-18

Feedback Form 4:

1 – Lenovo (Beijing) Ltd

Response to Xiaomi:

The general procedure of the L2/L1 inter-cell mobility is as follows. UE receives the configuration for serving cell change. UE just stores the configuration and continues to perform the beam measurement and RRM. Once UE receives the activation indication from L2/L1 signaling, UE switches to the configured candidate cell. The above procedure is a fast switching, which is suitable for e.g. FR2 deployment. Therefore, it is different from L3 handover.

2 – Lenovo (Beijing) Ltd

Response to ZTE:

Yes. The purpose is to ensure some services with high throughput and low delay e.g. 4k/8k TV, online game, and XR/VR according to the market.

3 – Lenovo (Beijing) Ltd

Response to InterDigital:

According to use cases discussed by the contributions for Rel-18 workshop, most of them is associated with DCCA. Also, some cases may not be associated with DCCA. For example, mobility enhancement for idle/inactive UE. In addition, it is not clear if protocol stack of CA is reused in L2/L1 centric mobility. Our view is whether a single WID for DCCA and mobility depends on the agreed use cases for Rel-18.

4 – Lenovo (Beijing) Ltd

Response to China Communications:

Agree with you. Coexistence of CHO and CPAC was discussed in eDCCA. But, there is no progress in RAN2 discussion.

5 – Lenovo (Beijing) Ltd

Response to Vivo:

The capability of the UEs could be diversity. Not all UEs are expected to support DCCA during DAPS. Some UEs with high capability can support DCCA during DAPS for the service with high bit rate. Therefore, the network determines whether CA and DC can be supported by this UE depending on the UE capability.

For coexistence of CHO and CPAC, Coexistence of CHO and CPAC was discussed in the email discussion. But there is no progress currently. If CHO and CPAC are configured at the same time, we need to solve the issue of execution collision. For example, how to handle the case that CHO condition is met during CPAC execution.

6 – Lenovo (Beijing) Ltd

Response to ITRI:

Our view is that CHO execution should be have priority over CPAC execution since CHO is associated with PCell.

7 – Lenovo (Beijing) Ltd

Response to Nokia:

For P5 associated with fast activation/deactivation for SN/SCG, we consider the FR2 deployment, wherein channel is fast change. In addition, the coverage of FR2 is smaller than FR1. The handover could be more frequent. Therefore, comparedwithlegacyswitchbetweenSNs/SCGs, weaimtostudypossibleapproaches to reduce the signaling/process delay during SCG switch, e.g. multiple SCGs can be configured to the UE in advance, and then the real switch can be triggered by L1/L2 signaling or UE initialized way.

For P6, Yes. We think more than one SCG can be configured to UE in advance, which includes the case that those SCGs belong to the same SN or different SNs. Then, more than one SCG e.g. two SCG can be activated at the same time.

For L1/L2 centric mobility, we agreed that the gain should be identified first. In legacy L3 handover, source gNB need to transmit the handover request to candidate target gNB and wait for response after determining the handover based on the measurement report from UE. Thus, the UE often misses the reception of RRC handover command because UE has entered into the target cell, especially for high speed UE, which results in RLF. That is why CHO was introduced in Rel-16. If we further consider the FR2, the possibility of missing the reception of RRC handover command could be higher. L1/L2 signaling based option can reduce the possibility of missing the reception of RRC handover command because the configuration of serving cell has been transmitted to UE in advance.

3.2 RWS-210263 Considerations on SON related enhancements in Rel-18

Feedback Form 5:

1 – Lenovo Information Technology

[Response to CATT]: yes, we agree that we can wait for R17 conclusion on MRO enhancements for CPAC.

2 – Lenovo Information Technology

[Response to CMCC]: yes, we also share the same view with your paper RWS-210336.

3 – Lenovo Information Technology

[Response to China Telecom]: thank you for supporting on MRO for voice fallback. We are also interested in the SON for RAN slicing if any particular issues can be identified.

4 – Lenovo Information Technology

[Response to Huawei]: one example of IAB is that cross link failure information reporting may be beneficial for topology and routing optimization. We have no intention to exclude MDT for V2X.

5 – Lenovo Information Technology

[Response to Samsung]: we think all cases should be considered as the initial discussion. If time is limited, we can discuss how to down select in the future. For the second question, we have no clear answer. But we should have more confidence on NR MBS

3.3 RWS-210258 Multi-carrier scheduling for Rel-18

Feedback Form 6:

1 – Beijing Xiaomi Mobile Software

Thanks for the contribution and what is the user senario for this enhancement?

2 – Lenovo (Beijing) Ltd

@ZTE: Thanks for the good comments.

(1) 4 or 8 are just examples. Considering RAN1 has specified one DCI scheduling up to 8 PDSCHs on asingle serving cell, maximum 8 carriers scheduled by a single DCI is a reasonable assumption.

(2) Yes, one DCI can schedule both FR1 carriers and FR2 carriers. I think it is no need to limit only FR1 carriers or FR2 carriers scheduled by a single DCI.

(3) Yes, one DCI can schedule both licensed carriers and unlicensed carriers. I think it is no need to limitonly licensed carriers or unlicensed carriers scheduled by a single DCI.

3 – Lenovo (Beijing) Ltd

@MediaTek: Thanks for the good comments. Yes, I share same view with you.

4 – Lenovo (Beijing) Ltd

@vivo: Thanks for the good comments.

(1) Myoriginalintentionformulti-carrierschedulingismulti-cellschedulingasnormalCA,i.e., cell=carrier,as I see this topic is a continuation and enhancement of Rel-17 DSS two-cell joint scheduling. In case of multi-carrier as a single serving cell, I see companies may have different options to regard “multiple carriers” as “multiple active BWPs” or “multiple carriers” as “single wide carrier”. The main solution for joint scheduling in frequency domain either for the normal CA or the multiple carriers as single serving cell could have no fundamental difference.

(2) I think it is no need to limit only FR1 carriers or FR2 carriers scheduled by a single DCI. So one DCIcan schedule both FR1 carriers and FR2 carriers.

(3) The main benefit of two-step DCI for joint scheduling is to avoid a huge payload size of the single DCI for scheduling multiple carriers and ensure 3+1 DCI size budget.

5 – Lenovo (Beijing) Ltd

@CATT Thanks for the good comments.

(1) Yes. The DCI payload size for multi-carrier scheduling contradicts with scheduling flexibility. Morescheduling flexibility, larger DCI payload size. More restricted scheduling flexibility, lower DCI payload size. The DCI payload size is quite related to the number of maximum scheduled carriers. In that sense, simulation can be one straightforward way to achieve a reasonable number.

(2) Yes, I think it is no need to limit only FR1 carriers or FR2 carriers scheduled by a single DCI. So oneDCI can schedule both FR1 carriers and FR2 carriers.

(3) The main benefit of two-step DCI for joint scheduling is to avoid a huge payload size of the singleDCI for scheduling multiple carriers and ensure 3+1 DCI size budget. Yes, it is related to the number of CCs joint scheduled by a single DCI. If a single DCI can schedule maximum 2 carriers, maybe a single stage DCI can work as we studied in Rel-17 DSS. If a single DCI can schedule more than 2 carriers, we can use two-stage DCI to balance the overhead of the first stage DCI.

6 – Lenovo (Beijing) Ltd

@Huawei: Thanks for the good comments.

My original intention for multi-carrier scheduling is multi-cell scheduling as normal CA, as I see this topic is a continuation and enhancement of Rel-17 DSS two-cell joint scheduling. In case of multi-carrier as a single serving cell, I see companies may have different options to regard "multiple carriers" as "multiple active BWPs" or "multiple carriers" as "single wide carrier". The main solution for joint scheduling in frequency domain either for the normal CA or the multiple carriers as single serving cell could have no fundamental difference.

7 – Lenovo (Beijing) Ltd

@Xiaomi: Thanks for the good comments.

We see this topic a continuation and enhancement of Rel-17 DSS two-cell joint scheduling This enhancement is useful to not only reduce the signaling overhead when scheduling the multiple narrow carriers in FR1 via a single DCI but also save UE blind decoding complexity when CORESET is only configured on one carriers in either FR1 or FR2.

4 Round 2 Questions/Comments to Lenovo/Motorola Mobility

Thank you for your questions and comments to our proposals on eMBB evolution in R18. We have provided answers and comments where appropriate in section 3. Kindly input any further questions and comments you may have in this section.

4.1 RWS-210283 Mobility Enhancement in Rel-18

Feedback Form 7:

1 – China Telecommunications

Thanks for your response, for coexistence of CHO and CPAC, we can pay attention to the subsequent progress in RAN2, if it is not supported in R17, we are OK to study it in R18.

For FR2 to FR2 case, except for DAPS handover for FR2 to FR2 (as you propose in Proposal1), would you like to study other solutions such as RACH-less HO or MBB HO to reduce user data interruption?

2 – HuaWei Technologies Co.

Thanks for the comprehensive papers. We have some interest in some of your proposals. Among all the proposals, including CHO, DAPS, MR-DC, L1/L2 mobility, we are wondering if there is any priority given that the scope is relatively big?

4.2 RWS-210263 Considerations on SON related enhancements in Rel-18

Feedback Form 8:

1 – China Unicom

Please clarify the SON enhancement for NTN mobility?

4.3 RWS-210258 Multi-carrier scheduling for Rel-18

Feedback Form 9:

1 – vivo Communication Technology

Thanks for your reply. Follow up on the multi-cell scheduling (i.e. cell=carrier) and multi-carrier scheduling (a cell includes multiple carriers), we think the former case was the assumption RAN1 have in Rel-17 study, while in the latter case, the design could be different as the RBs in the mulitple carriers could be jointly indexed so that at least the FDRA design will be different. So it seems the DCI design for joint scheduling will dependent on the cell-to-carrier modeling.

2 – ZTE Corporation

Q1: Thanks forthe response. If one DCIcan schedule cells across frequency rangesand across licensed/un-

licensed bands, it may end up with large DCI size since different DCI fields may be needed for different frequency ranges and for different licensed/unlicensed bands. What's your view on this aspect?

5 Round 2 Answers from Lenovo/Motorola Mobility

5.1 RWS-210283 Mobility Enhancement in Rel-18

Feedback Form 10:

1 – Lenovo (Beijing) Ltd

Response to China Telecom:

Thanks for your further discussion.

RACH-less is restricted to the case, which has the known TA or same TA as source. For MBB HO, DAPS is MBB based HO for PCell switching. Therefore, we are not sure if MBB HO in the question is associated with PSCell change since we already have DAPS for PCell switching. We are open to further discuss which additional scenario can be included in Rel-18.

2 – Lenovo (Beijing) Ltd

Response to Huawei:

Thanks for your questions.

We are open for further discussion what scenarios can be prioritized in Rel-18. We slightly prefer the scenarios to support the service with high throughput since the services with high throughput e.g. 4K/8K streaming, VR and XR are popular in future.

5.2 RWS-210263 Considerations on SON related enhancements in Rel-18

Feedback Form 11:

1 – Motorola Mobility UK Ltd.

Response to China Unicom:

Thank you for your question. In release 17, the mobility enhancements for NTN is under discussion. MRO for NTN mobility is one of potential objectives in release 18.

5.3 RWS-210258 Multi-carrier scheduling for Rel-18

Feedback Form 12:

1 – Lenovo (Beijing) Ltd

@vivo:

Thanks for the comments. Yes, in case cell=carrier, this proposal is an extension of Rel-17 DSS study, i.e., multiple TDRA/FDRA fields may be applied to the multiple scheduled carriers with one-to-one mapping;

in case a single cell includes multiple carriers, at least multiple TDRA fields may be applied to the multiple scheduled carriers with one-to-one mapping and whether a single FDRA field with jointly indexing applies to the multiple scheduled carriers or multiple FDRA fields with independently indexing apply to the multiple scheduled carriers is dependent on how to aggregate the multiple carriers. If those carriers are regarded as multiple active BWPs, then multiple FDRA fields are contained in the DCI for full scheduling flexibility in each BWP. However, if single FRDA field is contained in the DCI with jointly RB indexing, there may be some drawbacks: (1) there is a limitation on the number of carriers since the total number of RBs for the aggregated carriers should not exceed the maximum value of 275 per serving cell; (2) if those scheduled carriers are regarded as a single BWP with contiguous RB indexing across the non-contiguous carriers, it seemingly contracts with the concept of BWP; (3) if the multiple scheduled carriers are configured with different SCS values, the single FDRA field can't work, which is true for different bands.

2 – Lenovo (Beijing) Ltd

@ZTE:

Thanks for the comments. I think the payload size of the DCI is mainly dependent on the number of scheduled carriers. For the large DCI size, we propose using two-stage DCI so as to ensure the size of the 1st stage DCI in a reasonable level.

6 Summary

Mobility Related Enhancements: Email discussion saw some good exchange of ideas and reasonable consensus that mobility enhancements are needed in R18 with CHO, DAPS, MR-DC, L1/L2 mobility being candidate areas. Some questions were raised regarding complexity of DAPS+MR-DC. Given the large scope of this area, some prioritization of the various proposals is desired.

SON Enhancements: There was significant support for SON and MDT enhancements. The following interest areas were discussed and had general support: MRO for CPAC/fast MCG recovery/EPS voice fallback, Successful PSCell Change, SON for IAB/V2X/NTN/Slicing, and MDT for V2X/MBS. The detailed scope and priorities need further discussion.

Multi-Carrier Scheduling: Clear benefits on signaling overhead reduction are expressed by many companies. General questions, e.g., scenarios, maximum number of scheduled carriers within FR1/FR2, licensed or unlicensed spectrum, are asked. More detailed views on the two-stage DCI for payload size reduction and the relationship between multi-carrier scheduling and multi-band as a single serving cell are exchanged.