

**RAN-R18-WS-non-eMBB-CATT - Version 0.0.4**  
**RAN**

**3GPP TSG RAN Rel-18 workshop**

**RWS-210556**

**Electronic Meeting, June 28 - July 2, 2021**

**Agenda Item:** 4.2

**Source:** CATT

**Title:** Email discussion summary for [RAN-R18-WS-non-eMBB-CATT]

**Document for:** Report

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## 1 Introduction

This email discussion summary covers the following documents:

RWS-210406	On NR MBS enhancements in Rel-18	CATT
RWS-210407	On sidelink relay enhancements in Rel-18	CATT
RWS-210408	On NTN enhancements in Rel-18	CATT
RWS-210409	On Redcap enhancements in Rel-18	CATT
RWS-210410	On further sidelink enhancements in Rel-18	CATT
RWS-210411	On XR in Rel-18	CATT

The remainder of this document is organized that general comments are included in section 2, discussions on each contribution are in section 3. In section 4 the summary is provided.

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## 2 General comments and questions

### 2.1 Round 1 general comments/questions

The main topics that are discussed in the contributions are briefly summarized in the table below.

**Table 1: Breif summary of CATT contributions under A.I. 4.2**

<b>non-eMBB</b>	NR MBS [RWS-210406]	Further enhancements based on Rel-17 NR MBS framework, including for example support of Multicast reception in idle/inactive mode, FTA, MBS+DC, and dynamic control of the broadcast transmission area.
	Sidelink Relay [RWS-210407]	Continuation based on Rel-17 work, e.g., service continuity enhancement, U2U relay, multi-hops, multi-paths and etc. Other aspects may also be looked into.
	Sidelink Enhancement [RWS-210410]	Sidelink enhancement with focus on the evolution of 5G vertical applications and address the urgent requirement for high data rate from new use-cases. CA support for sidelink should be prioritized. Enhancement for FR2/FR2.x can be considered.
	NTN [RWS-210408]	Continuation of Rel-17 NTN, also with extension to Regenerative payload and ISL. Further study and support of new satellite back-hauling scenarios, based on SA1 progress as well as SA2 input.
	Redcap [RWS-210409]	Discuss whether to support 10 and/or 5MHz RedCap UE in Rel-18. Discuss the potential UE power saving enhancements for RedCap devices for Rel-18. NR positioning for RedCap UEs should be supported in Rel-18.
	XR [RWS-210411]	Necessary work based on Rel-17 studies. Key aspects may include capacity, latency and power consumption. Also desirable to study KPI metric to better reflect XR and CG performance in RAN.

Please provide your general comments to these contributions if any, in the feedback form below.

**Feedback Form 1: General comments/questions to all CATT contributions under A.I. 4.2**

**1 – Intelsat**

We generally agree with the NTN enhancements in RWS-210408 .

**2.2 Round 1 answers by moderator**

Thank you Intelsat for the comment and support.

**2.3 Round 2 general comments and questions**

Please provide your general comments for round 2.

**Feedback Form 2: General comments - round 2**

**2.4 Round 2 answers by moderator**

No general questions or comments received in round 2.

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**3 Questions /comments to the Tdocs**

In this section, questions and comments are collected for each of the contributions.

**3.1 RWS-210406 On NR MBS enhancements in Rel-18**

**3.1.1 Round 1 comments/questions**

Please provide your comments/questions to the contribution if any, in the feedback form below.

**Feedback Form 3: Comments or questions to CATT contribution RWS-210406**

**1 – Xiaomi Communications**

We are interested in the MBS topic. We have the following points for clarification regarding the discussion paper:

Point 1: As RAN already supports the delivery mode 2, it is not clear what the extra RAN work to support the free-to-air service would be.

Point 2: We wonder whether we can use delivery mode 2 to support multicast service.

**2 – ZTE Corporation**

Thanks for the contribution. We have the following questions of the tdoc:

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If multicast in INACTIVE is supported, how to guarantee the reliability/QoS of multicast in INACTIVE?

-

Is FTA an SA/CT issue, per previous RAN Plenary meeting discussion?

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Do you see the need to support MBSFN?

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Can Dynamic control of the broadcast transmission area be triggered from 5GC and still feasible/achievable in Rel-17?

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Again, regarding “dynamic control of the broadcast transmission area”, is this a cell-level or beam-level update?

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**3 – China Telecommunications**

Thanks for the contribution. Our questions are shown as follows:

1) What is the payload of SIB to support MBS in idle/inactive mode? Does it only applies to small data transmission?

2) Is it up to SA/CT for supporting services to devices with no/3rd party subscription?

**4 – vivo Mobile Communication Co.**

Thank you for the contribution. For P1, we also support the multicast for idle/inactive UE.

For p2, what is exact technical candidate for supporting FTA Service in CATT mind?

For P4, do you think that we should discuss how to involve SFN firstly and do you want to reuse LTE counting mechanism or addition enhancement beyond LTE counting?

## 5 – China Mobile Com. Corporation

Thanks for the contribution!

Regarding the 2nd objective “Specify RAN enhanced functions for the support of various services beyond Rel-17, including, FTA service [RAN1, RAN2, RAN3]”, do you suggest to let RAN1 lead this discussion? I am wondering whether this has any impact on RAN1 spec, it seems this more relates to higher layer.

Regarding the 4th objective “Study the potential enhancements to broadcast transmission, e.g, dynamic change of broadcast transmission area [RAN2, RAN3]”, whether MBSF can re-configure the broadcast area to realize “dynamic change of broadcast transmission area”?

## 6 – BBC

BBC supports the evolution of NR MBS under Rel-18.

In particular to the specific topics listed in your contribution, we think the following topics have higher priority:

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The support of various services beyond Rel-17, including FTA service should be considered in R18.

Note that BBC has also proposed receive only mode operation to support FTA for Rel-18 in RWS-210133 and being discussed under [RAN-R18-WS-crossFunc-BBC] in NWM.

## 7 – Intel Corporation (UK) Ltd

Thank you for the contribution. Please see our question below:

1. For multicast reception in *RRCIDLE*, since SA2 only agrees the support of multicast in *CM-CONNECTED* and *RRCIDLE* corresponds to CM IDLE state, how to resolve the conflicts with SA2 conclusion?

## 8 – Lenovo (Beijing) Ltd

Thanks for the contribution. Regarding the second objective, ”- Specify RAN enhanced functions for the support of various services beyond Rel-17, including, FTA service [RAN1, RAN2, RAN3]”, what kind of standard impact in RAN1 do you think?

## 9 – Qualcomm Incorporated

On P1: We wonder how multicast can be supported in idle? According to R17 SA2 system design, ”multicast” is supported in NAS CM\_CONNECTED however the UE in RRC\_IDLE is in NAS CM\_IDLE. Additionally, ”broadcast” is already supported in all RRC states. We think multicast reception in RRC\_INACTIVE state can save UE power, but RRC\_IDLE should be excluded.

On P2: in our understanding FTA is just a service requirement defined in TS 22.101, and has nothing to do with RAN. The solution defined by SA2, which also impacts RAN, is Receive Only Mode (ROM). So, we wonder whether you actually meant ROM?

## 10 – MediaTek Inc.

Thanks for the proposal. Can you clarify the exact RAN enhanced functions for the support of FTA service?

## **11 – Lenovo (Beijing) Ltd**

Thank CATT for the elaboration. Further comments from my side for better understanding your proposal: Regarding question on RAN impact on the support of various services beyond Rel-17, even introducing some reports from UE to network regarding the capability of NR FTA service reception, we do not see the RAN1 impact.

### **3.1.2 Round 1 answers by moderator**

Rapporteur would thank all companies for their comments and questions to this contribution. The following are our response.

#### **On support FTA**

First of all, thank you BBC for sharing your view on this part.

Then regarding the potential RAN impact asked by several companies, we don't foresee huge impact to RAN. While we are open to further discussions, we think one possible aspect is similar as what we've done for LTE, i.e., to introduce some report from UE to network regarding the capability of NR FTA service reception. At least for this particular point we may need some R1/R2 discussions and work.

Then as a response to Qualcomm's 2<sup>nd</sup> question, we are open to discuss NR solution to support FTA services, for which a bit more details can be found above.

At last, regarding China Telecom's question on SIB impact, currently we don't see a big risk to have great impact on SIB. In any case we believe a good design should avoid that.

#### **On support of multicast in Idle/inactive**

Firstly of all, we don't have strong view regarding the exact solution (e.g., some asked about mode 1 vs mode 2) at this very early stage. We think more discussions are needed in R18, to figure this out. But some discussions/contributions already exist in R17, so those are perhaps good basis for further discussions.

Then regarding the question specific for idle state, we agree that some work in SA is also needed. We observed some proposals in SA2 R18 WID already, and we believe those are needed.

#### **On broadcast transmission area adaptation**

Firstly of all this cannot be done via CN-based mechanism, as that can only change the broadcast service area, not the broadcast transmission area. We think the latter helps to improve the resource efficiency.

Then regarding the detailed solution/granularity (cell or beam level), we do not have quite strong view at this early stage. We are open to discuss.

At least, regarding one question from vivo, we don't think this is coupled with SFN, so they can be discussed separately.

## **Support of SFN**

We are open to discuss this. In Rel-17 already we support SFN with some limitations. It can be further discussed what are the benefits and impact /complexity.

### 3.1.3 Round 2 comments/questions

Please share your further comments and questions based on the previous discussions.

#### **Feedback Form 4: Round 2 comments and questions to CATT contribution RWS-210406**

##### **1 – Lenovo (Beijing) Ltd**

Thank CATT for the elaboration. Further comments from my side for better understanding your proposal:  
Regarding question on RAN impact on the support of various services beyond Rel-17, even introducing some reports from UE to network regarding the capability of NR FTA service reception, we do not see the RAN1 impact.

##### **2 – ZTE Corporation**

Thanks for the reply and clarifications. We have below further questions/clarifications:

- Regarding FTA, we are wondering whether “some report from UE to network regarding the capability” is supposed to be supported in current release, e.g., together with the report of UE’s interests.
- Regarding the dynamic transmission area, we suppose it can already be supported based on UE’s interest indication and network implementation (by turning on/off the Broadcast service transmission) in current release?

##### **3 – vivo Mobile Communication Co.**

Thanks for the clarification. Because We have supported Broadcast in idle/inactive UE, why do you think some reportings from UE are helpful/essential for the FTA supporting?

##### **4 – HUAWEI TECHNOLOGIES Co. Ltd.**

[Huawei, HiSilicon] Thanks for the answers. It seems that we have similar views (as CATT) on FTA and multicast in Idle/Inactive.

### 3.1.4 Round 2 answers by moderator

Thanks for the comments and question in round 2. Our response is in the following.

## **On FTA**

It seems the main direction of the discussion is on what needs to be done in RAN to support FTA, rather than the motivation of support it. As this has been discussed already in Round 1, we’d suggest not repeating the discussions, but we leave the more detailed discussions to a later stage.

## **On broadcast transmission area adaptation**

In R17, the common understanding is that the broadcast service area is the same as the actual broadcast transmission area, which is planned statically by upper layers and cannot be changed dynamically, it leads to low resource efficiency. As discussed, we see benefit to improve resource efficiency by supporting a more dynamic broadcast area. To achieve this, gNB needs to know the accurate number of UEs(including UEs in idle/inactive mode) interested in the broadcast service. However, R17 only supports MBS interest report for connected UE, which is mainly for broadcast service continuity.

### **3.2 RWS-210407 On sidelink relay enhancements in Rel-18**

#### **3.2.1 Round 1 comments/questions**

Please provide your comments/questions to the contribution if any, in the feedback form below.

#### **Feedback Form 5: Cmments or questions to CATT contribu- tion RWS-210407**

##### **1 – ZTE Corporation**

- 1) For the multi-path, it is not clear how many paths should be considered, two legs or more? In addition, what is the granularity for the multi-path transmission? services/UE RB/QoS flow level□ Similarly, is there any restrictions on the hop number for the multi-hop support?
- 2) As we know, the relay of MBS is only supported for L3 relay in LTE. The majority work is done in SA2. With regard to the MBS relay mentioned in this paper, does it denote L3 relay or L2 relay, or both?
- 3) For the statement “most of the Rel-17 SL DRX mechanisms can be reused as baseline in Rel-18, further optimization can be considered by taking the special characteristics of relay UE into account.”, it is suggested to clarify what the special characteristic of relay UE is that should be considered for power saving?

##### **2 – LG Electronics Inc.**

Q1: Similar to the 3rd question from ZTE, what specific relay UE characteristic needs to be considered for further power saving on top of Rel-17 design?

##### **3 – China Telecommunication Corp.**

Thanks for the good contribution for sidelink.

Generally, we think servie continuity enhancement to sidelink relay may be needed, since sidelink relay work is ongoing in R17 and mobility is a potential advantage compared with non-3GPP wireless technology such as WLAN.

However, regarding the package of the other objectives such as U2U relay, multi-path relay, combination of sidelink relay and MBS, multi-hop sidelink relay, we believe it will bring heavy load for one release and we don't see the need to study all of them in R18. What are CATT's considerations for the priority of the new sidelink features/objectives and reasons?

##### **4 – HuaWei Technologies Co.**

1. We have similar understanding on having multi-path support, and in our understanding for UL this mainly requires the gNB to aggregate the data from multi-path (including direct and indirect path), is it consistent with your proposal?



<p>2. In Rel-17 we have not yet supported U2U and we think it may be possible to have a fundamental U2U function for Rel-18, can you please clarify which aspects to be addressed for U2U, e.g. in our understanding multi-hop is not essential for U2U?</p>
<p><b>5 – China Mobile Com. Corporation</b></p> <p>For service continuity enhancement, we also support to extend the mobility scenario, e.g., inter-gNB mobility, indirect to indirect switch, group mobility. Our question is whether DAPS and conditional handover can also be considered in the scope? Regarding the scenario of multi path, do you also consider there is Uu connection between the UE and gNB, or you only consider multiple paths based on multiple relays?</p>
<p><b>6 – Intel Corporation (UK) Ltd</b></p> <p>1. Could you provide example of specific applications that you are targeting to use RSU for relaying MBS service in V2X scenario?</p>
<p><b>7 – Lenovo (Beijing) Ltd</b></p> <p>Thanks for your paper.</p> <p>There are a lot of use cases listed in the paper. It seems difficult to accommodate all of them in Rel-18. What cases should be prioritized in Rel-18?</p>
<p><b>8 – ROBERT BOSCH GmbH</b></p> <p>In your Proposal 1 (Rel-18 sidelink enhancement should focus on the evolution of 5G vertical applications and address the urgent requirement for high data rate from new use-cases.)</p> <p>Q1: what should be the possible use cases for automotive?</p> <p>Q2: Do you support advanced VRU use cases (with new class of VRUs / new capability)?</p>
<p><b>9 – Nokia Denmark</b></p> <p>P5: it's not clear what power saving optimization specific for SL relay is needed? We may clarify from CATT for this.</p>
<p><b>10 – vivo Communication Technology</b></p> <p>Regarding the MBS-based relay, what is the detailed scopes? For example, does it consider broadcast MBS, or multicast/groupcast, or both? Does it cover both L2 and L3 relay? Does it support NR MBS only, or also LTE MBS?</p>

### 3.2.2 Round 1 answers by moderator

Rapporteur would thank all companies for their comments and questions to this contribution. The following are our response.

#### Multi-path

In our view Rel-18 could focus on the case of two legs, for the sake of lower complexity. And the granularity of aggregation could be RB level, but this can be discussed.

Also, we share the understanding from Huawei, i.e., ‘for UL this mainly requires the gNB to aggregate the data from multi-path (including direct and indirect path)’.

Regarding the main scenario, we think intra-gNB case should be considered first. With the intra-gNB case, direct/indirect should be discussed with high priority.

### **Relay + MBS**

First of all, we don’t think either L2 or L3 could be already excluded in this early stage, so we’d prefer to discuss them.

Then, regarding V2X scenario, we do not have strong view at this stage. Basically we are looking at all possible scenarios.

At last, regarding vivo’s question we can confirm that our main focus in NR MBS. And we are open to discuss L2 or L3, but from R2 point of view it seems L2 have greater impact.

### **Power saving aspects**

On potential enhancement: we are open to discuss on the enhancement for power saving. One example is for relaying of SI/paging, maybe we could consider power saving mechanism so that UE does not need to continuously monitor.

### **On priority of the objectives**

We are open at this very early stage of discussion. We tend to agree with China Telecomm that service continuity is one of the important things. Also, we tend to agree with Huawei that U2U multi-hop is perhaps not the first in the list.

### **On mobility enhancement**

In our view DAPS and CHO type of mechanism is not very urgent.

#### **3.2.3 Round 2 comments/questions**

Please share your further comments and questions based on the previous discussions.

**Feedback Form 6: Round 2 comments and questions to CATT  
contribution RWS-210407**

**1 – LG Electronics Inc.**

Q1: We have a follow-up question on the power saving in relaying. In the example of relaying of SI/paging, does it intend to reduce the monitoring time in the relay UE, in the remote UE, or both?

**2 – ZTE Corporation**

For the power saving part, does it mean to introduce sidelink DRX between relay UE and remote UE. If that is the case, we are actually support this idea.

### 3.2.4 Round 2 answers by moderator

Thanks for the comments and question in round 2. Our response is in the following.

**On power saving aspects**

- In the example of relaying of SI/paging, we think the power saving is mainly targeted at the remote UE if the relay UE is connected to network directly. If multi-hop is considered, power saving for both relay and remote UE can be considered.

- And we confirm that the main case that we are discussing is to introduce sidelink DRX between relay UE and remote UE.

### 3.3 RWS-210408 On NTN enhancements in Rel-18

#### 3.3.1 Round 1 comments/questions

Please provide your comments/questions to the contribution if any, in the feedback form below.

**Feedback Form 7: Comments or questions to CATT contribution RWS-210408****1 – Asia Pacific Telecom co. Ltd**

Support Regenerative payload and ISL. We wonder any specs impact to support ISL, considering transparent payload can be well supported.

**2 – Beijing Xiaomi Mobile Software**

We basically share your view on the potential Rel-18 NTN enhancements. However, we think the ISL should not be coupled with regenerative payload case. Also, other potential enhancements such as TN/NTN mobility, UE's data rate improvement to support more services should be considered in Rel-18.

**3 – Beijing Xiaomi Mobile Software**

One additional question we have is on the satellite backhauling. what is the use cases/requirements to support the satellite backhauling. It seems this may mainly impact RAN3 work, is there any impact on other RAN WGs.

#### **4 – Lenovo (Beijing) Ltd**

Regarding DC between TN and NTN, we agree that it is beneficial for service continuity .

Regarding beam management enhancement, we support coupling between beam and bwp. And regarding beam splitting between control and data, we noticed that current R17 agreement supports two configuration for bwp#0 and bwp#x. If control is associated with bwp#0 and data is associated with bwp#x, it is already supported. Do you have other different schemes in mind?

Regarding coverage enhancement, we agree that it is beneficial for smart phone.

Regarding positioning for NTN, we agree that it is beneficial to support data transmission and positioning simultaneously in a single RAT. However, we wondering GNSS is already existing, so it may be second priority?

Regarding ISL, we also wondering what's the spec impact on physical layer?

Meanwhile, we also think without GNSS should be considered in R18.

#### **5 – Lenovo (Beijing) Ltd**

We are interested in the proposals for NTN in this contribution, and have the following quesitons:

(1) For TN/NTN or LEO/GEO coordination enhancement, considering the on-going Rel-17 WI, we wonder if there are new spec impacts to support coordination? Or the current discussions in Rel-17 (although not agreed or not treated) like higher priority for TN/GEO in cell reselection are sufficient?

(2) For positioning enhancement, do you consider the case when UE is unable to acquire its positioning info?

(3) For regenerative payload, do you consider ISL only between LEOs or it can also be between GEO and LEO e.g. for coordination?

(4) For satellite backhauling, we think some operators have already implemented such arch e.g. for disaster backup. We wonder if there is clear RAN impact that should be studied.

#### **6 – vivo Communication Technology**

Thanks CATT for the contribution. please find our questions and comments as below

1. On TN/NTN coordination, could CATT elaborate more on how to solve the issue due to the differential delay between TN and NTN?

2. On beam management enhancement, is there any benefit for coupling BWP and beam switching other than signaling overhead reduction?

3. On coverage enhancement, we also agree that UL coverage should be enhanced especially for hand-held device. Could CATT elaborate more on which areas might need to be enhanced?

4. On positioning enhancement, we are wondering whether it should be discussed under NTN or positioning enhancement in Rel-18? In addition, the positing accuracy and latency should be taken into account, and further evaluation might be required.

#### **7 – China Telecommunications**

We are wondering whether maintenace of NG interface via the ISL is needed in regenerative payload scenario.

As for coverage enhancement, which methods in TN could be reused in NTN? What is the specific aspect should be considered in NTN?

## **8 – ZTE Corporation**

Thanks for your contribution. We are also interested in the further enhancement on NTN with some aspects listed in our contribution (RWS-210468). For the detailed objectives, it seems that we share same views on the Rel-17 leftover (e.g., beam management) and synchronization issue for the UE without GNSS, etc. W.r.t some of your proposal, clarification on following are preferred:

Q1: For the “ Support Regenerative payload and ISL”, it’s fine to conduct the relevant work, but for the study on “ISL”, is there any detailed consideration and do we need to work on the whole part including the PHY level issue for ISL?

Q2: For the case to support satellite backhauling scenarios/requirements, it seems that the corresponding discussion in SA should be done firstly. Maybe the related issue in RAN can be postponed later once the progress in SA is made. Any views on how to organize this topic?

## **9 – China Mobile Com. Corporation**

This is an interesting topic. We have the following questions for clarification:

- 1) Regarding “control beam and data beam splitting”, does it mean SFN-like control beam? what is the potential specification impact?
- 2) Regarding “Coverage enhancement”, there is an ongoing study on performance enhancement in Rel-17 NR NTN WI, e.g., enhancement on aggregated transmission (including repetition). Not sure whether the current enhancement in Rel-17 is enough?
- 3) Regarding “positioning enhancement”, does it focus on the case that UE does not have GNSS module, or the case that GNSS signal is unavailable for UE with GNSS module?

## **10 – THALES**

Many thanks for your proposals.

Since several options are considering for the regenerative payload, do you consider a study phase during which some trade-off analysis will be carried out against a set of criteria ?

In terms of positioning enhancements, do you consider network based UE location to meet reliable and high accuracy requirements of some regulated services (e.g. emergency calls) ?

Would you also consider asynchronous DC & CA between satellites of a given space segment to increase performance ?

## **11 – HUAWEI TECHNOLOGIES Co. Ltd.**

Q1: On ISL, what is the expected specification change and which interface should be changed?

## **12 – Spreadtrum Communications**

For coverage enhancement, in addition to enhancement(s) on the aggregated transmission (including repetition) in R17 NTN WI, what other coverage enhancement technologies do you specifically consider in R18 NTN?

## **13 – Sony Corporation**

Thanks for the contribution. We have a question.

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Do you assume that the ISL uses 5G wireless communication? If so, what are the pros/cons of using 5G for ISL compared to proprietary solution for ISL?
<b>14 – Apple GmbH</b> Thanks for your nice proposals. We are generally supportive of regenerative payload, beam management enhancement. What is your view of UE without GNSS enhancement?
<b>15 – DOCOMO Communications Lab.</b> Thank you for contribution. Regarding GEO/LEO coordination, we think same thing can be said for GEO/HAPS or LEO/HAPS. Is this included in your intention? Or only GEO/LEO (and TN/NTN)?
<b>16 – China Unicom</b> Thanks for sharing your view on NTN enhancement in Rel-18. We also have the same view of supporting coverage enhancement in R18, and this is critical for commercial deployment.
<b>17 – VODAFONE Group Plc</b> Thank you very much for your contribution on the evolution of the NTN we have a few questions: 1- How do you envisage Standardising the backhauling of the satellite links , where to date, all these links are proprietary, have locally assigned frequency bands and bandwidths? Have you considered the Regulatory aspects ? 2- Where would you use a IAB-like Regenerative Satellite topology as shown in figure 2-3 Thank you !

### 3.3.2 Round 1 answers by moderator

Rapporteur would thank all companies for their comments and questions to this contribution. The following are our response.

#### **For the Regenerative payload and ISL:**

Regenerative Payload and ISL don't have to be combined, e.g. ISL could also be considered for transparent architecture.

There're several regenerative options, full gNB on board, gNB-DU on board, or hybrid topology. However, I think we should focus on the very basic architecture in Rel-18, i.e. only consider the option where the full gNB is on board.

ISL could be applied between the LEOs, between GEO and LEO, between LEO and HAPS, or others. ISL between LEOs could make resource coordination more efficient between the on board gNBs, ISL between GEO and LEO could make it possible to coordinate between GEO and LEO, same story for HAPS.

On the RAN impact to support ISL, we understand it's related to which regenerative option to go:

- If we only consider full gNBs on board, we could treat ISL as a kind of transport layer, no specific RAN impact is foreseen.

the Xn interface, maybe also NG interface could be carried via the ISL. ISL carries NG interface in case of a satellite (gNB on board) could not connect to a NTN-GW due to the long distance between each other.

- If we consider CU-DU split, and consider IAB like relay in NTN system, we assume the ISL should be a NR-Uu, and RAN1 RAN4 need to further investigate how to support the ISL. (More complex, could be consider in the future release if needed)

### **For TN/NTN coordination, LEO/GEO coordination**

We understand the basic coordination options should be supported with higher priority, including PLMN/RAT selection between TN/NTN, inter RAT cell reselection, handover, etc. (1<sup>st</sup> priority)

Then we could further consider the potential enhancement to improve the performance e.g. to minimize the service interruption. DAPS like handover, DC operation could be considered. (2<sup>nd</sup> priority)

The solutions defined for the TN/NTN coordination could also be considered for LEO/GEO coordination. Coordination with HAPS is not excluded. (2<sup>nd</sup> priority)

### **For Beam management enhancement**

Current R17 agreement only supports the two-layer coverage with bwp#0 and bwp#x. However, in realistic deployment, the beam coverage is not continuous for satellite power efficiency improvement, and it requires more coordination between initial BWP and active BWP. When spot beam and beam sweeping in control beam are used, it may require access procedure modification.

Due to the benefits for coupling BWP and beam switching other than signaling overhead reduction, we understand it may provide more flexibility for beam switching, in which beam mapping

Regarding “control beam and data beam splitting”, does it mean SFN-like control beam? What is the potential specification impact? Our understanding is when spot beam and beam sweeping in control beam is used, modification to access procedure may be required.

### **For coverage enhancement**

On which areas might need to be enhanced, we understand the potential enhancement areas may include synchronization, paging and data channel.

On the question which methods in TN could be reused in NTN? What is the specific aspect should be considered in NTN? We understand that for NTN, DL and UL for coverage enhancement should be considered both. For details, UL PRACH, PUSCH, DL synchronization, and DL PDSCH can be considered as a full package.

Regarding to the question whether the current enhancement in Rel-17 is enough? We assume for NTN, when the raining occurs, current enhancement in Rel-17 is not sufficient.

### **For positioning enhancements**

The enhancement may cover two use cases: support of the non-GNSS capable UE and GNSS signal is not available for a GNSS capable UE.

On the question do you consider network based UE location to meet reliable and high accuracy requirements of some regulated services (e.g. emergency calls)? We understand it depends on the regulation requirement, as a baseline, the accuracy should be sufficient to support access successfully.

On how to proceed the work for positioning enhancement, i.e. in which SI/WI the positioning enhancement for NTN belongs to. We are ok to keep it in NR NTN Rel-18 or use a separate SI/WI.

### **For Satellite backhauling**

As mentioned by Lenovo some operators have already implemented such arch. And in 3GPP, SA2 have investigated and supported the very basic satellite backhauling scenario, i.e. gNB connects to 5GC via a single GEO/NGSO satellite.

As mentioned in our contribution (RP-210408), SA1 has approved a Rel-18 proposal in S1-211373, aiming at enabling of additional satellite backhaul scenarios, e.g. gNB connect to 5GC via hybrid backhauling scenarios, which could make the backhauling more flexible and robust.

To support the complex backhauling scenarios, we assume the RAN3 and maybe also RAN2 should be involved for, e.g., the Selection of the backhaul(s), switching between the backhauls, QoS management etc. Detailed RAN impacts of comprehensively supporting kinds of satellite backhauling scenarios need further study by cooperating with SA2.

Therefore, we think we could base our further discussions on SA2 progress.

### **3.3.3 Round 2 comments/questions**

Please share your further comments and questions based on the previous discussions.

#### **Feedback Form 8: Round 2 comments and questions to CATT contribution RWS-210408**

##### **1 – ZTE Corporation**

Thanks for your replies. W.r.t the regenerative payload, it seems that the full-gNB on board is prioritized from your side. In this way, the required capability for satellite will be higher, and may not be applicable for the case to support the IoT usage (e.g., IoT or Redcap) with lower cost satellite and HAPS. Maybe we can still work on the potential case with lower layer split as CU-DU part. In this way, to avoid the discussion on ISL, single hop connection can be prioritized. Any views on it?



For the beam management issue, it's confused from my side on following description: "However, in realistic deployment, the beam coverage is not continuous for satellite power efficiency improvement, and it requires more coordination between initial BWP and active BWP. " Does it imply that the coverage for all beams are discontinuous or only for the initial BWP? If the coverage of initial BWP is not continuous, how can we ensure the initial access for UE, which may be randomly activated at any location under the service region for one satellite?

## **2 – China Unicom**

Thanks for your contribution and clarification. We hold the same view on the regenerative payload and ISL. In addition, we wonder whether beam management enhancement and coverage enhancement for HAPS could be studied in R18 SI/WI?

## **3 – China Telecommunications**

Thanks for the answers. We share the same view that full-gNB onboard is the only regenerative payload option in R18. We notice that "the Xn interface, maybe also NG interface could be carried via the ISL." Since two interfaces may be implemented on the same ISL, we are wondering how to distinguish them for satellites. Another question is whether NG interface via ISL means transparent transmission for satellites?

### **3.3.4 Round 2 answers by moderator**

Thanks for the comments and question in round 2. Our response is in the following.

#### **On CU-DU split case**

We are ok to consider CU-DU split case, but to minimize the workload of Rel-18, the link between CU and DU should be out of 3GPP. And we expect not to touch IAB in this release.

#### **On beam management**

For beam management, considering the limitation of cost and power consumption, one satellite may only have a few beams, it may not be able to serve all the area under the coverage of the satellite. Thus, beam sweeping could be used for the initial BWP, which could ensure the initial access for the UEs in different areas of the satellite coverage. Similar situation for active BWP, maybe only some active BWPs are deployed, they could be used to serve the UEs according to the requirement, e.g. after UE initial access, an active BWP is steered to serve this UE.

#### **On HAPS**

Thanks for support and further comments. We are open to discuss this aspect further.

## On ISL

If we treat ISL as a kind of transparent network, we just need to focus on the Xn/NG carried on the ISL. NG interface via ISL is used in case of a satellite could not connect to the NTN-GW due to the long distance, the intermediate satellite just play the role of transparent transmission.

On how to distinguish the Xn/NG interfaces if they are carried on the same ISL between the two satellites, we assume it's done by the transport network layer, e.g. by different endpoint, or physically distinguish them via different radio signals.

### 3.4 RWS-210409 On Redcap enhancements in Rel-18

#### 3.4.1 Round 1 comments/questions

Please provide your comments/questions to the contribution if any, in the feedback form below.

#### **Feedback Form 9: Comments or questions to CATT contribution RWS-210409**

##### **1 – Classon Consulting**

FUTUREWEI supports studying redcap positioning, but should be in positioning not redcap. Good analysis on BW, we believe no need to revisit 40MHz or to consider sub 20MHz for ultra-low end wearables (see p6 of RWS-210037 and <https://nwm-trial.etsi.org/#/documents/4714> )

##### **2 – MediaTek Inc.**

Thank you for sharing your views.

We have the following questions:

Q1: Considering that the complexity reductions only amount to 11.89% at most in your analysis, do you see sufficiently wide use-cases to justify fragmenting the RedCap market (which comes with associated cost impacts)?

Q2: Do you have any further details on the direction of power saving enhancements?

##### **3 – Intel Corporation (UK) Ltd**

Thank you for the contribution. Please see our questions below:

1. While contribution to cost savings just from max BW reduction from 20 MHz to 5 MHz may be < 10%, what is your view on overall cost reduction possible with further associated simplifications (e.g., on buffer requirements, processing times, etc.), especially when the required data rates for many of the use cases may be significantly lower than the peak rates for Rel-17 RedCap?

2. Considering the outcome from the studies on UE power savings from Rel-17, which particular schemes do you envision for UE power saving enh. for 20/100 MHz UEs, that avoids repetition of previous discussions?

##### **4 – Lenovo (Beijing) Ltd**

Thanks CATT for the contribution. One question is that do you have a target lower BW for FR2, and evaluate the cost breakdown for this BW? Another question is what's your view on the power saving gain with lower BW?

## 5 – ROBERT BOSCH GmbH

Do you support sidelink positioning for RedCap? if yes, what is the BW? If no, how can we handle new classes of VRUs (e.g., eBike)?

## 6 – LG Electronics Inc.

Q1) Regarding your proposal on positioning, do you intend to support RedCap positioning with the performance comparable to the non-RedCap UEs, or with higher accuracy than the non-RedCap UEs?

### 3.4.2 Round 1 answers by moderator

Rapporteur would thank all companies for their comments and questions to this contribution. The following are our response.

#### On further complexity reduction

@Futurewei, MediaTek, Intel, Lenovo

We do have concerns on such direction. In our view, if supporting a feature will lead to significant complexity and heavy normative work, the feature should firstly show strong enough motivation and benefit.

- One of the most critical things is that, further BW reduction does not bring attractive cost reduction, which is shown in our paper (RWS-210409). Similar result is found in Ericsson's contribution (RWS-210313). Additional power saving may be achieved, but it is not the major motivation and the gain is suspicious. Thus the benefit of further BW reduction is not convincing.

-From technical view, the drawbacks on FR1 BW=5/10MHz are quite obvious. All the heated and tough discussion of UE BW reduction in current RAN1 will be repeated again and again, e.g. initial BWP sharing, early UE identification, RO resource sharing, resource fragmentation in frequency domain... Moreover, BW=5 MHz will lead to serious restriction in SSB/CORESET#0 configuration or re-design of SSB/CORESET#0, where neither is preferred.

-From economic view, BW=5/10MHz will lead to market fragmentation, device re-development, heavy gNB upgrading... is it really worthy to reduce BW for just 10% cost reduction?

-For FR1, BW=5MHz makes the boundary of RedCap and LPWA ambiguous. Rel-14 eMTC already supports BW=5MHz.

-For FR2, BW=50MHz has been studied in Rel-17 SI, but not accepted due to bad co-existence with normal UEs. We do not see things change in Rel-18.

-Understand that some use cases may not require BW=20MHz to serve. But this does not mean that such use cases cannot use BW=20MHz to serve. Note that only 10% cost reduction is foreseen. Even worse, if economic scale is counted, the cost reduction will be smaller.

-Sharing similar views with Futurewei, we are suspecting whether we should re-open the features dropped in Rel-17 WI. They are dropped not because of lack of TU, but for the unworthy trade-off between cost reduction and negative impact. To name a few, 16QAM (marginal cost reduction but serious network SE reduction),

processing time relaxation (marginal cost reduction but heavy gNB complexity)... Generally, unless new motivation is found, we do not think re-picking the dropped features is a good idea.

In summary, for Rel-18 RedCap UE, we tend to extend the capability (if necessary) based on Rel-17 scheme with controllable normative workload, in which further reducing the BW is not so preferred.

### **On RedCap positioning**

@Futurewei, BOSCH, LG

Positioning may be a good commercial need for RedCap use cases. It seems Rel-17 RedCap UE can optionally support positioning by nature. However, due to the reduced BW and number of Rx, positioning performance of RedCap will be worse than normal UE. That's why we consider positioning enhancement for reduced BW/#Rx UE.

-On whether RedCap positioning should be studied in positioning topic or RedCap topic, we prefer to study in Rel-18 positioning item.

-On Rel-18 sidelink positioning, we think the key items should be support of public safety and V2X. If RedCap is taken into consideration, it may have impact on the bandwidth. Anyway, it should be discussed in the sidelink positioning scope but only with low priority. .

-On the performance, we are not targeting higher accuracy than the non-RedCap UEs. Moreover, we think it is a 'best effort' enhancement. Whether the performance can be comparable to non-RedCap UE still needs further study.

### **On Power saving for RedCap**

@MediaTek, Intel, Lenovo

Power saving has been studied in previous releases. But not all the features are suitable for RedCap, e.g. Scell dormancy. It is also noted that power saving dedicated for RedCap has been studied in Rel-17 (lead by RAN2). The critical question is how much room is left for RedCap power saving.

-On power saving by lower BW, as explained before, there may be some gain but it is not sufficient to promote further BW reduction. In addition, we think configuring narrower BWP for the UE may achieve similar performance.

-On detailed directions, we prefer simple but efficient methods, e.g. lower power class, RAN2 enhancement in eDRX, PSM... We are also open to new features like wake-up radio and corresponding WUS, but it should be discussed whether this is under RedCap scope, or become an independent topic.

### **3.4.3 Round 2 comments/questions**

Please share your further comments and questions based on the previous discussions.

**Feedback Form 10: Round 2 comments and questions to CATT  
contribution RWS-210409**

**1 – vivo Communication Technology**

Thanks for the contribution. We agree with that whether UE BW reduction is to be supported needs further consideration comparing different approaches. Besides this, we wonder what is your view on other potential areas for Rel-18 eRedCap, in particular the following:

- 1) Lower UE power class
- 2) reduced number of HARQ processes
- 3) relaxed UE processing time for data/CSI
- 4) serving cell RRM relaxation
- 5) coverage recovery

**3.4.4 Round 2 answers by moderator**

Thanks for the comments and question in round 2. Our response is in the following.

**1) Lower UE power class**

Generally, we are supportive on lower power class, under the premise that no additional coverage recovery is needed.

**2) Reduced number of HARQ processes**

Reducing the number of HARQ processes may achieve additional cost reduction, but the gain heavily depends on the UE implementation. Meanwhile, this may put additional restriction on the network scheduling. Note that in LTE eMTC, the number of HARQ processes was even increased (at least from 8 to 10) in later release. We should be more careful whether this is a good trade-off for RedCap and NR.

**3) Relaxed UE processing time for data/CSI**

This was studied in Rel-17 SI but not included in the Rel-17 WI, due to the unworthy trade-off between the marginal cost reduction to UE and the significant negative impact to the network. We do not see new motivation to re-open the discussion.

**4) Serving cell RRM relaxation**

RRM relaxation in serving cell was studied in Rel-17 SI but not included in the Rel-17 WI, due to the negative impact on the performance in, e.g. cell switching/re-selection. Also the gain is perhaps not very clear. If the study is continued in Rel-18, the concerns raised in Rel-17 should be addressed first.

**5) Coverage recovery**

Coverage of RedCap was also studied in Rel-17 SI, but it was concluded that no need to introduce RedCap-dedicated coverage recovery in either DL or UL. We are open to further consider coverage recovery in Rel-18 if necessary, but currently we do not see new convincing motivation is found.

### 3.5 RWS-210410 On further sidelink enhancements in Rel-18

#### 3.5.1 Round 1 comments/questions

Please provide your comments/questions to the contribution if any, in the feedback form below.

#### **Feedback Form 11: Comments or questions to CATT contribution RWS-210410**

<b>1 – Classon Consulting</b>  We also support sidelink FR2 enhancements, see RWS-210039 and <a href="https://nwm-trial.etsi.org/#/documents/4714">https://nwm-trial.etsi.org/#/documents/4714</a> . Do you feel that the sidelink enhancements for FR2 should include work on CSI feedback?
<b>2 – Huawei Tech.(UK) Co.. Ltd</b>  Q1: Given that it is proposed to consider FR2 operation, does it mean SL operation on unlicensed band should be supported ?  Q2: If yes to Q1, does SL over unlicensed band also include FR1? Or FR2 is prioritized over FR1 in unlicensed band ?
<b>3 – Guangdong OPPO Mobile Telecom.</b>  <b>Comment on 3</b>  Besides FR2/FR2.x, unlicensed spectrum can also be considered in Rel-18 to reach the similar or better performance/target, e.g extremely high data rate.  <b>Comment on 4</b>  It seems reasonable to keep balance between time budget and potential work/objectives in Rel-18 SL.
<b>4 – Lenovo (Beijing) Ltd</b>  Thanks for the nice contribution and proposals, 1 <input type="checkbox"/> For cross-carrier control, whether both self-slot scheduling and cross-slot scheduling on same/different carrier(s) are considered? 2 <input type="checkbox"/> For FR2 enhancement, support self-scheduling on FR2 or cross-carrier scheduling from FR1 to FR2?

#### 3.5.2 Round 1 answers by moderator

Rapporteur would thank all companies for their comments and questions to this contribution. The following are our response.

##### **On CSI feedback**

We view CSI feedback more related to MIMO enhancement of sidelink. We are open to consider this aspect with available TU.

##### **On unlicensed band support**

We are open to consider unlicensed sidelink support if TU is available.

### **On balance between time budget and potential work/objectives**

We agree a balanced work scope planning is meaningful.

### **On use case and application**

This relates to ROBERT BOSCH GmbH's comments that were left under our relaying section. We are replying here.

First, regarding the possible use cases for automotive, we think the possible use case would be the sensor information sharing between vehicles supporting V2X applications, requirement of 1000 Mbps data rate within 50m communication range is presented with reliability of 99.99%. This will require extra-high data rate sidelink communication. And the aggregated data rate will be a challenge for the industry, especially when there are many vehicles in the given geographical area.

Then we are open to discuss the advanced VRU use cases with new class of VRUs / new capability.

#### **3.5.3 Round 2 comments/questions**

Please share your further comments and questions based on the previous discussions.

#### **Feedback Form 12: Round 2 comments and questions to CATT contribution RWS-210410**

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#### **3.5.4 Round 2 answers by moderator**

No comments or questions were received in round 2.

### **3.6 RWS-210411 On XR in Rel-18**

#### **3.6.1 Round 1 comments/questions**

Please provide your comments/questions to the contribution if any, in the feedback form below.

#### **Feedback Form 13: Comments or questions to CATT contribution RWS-210411**

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<p><b>1 – Classon Consulting</b></p> <p>We also support XR capacity enhancements, please see RWS-210036 p8 which shows large capacity gains from cooperative MIMO/interference probing and avoiding. <a href="https://nwm-trial.etsi.org/#/documents/4580">https://nwm-trial.etsi.org/#/documents/4580</a> .</p>
<p><b>2 – HuaWei Technologies Co.</b></p> <p>We think it is very important to have a specific metric to evaluate the XR experience for UEs and we have a similar proposal in RWS-210439. Do you think such a metric is a new KPI that can quantize the impact of network transmission on the user experience, especially on the RAN side? We see KPI for XR evaluation in RAN1 may not be enough to reflect E2E user experience, in addition we also think SA2/SA4 may need to be involved to define such a KPI.</p>
<p><b>3 – DOCOMO Communications Lab.</b></p> <p>We would like to hear more details of the proposal for "metric for QoS measurement in RAN." Is the idea similar to what HW/HiSi proposes in RWS-210439?</p>
<p><b>4 – MediaTek Inc.</b></p> <p>Thanks for the good contribution. We have some questions below to know more about the enhancements.</p> <hr/> <p>-</p> <p>For the RAN-layer XR KPI, is it intended to be reported to the application so the application can do a better job in service adaptation ( or say for application awareness of RAN usage)?</p> <hr/> <p>-</p> <p>For enhancement of capacity, latency, and power consumption, are there specific possible schemes in mind based on Rel-17 studies?</p>

### 3.6.2 Round 1 answers by moderator

Rapporteur would thank all companies for their comments and questions to this contribution. The following are our response.

#### **On Capacity enh. and power saving**

Thanks Futurewei for providing the comments. We had looked at the theoretical gain and implementation complexity of TRS/gNB coordination for cooperative MIMO. We are still evaluating the performance with realistic assumption in coordination delay and the associated system load of inter-node communication.

Thanks Mediatek for the comments. Regarding the capacity enhancement and power saving for XR, some of the Rel-17 schemes could be used for XR with additional enhancement, such as SPS/CG enhancement, dynamic scheduling enhancements with DRX. These enhancement could achieve both capacity and power saving improvement.

#### **on KPI for XR**

Thanks Huawei/Docomo/Mediatek for the questions. We are open to further discuss this important matter. We had proposed to have a RAN-layer KPI derived from end-to-end KPI in the beginning of XR study. The XR



study and work in RAN can only provide the results of RAN-based KPI in order to meet the desired user experience from end-to-end KPI since RAN can not control any factors and variations outside RAN. It will be nice to have SA2/SA4 defined an segmented KPI in RAN. However, the general practice of defining KPI in 3GPP is for RAN to define its own KPI derived from end-to-end KPI.

### 3.6.3 Round 2 comments/questions

Please share your further comments and questions based on the previous discussions.

#### **Feedback Form 14: Round 2 comments and questions to CATT contribution RWS-210411**

##### **1 – Classon Consulting**

Thank you for the reply comments! The cooperative MIMO scheme for interference probing and suppression requires some limited semi-static gNB coordination but no instantaneous coordination or information exchange among the gNBs. One way to implement the scheme, aka BiT, is as follows:

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Coordination stage:

gNBs semi-statically coordinate a common probing delay (the time gap between SRS probing and PDSCH transmission) and common SRS probing resources (e.g., set aside 1 or more OFDM symbols for UEs to send A-SRS for probing). “Common” means common to all cooperating gNBs.

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Execution stage without instantaneous inter-gNB coordination or information exchange:

1. gNB pre-scheduling: each gNB schedules its PDSCH transmissions separately.
2. A-SRS triggering: each gNB separately triggers its scheduled UEs for A-SRS transmissions, and the A-SRS at least has the same FDRA as the scheduled PDSCH.
3. A-SRS transmission: UEs transmit A-SRS, which by gNB coordination are on the SRS probing resources.
4. PDSCH precoding adjustment: each gNB separately estimates interference on the SRS probing resources and adjusts PDSCH precoding for each of its scheduled UE.
5. PDSCH transmission: each gNB transmits the scheduled PDSCH with adjusted precoding on a slot according to the coordinated probing delay after the SRS probing resources.

The interference on the SRS probing resources carries information that can reflect “instantaneous” DL interference (i.e., associated with one-time scheduling outcomes) and can be useful for PDSCH precoding adjustment to suppress DL interference. Therefore, no instantaneous coordination, information exchange, or knowledge of other cells’ UEs is needed.

##### **2 – MediaTek Inc.**

Thanks for the detailed reply.

For having a RAN-layer KPI derived from end-to-end KPI, what kind of information should be considered beyond per packet level (Ex. for frame level)?
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#### 3.6.4 Round 2 answers by moderator

Thanks for the comments and question in round 2. Our response is in the following.

On capacity: Thanks to Futurewei for the further comments. We are open to discuss these based on further evaluations.

On KPI: Thanks Mediatek for the further question. Yes we agree frame level can be used for further evaluation and discussions. It is simpler and quite useful.

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## 4 Summary of the discussions

In the previous sections, Q&As have been made on our contributions. In the following subsections, these discussions are summarized.

### 4.1 Summary of MBS (RWS-210406)

#### General aspects

Based on the discussions, it seems we could first make a general observation from high level.

**Observation 1** Generally, there is wide support to further enhance NR MBS in Rel-18. Exact work scope can be discussed further.

#### On support of multicast in Idle/inactive

Some companies question about supporting multicast in idle state, where the main concern seems to be that in Rel-17 it is not done in SA. During the discussions it has been clarified that to achieve this, some SA2 work may also be needed. And in our view SA and RAN should align their work scope in Rel-18, and that seems to be business as usual.

**Observation 2** It is useful to clarify that both RAN and SA need to align their work scope, to support multicast in Idle/Inactive in Rel-18.

#### On FTA

There seems to be no objection of the objective itself, but the discussions were mainly about the exact impact from RAN perspective for a better support of FTA by NR MBS. Some clarifications were provided on this matter.

**Observation 3** The exact work required in RAN to better support FTA by NR MBS can be further discussed.

#### Support of MBS transmission in gNB as SN

There is some support for this. It would be useful to collect more companies' views on this. Details can be further discussed.

**Observation 4** Support of MBS transmission in gNB as SN can be further discussed.

#### On broadcast transmission area adaptation

During the discussions, some clarifications were made about the requirement, as well as potential impact for broadcast transmission area adaptation.

It has been clarified that in R17, the broadcast service area is the same as the actual broadcast transmission area, which is planned statically by upper layers. We see benefit to improve resource efficiency by supporting a more dynamic broadcast area.

**Observation 5** Broadcast transmission area adaptation can be further discussed.

#### Better support of SFN

There were brief discussions on SFN. And it has been clarified that from our point of view, we are open to discuss it, taking into account different aspects such as gain, complexity and market requirements.

**Observation 6** Better support of SFN can be further discussed.

## 4.2 Summary for SL Relay (RWS-210407)

10 companies provided the comments in Round 1, and 2 companies provided further comments in Round 2. The main issues under discussions are summarized in the following:

- + What should be prioritized in Rel-18 since it is difficult to include all aspects in Rel-18?
- + Regarding to U2U, what is the contents? Whether multi-hop should be considered?
- + Regarding to the service continuity, whether DAPS and CHO should be considered?
- + Regarding to the power saving, what is the difference compared with current Rel-17 SL DRX?
- + Regarding to the multi-path, whether there is any restriction, e.g., the leg number?
- + Regarding to the combination of relay and MBS, whether it corresponding to L2 relay or L3 relay and whether it corresponding to LTE MBS or NR MBS?

Our views are summarized briefly as follows:

- + We are open at this very early stage, we think at least the Rel-17 leftovers, e.g., service continuity enhancement, U2U can be considered in Rel-18. Whether further enhancements, e.g., SL DRX between relay and remote UE, multi-path and multi-hop, relay UE forwarding MBS, should be included can be depends on companies' interest.

- + We think fundamental U2U functions can be studied in Rel-18, multi-hop is not urgent.
- + Regarding service continuity enhancement, DAPS and CHO are not urgent since the basic mobility scenarios, such as inter-gNB mobility, indirect/indirect mobility have not been studied.
- + Regarding power saving, we intended to support SL DRX between relay and remote UE. At least paging/SI reception as mentioned by interdigital can use SL DRX. We are also open to other enhancements if justified.
- + Regarding multi-path, we think multi-path within one gNB can be considered firstly.
- + Regarding the combination between relay and MBS, we think only NR MBS can be considered and the study of RAN2 can focus L2 U2N relay since L3 U2N relay mainly depends on SA2.

Based on the discussions, we have the following observations regarding the main technical directions to discuss in the next step.

**Observation 1** Regarding U2U, the fundamental functions can be considered, which include relay discovery, relay (re-)selection, relay and remote UE authorization, adaption layer design, QoS management and control plane procedures.

**Observation 2** Regarding U2N service continuity enhancement, inter-gNB service continuity, indirect/indirect service continuity and group mobility can be considered. Whether group resumption, DAPS and CHO can also be included can be further discussed.

**Observation 3** Regarding power saving of U2N and U2U relay, whether SL DRX should be considered between SL relay UE and remote UE can be further discussed.

**Observation 4** Regarding the combination of MBS and sidelink relay, we could focus on NR 5MBS service, and the RAN mainly focuses on how L2 U2N relay forward the 5MBS service to remote UEs.

**Observation 5** Regarding multi-path, at least indirect/direct and indirect/indirect path aggregation within one gNB can be considered in Rel-18. Whether it can be extended to inter-gNB case or U2U case can be further discussed.

**Observation 6** Regarding multi-hops, whether it should be included in Rel-18 can be further discussed.

## 4.3 Summary for NTN (RWS-210408)

15 companies provided the comments/questions in In Round 1, and 3 companies provided the comments/questions in Round 2. The discussions can be summarized as the following.

The main aspects that have been discussed are

- + Support of Regenerative payload and ISL
- + Further enhancement for TN/NTN coordination, LEO/GEO coordination
- + Beam management enhancement

- + Coverage enhancement
- + Positioning enhancements
- + Satellite backhauling

We've make some response and clarifications based on companies' comments and questions. The details could be found in the previous sections. With these discussions, the following observations can be made.

**Observation 1** For Regenerative Payload, there seems to be good support, and there also seems to be a trend to support full-gNB on board option in Rel-18, while CU-DU split could be considered with 2<sup>nd</sup> priority.

**Observation 2** ISL could be considered in Rel-18, between two LEOs, LEO and GEO, etc. However, it seems no much RAN impact is expected.

**Observation 3** TN/NTN coordination could be further considered in Rel-18.

+ Generally, basic coordination options, including PLMN/RAT selection between TN/NTN, inter RAT cell reselection, handover, etc. can be first considered (pending to the Rel-17 progress).

+ Then there are also potential enhancements, e.g., to minimize the service interruption, which could be discussed further.

+ The solutions defined for the TN/NTN coordination could also be considered for LEO/GEO coordination. Coordination with HAPS is not excluded.

**Observation 4** Beam management enhancement has some support and can be discussed further.

**Observation 5** For Coverage enhancement, both DL and UL for coverage enhancement should be considered. More specifically, UL PRACH, PUSCH, DL synchronization, and DL PDSCH can be considered.

**Observation 6** For positioning enhancement, both non-GNSS capable UE and the case where GNSS signal is not available for a GNSS capable UE should be considered. Detailed work management could be discussed further, e.g., whether to include it in NTN Rel-18 or use a separate SI/WI, etc.

**Observation 7** For Satellite backhauling, RAN impact is not clear for now, and coordination with SA2 may be needed.

## 4.4 Summary for Redcap (RWS-210409)

During the Round 1 and Round 2 discussion, 7 companies share their comments and questions. We've made some response and clarifications, and our views can be summarized as the following.

### 1) On further complexity reduction

#### a) Further BW reduction in FR1 (5MHz/10MHz)

We have concerns on this direction. The cost reduction is not so significant but the specification impact is

expected to be large. It also makes the boundary between RedCap and LPWA ambiguous, which increases the risk of market fragmentation. Noted that BW=20MHz is able to serve the use cases that may require narrower BW, just at about <10% additional cost, which can be even smaller considering economic scale.

#### b) Further BW reduction in FR2

BW=50MHz in FR2 has been studied in Rel-17 SI, but not accepted due to co-existence issue with normal UEs. We do not see things change much in Rel-18.

#### c) Leftovers of Rel-17

Several features were dropped in Rel-17 WI, including 16QAM in DL/UL, relaxed processing time for data/CSI, coverage recovery, serving cell RRM relaxation, etc. We do not see a strong need to re-open the discussion unless new motivation is found.

### 2) RedCap positioning

We support positioning enhancement for RedCap UE to compensate the performance loss due to reduced BW and number of Rx. From our point of view it seems reasonable to further study it in Rel-18 positioning item. Common design and same positioning accuracy (under the same condition) between RedCap and non-RedCap UE is pursued. Sidelink positioning for RedCap, if considered, should be discussed in sidelink positioning scope but perhaps only with low priority.

### 3) RedCap power saving

We are positive in RedCap power saving, but it is unclear how much room is left. Generally we prefer simple but efficient methods like lower power class, RAN2 enhancement in eDRX, PSM... We are also open to new features like wake-up radio and corresponding WUS. However, lower BW for power saving is not convincing to us since similar effect can be achieved by configuring narrow BWP.

## 4.5 Summary for SL enhancement (RWS-210410)

The technical aspects discussed from the presentation are broadly based and mainly include the following eight areas:

- + Co-channel existence between NR-V2X and LTE-V2X
- + Carrier aggregation enhancement
- + MIMO enhancement
- + FR2 enhancement
- + Unlicensed support for sidelink
- + IIoT support for sidelink
- + Power saving enhancement for sidelink

+ Resource management enhancement for sidelink

Below are some observations from the discussion:

+ For the issue of co-channel co-existence issue between NR and LTE , the main intention is to achieve the scenario that NR and LTE share the same resources to achieve more efficacy when two RAT are deployed. This will require the NR v2x UE to have the ability to receive LTE v2x signal. Note there will be no changes for LTE v2x UE.

+ Most companies support the idea of carrier aggregation enhancement.

+ For MIMO enhancement, one main component proposed is the CSI enhancement.

+ There is also support for FR2 enhancement, most favor at least enhancement in the area of beam management.

+ For unlicensed support for sidelink, the main intention is the requirement for data rate increase. However, the overall effort of for supporting unlicensed band cannot be under estimated, since this will involve changes to nearly all aspects of sidelink specifications.

+ Two companies proposed IIoT support for sidelink. The main idea is to introduce device to device communication capability for IIoT devices. In this sense, it may be more correct to place this enhancement in the area of IIoT enhancement.

+ Several companies proposed further power saving enhancement for sidelink, the including the proposal to introduce WUS/GTS signal .

+ Resource management enhancement for sidelink are also proposed, mainly for UE scheduling another UE.

Overall, in our view the scope of the sidelink enhancement from the presentation is too big and further selection is needed. It is suggested the main focus of next phase of discussion is to rank the priority of these proposals.

## 4.6 Summary for XR (RWS-210411)

In RWS-210411, we provide some considerations to XR. During the round 1 and 2 discussions, we received some comments and questions from companies. The discussions can be summarized in the following.

Firstly there were discussions on capacity issue and potential ways to improve. We've clarified that the potential solution in improving the system capacity would be discussed along with the evaluation results in working group during XR study. The work item objective should be specified based on the conclusion of the study. Then regarding the detailed solution we also made it clear that we are open to discuss further.

Secondly, there were discussions on power saving for XR. We've clarified that in our understanding some of the Rel-17 schemes could be used for XR to achieve both capacity and power saving improvement.

At last, there were some questions and response regarding the KPI to measure/reflect the experience of XR service. From our point of view, the XR study and work in RAN can only provide the results of RAN-based

KPI in order to meet the desired user experience from end-to-end KPI. Then we are open to further discuss what the best suitable metrics is.