RAN-R18-WS-non-eMBB-LG - Version 0.0.5
RAN

3GPP TSG RAN Rel-18 workshop **RWS-210579**

Electronic Meeting, June 28 - July 2, 2021

Agenda Item **4.2**

Source **LG Electronics**

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

1 Introduction

This e-mail discussion summary covers the documents the following documents:

1. RWS-210238, LG's View on Rel-18 5G-Advanced: non-eMBB related
2. RWS-210244, Enhancement for sidelink operation
3. RWS-210230, Enhancement for RAN slicing
4. RWS-210231, Enhancement for SDT
5. RWS-210232, Enhancement for NTN
6. RWS-210228, Factory IAB
7. RWS-210229, Inter-UE duplication avoidance

2 First Round

2.1 General aspects [RWS-210238]

For non-eMBB, LG has proposed 7 items for Rel-18 in RWS-210238 including,

A. Enhancement for sidelink operation (RWS-210244)

B. Enhancement for RAN slicing (RWS-210230)

C. Enhancement for SDT (RWS-210231)

D. Enhancement for NTN (RWS-210232)

E. Factory IAB (RWS-210228)

F. Inter-UE duplication avoidance (RWS-210229)

G. Enhancement for RedCap (No seperate document)

2.1.1 Comments/Questions

Feedback Form 1: General comments/questions on RWS-210238, LG's view on R18 5G-advanced: non-eMBB related.

1 – Intel Technology India Pvt Ltd Can you clarify why private network (Factory IAB) needs to be discussed in Rel-18 IAB, given that dynamic topology adaptation and dynamic interference coordination can be covered/discussed under mobile IAB?
2 – Intel Technology India Pvt Ltd And is this the correct understanding that the redundant transmission due to UE duplication could not provide the diversity, thus needs to be avoided?

2.1.2 Answers

Feedback Form 2: Asnwers for RWS-210238, LG's view on R18 5G-advanced: non-eMBB related.

1 – LG Electronics Inc. **@Intel** *Regarding 1st Question:* The enhancements you mentioned in the question, of course, can be discussed under mobile IAB. However, we think that market demands for a private network is growing and one of promising use case for a private network is factory IAB. Considering that factory IAB may need more stringent requirements than mobile IAB, we think that if those enhancements are discussed for factory IAB, this can also cover mobile IAB, but if discussion is targeted at mobile IAB, this may not completely cover factory IAB.
2 – LG Electronics Inc. **@Intel** *Regarding 2nd Question:* Yes. As the transmission is already successful by one UE, there is no reason to waste radio resource by redundant transmission from other UEs.

2.2 Enhancement for sidelink operation [RWS-210244]

The potential enhancement area includes,

A. Sidelink carrier aggregation

B. Co-channel coexistence of LTE and NR sidelinks

C. Sidelink beam management or multi-panel management

D. Enhancements for sidelink operation in FR2

2.2.1 Comments/Questions

Feedback Form 3: Comments/Questions on enhancement for sidelink operation (RWS-210244)

1 – Classon Consulting

[for FUTUREWEI]

We also support sidelink MIMO and FR2 and unlicensed enhancements, see RWS-210039 and https://nwm-trial.etsi.org/#/documents/4714 .

2 – Huawei Tech.(UK) Co.. Ltd

What will be performance impact on both LTE-V and NR-V in coexistence? Can LTE-V and NR-V service requirements be satisfied by using the same band for LTE-V and NR-V?

3 – Guangdong OPPO Mobile Telecom.

Q1) For multi-panel topic for V2X, the motivation is to study panel selection or panel coordination? It is generally feel that multi-panel selection is only applicable in V2X and not other use cases. If we want to have broader support of NR sidelink, it is better to work on beam management as a whole and treating multi-panel selection as a special case.

Q2) For LTE/NR SL coexistence, the study focus on semi-static RP configuration (which can be implemented by exiting NR SL), or considering dynamic method (which needs SL enhancement)? If LTE/NR V2X resource pools are overlapped, hardware changes are necessary for NR V2X receiver to perform channel estimation and decoding of LTE V2X PSCCH for sensing to avoid collisions.

4 – Lenovo (Beijing) Ltd

Q1: In page 5 whether multi-panel management can be also used for some groupcast,e.g., connection based groupcast?

5 – ROBERT BOSCH GmbH

On multi-panel sidelink (a.k.a DAS):

Q1: how does this topic affect sidelink positioning?

Q2: what is the impact on sensing and how can collision be avoided ?

On multi-carrier operation:

Q3: do you support multiplexing data or duplication? and if multiplexing, do you support more than 1 TB per slot (i.e., on different carriers)? If no, should we study inter UE prioritization?

6 – DOCOMO Communications Lab.

Could I ask priorities among proposed topics? All might be difficult in Rel-18.

7 – CATT

For co-channel coexistence with LTE and to achieve ”For example, Rel-18 UEs can detect LTE sidelink resource allocation and uses the un-occupied resources for NR sidelink transmissions’, does this require NR-V2X UE also equipped with LTE-V2X modem ?

8 – Huawei Tech.(UK) Co.. Ltd

As a followup to our question on NR-V2X and LTE-V2X coexistence, your paper say:

For example, Rel-18 UEs can detect LTE sidelink resource allocation and uses the un-occupied resources for NR sidelink transmissions.

Does this imply actual decoding of SCIs from another RAT, or do you intend more like sensing of resource occupancy based on received power?

2.2.2 Answers

Feedback Form 4: Asnwers for RWS-210244, enhancement for sidelink operation

1 – LG Electronics Inc.

Answer to #1 Futurewei: Thanks you for the comment. We would like to clarify our current position that sidelink operation on an unlicensed band requires further consideration as it may not be straightforward to ensure fair and efficient channel access at the presence of various RATs including NR-U Uu, NR-U SL, and other non-3GPP technologies.

2 – LG Electronics Inc.

Answer to #2 Huawei: The minimum requirement would be like the impact caused by NR-V sharing a channel with LTE-V shall not be worse than what would be caused by using LTE-V on the same channel. In other words, when a certain number of LTE-V UEs change to NR-V operation on the same channel, the performance of the remaining LTE-V UEs shall not be adversely impacted. We can ensure the LTE-V service requirement on the channel by this. In our view, there will be a separate channel dedicated for NR-V operations (i.e., not shared with LTE-V) for the operation of Rel-16/17 UEs, thus the use of the shared channel is mainly for the supplementary purpose from NR-V perspective. And when the technology migrates and the number of LTE-V only UEs significantly reduces, the shared channel would be mostly used by Rel-18+ NR-V thereby providing meaningful load reduction in the NR-V only channel to Rel-16/17 NR-V UEs.

3 – LG Electronics Inc.

Answer to #3 OPPO Q1: We understand that Rel-17 MIMO considers multiple panels of a UE and this is not limited to vehicles though these panels might not be separated in space in some non-vehicle UEs. So we think there can be non-vehicle UEs equipped with multiple panels and, when those UEs support sidelink, then it would be natural to consider multi-panel selection as well in sidelink. We are fine with having a broader support of sidelink beam management if it is common understanding that multi-panel selection is included in it.

Answer to #3 OPPO Q2: Our preference is to ensure sufficient resource efficiency, and we think semi-static RP configuration may adversely impact the existing LTE-V2X performance as it would imply that resources for LTE-V2X shrinks in order to allow NR-V2X operations in the same channel. We view this co-channel coexistence as an extension of LTE/NR V2X in-device coexistence specified in Rel-16, i.e., the device supports both LTE-V2X and NR-V2X, and the two RAT exchanges information inside the device. So no significant hardware changes are expected from the device perspective. We think this is in line with the 3GPP assumption that LTE-V2X is used for basic safety and NR-V2X is used for advanced use cases.

4 – LG Electronics Inc.

Answer to #4 Lenovo: We think multi-panel (or sidelink beam) management is a low hanging fruit in uncast as we can use the sidelink CSI reporting framework defined in Rel-16. We are open to considering some groupcast if there is an easy and effective solution.

5 – LG Electronics Inc.

Answer to #5 Bosch Q1: This document addresses DAS-related aspects in the data communication like which panel is used to send which data packet, and what information the TX UE uses for the panel selection, etc. Please refer to our contribution RWS-210245 for DAS-related aspects in positioning.

Answer to #5 Bosch Q2: We think the sensing and resource allocation is an aspect that can be investigated once the specification work starts for this objective. We currently think that roughly two different approaches can be considered. One is a conservative approach where the sensing and resource allocation is not changed from Rel-16/17 and TX UE just selects one panel for its transmission of a TB on the resource selected by the existing procedure. The other is a more progressive one which may appear as panel(or beam)-based sensing where a UE is allowed to transmit a TB in a panel if it identifies the selected resource is vacant using the sensing result from the selected panel.

Answer to #5 Bosch Q3: We think data multiplexing should be supported, i.e., N TBs are transmitted in a slot using N sidelink carriers. We are fine with supporting packet duplication for better reliability, and in this case, we believe Rel-15 solution designed for LTE sidelink shall be reused as much as possible.

6 – LG Electronics Inc.

Answer to #6 DOCOMO: We currently think that the proposed topics are important in Rel-18 and need to be supported. We expect that the support of sidelink carrier aggregation can be relatively easy by reusing Rel-15 design. If WG capability is limited, we can consider reducing scope of some topics. An example would be to limit FR2 support to so called “FR1 assisted operations” so that control signaling for the procedures like beam management, sidelink RLM, PC5-RRC is transmitted on FR1 and as a result allows reusing the Rel-16/17 solution.

7 – LG Electronics Inc.

Answer to #7 CATT: We view this co-channel coexistence as an extension of LTE/NR V2X in-device coexistence specified in Rel-16, i.e., the device supports both LTE-V2X and NR-V2X, and the two RAT exchanges information inside the device. So no significant hardware changes are expected from the device perspective. We think this is in line with the 3GPP assumption that LTE-V2X is used for basic safety and NR-V2X is used for advanced use cases, which means that a device with NR-V2X also has LTE-V2X decoder operating on a channel used for LTE-V2X if the device participates in basic safety services.

8 – LG Electronics Inc.

Answer to #8 Huawei: Our assumption is to apply NR-V2X sensing principle which is based on the SCI detection, thus it will require decoding SCI of LTE-V2X. But as we responded to other questions, we view

this co-channel coexistence as an extension of LTE/NR V2X in-device coexistence specified in Rel-16, i.e., the device supports both LTE-V2X and NR-V2X, and the two RAT exchanges information inside the device. So no significant hardware changes are expected from the device perspective. But we are open to other sensing mechanism, e.g., based on received power, if it can serve the purpose of identifying resources where NR-V2X transmissions do not adversely impact the legacy LTE-V2X operations.

2.3 Enhancement for RAN slicing [RWS-210230]

The potential enhancement area includes,

A. Support slice aware mobility when usage of network slices is restricted.

A1. Restriction is based on frequency, geographical area, timely-manner, simultaneous usage of network slices

A2. Consider both idle mode and connected mode mobility

B. Support power saving mechanisms based on slice priority and/or disjoint network slices information.

B1. RRM relaxation

B2. DRX optimization

2.3.1 Comments/Questions

Feedback Form 5: Comments/Questions on enhancement for RAN slicing (RWS-210230)

1 – KDDI Corporation

Thank you very much for the proposal. Let me ask questions below.

<Q1>

With regard to "Support slice aware mobility when usage of network slices is restricted." could you elaborate the delta from the Rel-17 RAN slicing? We understand that with Rel-17 specification, UE can recognize slice availabilities. Could you explain the issue which you try to address with this Rel-18 objective?

<Q2>

With regard to "power saving mechanisms based on slice priority", does it relate to paging subgrouping mechanism which is now being discussed in RAN2? Is there any issue which cannot be addressed by the paging subgrouping mechanism?

2 – Motorola Mobility UK Ltd.

On A1: does it mean that potential R18 enhancements shall consider non-homogenous slice deployments?

Furthermore, can you clarify the restrictions based on "timely-manner" and "simultaneous usage of network slices". For cell reselection in idle/inactive I wonder how the UE shall use these restrictions for finding a suitable cell.

3 – Bell Mobility

Thanks for the proposal.

On your motivation slide (slide #3) you mention RAN enhancements to support new requirements as:

Multiple and different slices are supported on different frequencies or geographical area (regardless of tracking area). Bell strongly supports this requirement.

With the current homogeneous principle:

1) TA tend to be bigger than the geographical area need for many use cases. To offer a slice in a localized place, TA reconfiguration is needed but not desired.

2) In multi band scenario, if all bands are deployed on a gNB under the same TAC, all bands must support all slices. Not optimal.

Clarification: A-1: By ”timely manner” do you mean a slice is created and available only for a certain period of time? Also can you clarify what do you mean by restriction by ”simultaneous usage of network slices”?

4 – Intel Technology India Pvt Ltd

(1) Simultaneous slice support was discussed in SA2 and no conclusion was made in Rel-17. Should the work be first continue in SA2?

(2) Non-uniform Slice support in a RA was discussed in Rel-17 and SA2 confirmed that slice support within a RA needs to be uniform. If non-uniform slice support in a RA is to be discussed, should it be first discussed in SA2? (as it impacts PDU session maintenance and impacts allowed slices concept in SA2)

(3) For different users or services having different priority, isn’t this currently being discussed in Rel-17? Should this wait for the Rel-17 progress?

5 – ZTE Corporation

Thanks for your proposal. We also see the need for further enhancement for RAN slicing to evaluate the RAN impact of Rel-18 progress in other WG (SA1/SA2).

In addition, we are interested in UE leverage different slice resource in MN and SN, continuation of slice remapping, and further enhancement on cell (re)selection as mentioned in our paper RWS-210482.

Regarding your proposal on supporting power saving mechanisms based on slice priority and/or disjoint network slices information, could you please explain how the slice priority and/or disjoint network slices information would impact the RRM relaxation and what kind of DRX optimization is needed?

6 – Nokia

The existing power saving mechanisms serve the purpose without limitations due to slicing. What would be the gap or specific use case to consider extra power saving optimizations for network slicing?

7 – Huawei Tech.(UK) Co.. Ltd

Thank you for the contribution

Can you clarify what do you believe in your contribution is not a left over or requirement from other group and further clarify the requirements for such evolution?

8 – Samsung Electronics Co.

Regarding restriction on frequency, what's the difference from current R17 WI? Is the "Regardless of TA" a difference?

Could you please clarfy more the restriction on "simultaneously supported network slices at UE"?

2.3.2 Answers

Feedback Form 6: Answers for RWS-210230, Enhancement for RAN slicing

1 – LG Electronics UK

@KDDI

Regarding Q1, one example scenario that we'd like to discuss in Rel-18 is that some of network slices are not allowed to be used simultaneously by the UE. For example, the UE will receive available network slice #1 and slice #2 in a tracking area. In Rel-18, we'd like to consider a new case that if slice #1 is registered, network slice#2 is not allowed to be used simultaneously with slice #1 although both are available in the area. We'd like to discuss Rel-18 RAN slicing enhancements to support new use cases/scenarios.

Regarding Q2, we think the existing power saving mechanism such as RRM relaxation can be further enhanced based on slice restriction information. We do not see the need to enhance Paging subgrouping for RAN slicing now, but we are open for discussion for any mechanism.

@Motorola Mobility

Yes, we consider non-homogeneous slice deployments in Rel-18 and this should be coordinated with SA.

Regarding slice restrictions, for example, a particular network slice #A may not be allowed to be used simultaneously with other network slice. And then, if the UE is registered for slice #A, the UE selects a cell supporting #A. The UE does not need to consider other cells not supporting slice #A although cell quality is good. Similarly, if a particular slice is unavailable for a certain period of time, the UE does not need to consider the slice for cell selection/reselection.

@Bell Mobility

We agree with your point regarding the limitations of the current homogeneous principle.

Regarding "timely manner", we consider the case that a slice may be available for a certain period of time depending on types of services or due to temporary reasons. For example, a service may be available in a particular area for special purpose during business hours.

Regarding "simultaneous usage of network slices", for example, if network slice #1 is registered, network slice #2 is not allowed to be used simultaneously.

@Intel Technology India

Regarding 1) and 2), yes, we also think coordination with SA is essential.

Regarding 3), we consider slice priority and slice restrictions are different. If usage of a particular network slice is restricted, that means the network slice is not a candidate to be considered.

@ZTE

Based on disjoint network slice information, for example, a UE may not need to apply the same RRM measurement rule for a frequency associated with the slice restricted. For DRX optimization, a UE may change PDCCH monitoring cycle depending on the on-going service. We need further discussion on these.

We'd like to discuss slice aware power saving and are open for any mechanism.

@Nokia

We want to investigate further slice aware power saving mechanism. For example, the UE may apply RRM relaxation for a frequency associated with network slice restricted for usage. Especially when slice restrictions apply, we think the UE could further reduce power consumption based on the restrictions.

@Huawei

In Rel-17 deployment scenario, all cells in a tracking area have the same slice availability. However, this deployment may not satisfy use cases studied in Rel-18 SA work. As Rel-18 SA discussion is on-going for new use cases and requirements for further enhanced network slice and possible RAN impacts are foreseen, we suggest Rel-18 RAN slice enhancements.

@Samsung

Although the UE have configured/allowed network slice for the UE, let's say network slice #1 and #2, they may not be allowed to be used simultaneously by the UE. For example, network slice #1 is registered, network slice #2 is not allowed to be used.

Regarding "Regardless of TA", we suggest to apply non-uniform slice availability in Rel-18. The main intention is to satisfy new use cases; small area or particular cells in a tracking area may needs to be configured with a specific network slice, which is not available for entire tracking area.

2.4 Enhancement for SDT [RWS-210231]

The potential enhancement area includes,

A. Paging enhancement for DL SDT

A1. To trigger UE to be ready for receiving DL data in RRC_INACTIVE.

B. DL SPS utilization for DL SDT

B1. Scheduling overhead can be considered for the subsequent DL data transmission.

B2. Dynamic scheduling is not precluded.

C. DRX enhancement for DL SDT

C1. UE power saving can be considered for the subsequent DL data transmission.

D. Co-existence with UL SDT

D1. Bi-directional data exchange scenario should be considered.

2.4.1 Comments/Questions

Feedback Form 7: Comments/Questions on enhancement for SDT (RWS-210231)

1 – ZTE Corporation

We are generally supportive of this work proposed for SDT enhancements.

For the point B (about DL SPS), is the intention to reuse the CG-Type 1 resource for DL or is it something else?

For the point D (coexistence with UL SDT), we agree that the general MT-SDT scheme supported should be able to co-exist with UL. Our understanding is that similar to Rel-17 where it is possible for DL data to be exchanged in a MO-Triggered SDT session, I guess the intention is to support UL data in a MT-SDT scheme. Is this the correct understanding of this bullet point D about coexistence, if not, please can you elaborate this a bit more?

2 – HUAWEI TECHNOLOGIES Co. Ltd.

[Huawei, HiSilicon] We agree that MT-SDT would be a useful enhancement. We have the following questions for the remaining proposed enhancements:

a. DRX enhancement for DL SDT: For SDT in Rel-17 it was decided that DRX is not required. The reason behind is that an SDT-specific search space can be utilized where PDCCH monitoring occasions are sparser than normally (e.g. in RRC Connected mode). Considering this, why do you think this would be an issue that has to be addressed specifically for downlink SDT?

b. Co-existence with UL SDT: Does co-existence here refer to the UE being simultaneously configured with both UL SDT and DL SDT? Assuming this is the case, what particular issues do you foresee for such co-existence/configuration?

3 – Beijing Lenovo Software Ltd.

Thanks for this interesting paper on SDT.

For DRX enhancement for DL SDT, do you mean some specific enhancements to DRX if DL SDT is configured?

For co-existence with UL SDT, what is the meaning of the Bi-directional data exchange? We think the MO-EDT could support the subsequent DL data transmission, naturally, the MT-EDT could support the subsequent UL data transmission, is there any special case for the co-existence with UL SDT?

4 – Nokia Corporation

Q1: We also see the need for PDCCH monitoring reduction for SDT procedures of longer duration. However, are you open to other schemes than DRX?

Q2: What is meant by ”Bi-directionality” that should be supported (SDT feature already supports subsequent UL/DL data transmission)? Is the co-existence of UL SDT with DL SDT meant or something else? And what types of bi-directional traffic are you considering?

2.4.2 Answers

Feedback Form 8: Answers for RWS-210231, Enhancement for SDT

1 – LG Electronics Inc.

@ZTE

Regarding first question, yes we assume a new type of DL SPS similar to CG-Type 1 used for UL SDT.

Regarding second question, yes your understanding is correct. The UL data may arrive after the DL SDT is triggered, in which case the UE has to transmit UL data while DL SDT is ongoing. We don't know yet exact impact on such coexistence, but what we propose is to consider this scenario in DL SDT work.

@Huawei

a: We think any mechanism to enable discontinuous PDCCH monitoring is a kind of DRX. It can be realized by sparse SDT-specific search space, as you mentioned. But we are open for any other mechanism to enable discontinuous PDCCH monitoring. The important point is that the UE should reduce power consumption while performing DL SDT. Note that DL SPS is also a potential method to reduce UE power consumption.

b: The UL data may arrive after the DL SDT is triggered, in which case the UE has to transmit UL data while DL SDT is ongoing. We don't know yet exact impact on such coexistence, but what we propose is to consider this scenario in DL SDT work.

@Lenovo

Regarding first question, we don't propose specific enhancements but want to point out that the UE should reduce power consumption while performing DL SDT. This can be realized by various method, e.g. sparse SDT-specific search space, DL SPS, or DRX specific to DL SDT.

Regarding second question, what we want to consider is the case where the UL data is generated while DL SDT is ongoing. This may be naturally considered in subsequent DL transmission, but anyway we should not neglect this scenario.

@Nokia

Q1: Yes, we are open for any mechanism to enable discontinuous PDCCH monitoring in DL SDT. What is important is that the UE should reduce power consumption while performing DL SDT

Q2: What we want to consider is the case where the UL data is generated while DL SDT is ongoing. UL data may be transmitted by UL SDT defined in Rel-16 or subsequent DL SDT procedure. Regarding traffic type, typical example is a chatting message using a messenger. Conversation between two users generate would generate small data in both UL and DL.

2.5 Enhancement for NTN [RWS-210232]

The potential enhancement area includes,

A. Support CA and DC in NTN networks, including:

A1. CA with LEO PCell + SCell: Increase data throughput

A2. DC with GEO (MN) + LEO (SN): MN manages UE mobility and MN takes role of data transmission

A3. DC with LEO(MN) + LEO (SN): Increase data throughput

A4. DC with TN (MN) + NTN (SN): SN complements weak signal area of MN

B. Support regenerative payload using inter-satellite link (ISL) to reduce signaling latency between satellites.

2.5.1 Comments/Questions

Feedback Form 9: Comments/Questions on enhancement for NTN (RWS-210232)

1 – Asia Pacific Telecom co. Ltd APT/FGI shares the same view to support CA/DC. as shown in RWS-210194**,** Some of 5G use cases for satellite access networks provided by Table 4.2.1-1 in TR 38.811 may not be supported by the Rel-17 NTN, e.g., multi connectivity and mobile cell hybrid connectivity.
2 – Intelsat We share the interest in the listed enhancements with an emphasis on DC.
3 – Asia Pacific Telecom co. Ltd We share the same view that multi-connectivity shall be supported. However, we wonder how to synchronize multiple sources via different satellites considering different propagation delays.
4 – Intel Technology India Pvt Ltd Do you expect any impact for RAN1 specification from your proposal?
5 – Lenovo (Beijing) Ltd We think CA and DC can be considered for NTN at least for the listed cases. And some questions: For A2, should it be ”SN takes role of data transmission”? For A4, does SN include both GEO and LEO or just LEO?
6 – MediaTek Inc. Q1: Scope of asynchronous multi connectivity & Carrier Aggregation seems wide. Is it asynchronous or synchronous Dual Connectivity, Carrier Aggregation?, CA?, PHY level? Feasible with OFDMA waveform? What is the use case? Why not use TN with higher link budget if available? What are the system benefits? Q2. What would be the scope of enhancements for regenerative architecture with full gNB on board and which working group – i.e. RAN1, RAN2, RAN3?
7 – CATT On the views to NTN Rel-18, we’re pretty much aligned on the scope. On CA and DC operation, we are also interested in this topic. We just wondering if it’s applicable for two LEO cells/gNBs in case of earth moving cell scenario? Anyway, the detail scenarios could be further discussed.

8 – 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 is the pros/cons of using 5G for ISL compared to proprietary solution for ISL?

2.5.2 Answers

Feedback Form 10: Answers for RWS-210232, Enhancement for NTN

1 – LG Electronics France

Asia Pacific Telecom co. Ltd # 1

LG: We agree that CA/DC should be supported in order to support listed satellite access networks.

Intelsat # 2

LG: Thanks for sharing the view. We can list various DC scenarios now and discuss the feasibility one by one later.

Asia Pacific Telecom co. Ltd # 3

LG: We understand your concern that it may be challenging to synchronize multiple satellite nodes with different propagation delays. Maybe RAN1 can discuss the timing synchronization.

Intel Technology India Pvt Ltd # 4

LG: For CA operation, we can re-use existing procedure, so we think no big NTN-specific enhancement is needed. However, we may need to look into details, e.g., on whether/when uplink power is limited.

For DC operation, the UE should connect to multiple satellites simultaneously, so we could consider timing/synchronization or resource allocation between the satellite nodes.

Lenovo (Beijing) Ltd # 5

LG: For A2, as LEO satellites have much shorter propagation delay, we think LEO satellites are generally more adequate for data transmission than GEO satellites, but it does not mean MN cannot transmit data. So it is general use case from our perspective, but it is up to network decision how to transmit the data.

LG: For A4, we think both GEO and LEO can be used for the complement of TN.

MediaTek Inc. # 6

LG: For Q1, we see the need of CA/DC support to increase per-UE throughput as well as to increase link stability. We currently think that both synchronous and asynchronous DC can be included in a scope, with the assumption that satellite companies or service provides are interested in both, but we are open to discuss. Of course if TN is stably available, then TN will take role of data transmission, but if TN cell quality is not stable (e.g. ocean near the land, or grand park), then satellites could provide more stable service.

LG: For Q2, we think it will be mainly RAN2 and RAN3's work.

CATT # 7

LG: We agree that it may be more challenging to maintain DC to two LEO satellites than other scenarios, but our intention is not to preclude any scenario at this stage.

Sony Corporation # 8

LG: At this stage, we have no strong view regarding which communication technologies should be used for ISL. While we do not see a strong need to use 5G for ISL communication, this is somehow related to other inter-satellite communication use cases such as multi-hop satellite communications (or NTN IAB). Maybe we can discuss with satellite companies and service operators, but we would like to avoid too wide scope for this.

2.6 Factory IAB [RWS-210228]

The potential enhancement area includes,

A. Dynamic topology adaptation with zero-interruption mobility

A1. Enhanced DAPS or DC-based zero-interruption mobility.

A2. Controlled group mobility.

B. Dynamic topological redundancy with controlled duplication and express routing

B1. Controlled duplication based transmission.

B2. Express routing for delayed packets.

C. Dynamic interference coordination

C1. CLI enhancements to support dynamic interference coordination for intra- or inter-IAB networks.

2.6.1 Comments/Questions

Feedback Form 11: Comments/Questions on Factory IAB (RWS-210228)

1 – Intel Technology India Pvt Ltd (1) Does this factory IAB network in private network assume using unlicensed band? (2) Does the controlled duplication-based transmission mean PDCP duplication or packet duplication in IAB-node with two egress paths? Who will control/trigger the duplication?
2 – Sony Europe B.V. What does ”controlled” mean for group mobility and packet duplication? if it is unlicensed spectrum then what are different scenarios?
3 – Lenovo Mobile Com. Technology Is it a new WID only for factory IAB or a WID combinated with other IAB enhancements? And we are also wondering about the controlled group mobility and packet duplication.

4 – Fraunhofer HHI

Thanks for the contribution. Fraunhofer also supports some of the identified topics, particularly aspects of dynamic topology adaptation with reduced service interruption and dynamic interference management (RWS-210320).

Could the following also be clarified:

#1) In LG's view, is DAPS the only HO mechanism for non-DC connections that should be considered?

#2) Regarding the controlled group mobility, is LG envisaging the mobile IAB node controlled-group mobility or?

2.6.2 Answers

Feedback Form 12: Answers for RWS-210228, Factory IAB

1 – LG Electronics Inc.

@Intel

Regarding 1st question:

We think licensed band is a baseline for factory IAB, but unlicensed band is also considered under controlled environment.

Regarding 2nd question:

The controlled duplication-based transmission is packet duplication in IAB-node with two egress paths, not PDCP duplication. We think this should be controlled by (pre)configuration from the IAB donor CU and can be triggered when the status of IAB node, e.g., buffer load/link quality, meets the configured condition.

@Sony

Regarding 1st question:

We use "controlled" to emphasize that group mobility and packet duplication should not be performed arbitrarily and should be controlled by configuration from the IAB donor CU.

Regarding 2nd question:

We think that if unlicensed band is used for factory IAB, this unlicensed band would be used under controlled environment, i.e., less LBT failure would be expected.

@Lenovo

Regarding 1st question::

Considering the amount of objectives for factory IAB, we think that this can be combined with other IAB enhancement.

Regarding 2nd question:

We use "controlled" to emphasize that group mobility and packet duplication should not be performed arbitrarily and should be controlled by configuration from the IAB donor CU.

@Fraunhofer

Regarding 1st question::

It would be good to clarify non-DC connection first in your question. Our intention is to receive DL traffic from two parents simultaneously, but not to transmit UL traffic to two parents simultaneously during HO as similar to existing DAPS. Having said that, We are open to discuss further options.

Regarding 2nd question:

We think that group mobility is not limited to mobile IAB node. Actually an IAB node which is fixed or has less mobility, also may need group mobility for its descendant IAB nodes and connected UEs during HO/migration. So, we expect more general enhancement to cover all cases for group mobility.

2.7 Inter-UE duplication avoidance [RWS-210229]

The potential enhancement area includes,

A. How to inform the UEs in the same group that the transmission of a message/information for a certain event is necessary or not.

A1. Evaluate which layer is suitable for handling this feedback.

A2. Evaluate which information should be provided with this feedback.

B. How to avoid transmission of a message/information for a certain event if that is informed not necessary?

B1. Introduce a layer2 mechanism to avoid redundant transmission based on the feedback.

2.7.1 Comments/Questions

Feedback Form 13: Comments/Questions on Inter-UE duplication avoidance (RWS-210229)

1 – Beijing Xiaomi Mobile Software

Thanks for the contribution.

We are interested in this use case of negotiation/coordination procedures between multiple UE devices for back up reasons.

2 questions

1 The use case is ”to minimize the redundant transmission of the same message/information between the UEs, who are involved in the same mission”. Do you have more thoughts of coordination of multiple different data streams across the UEs, who are involved in the same mission?

2 The objective: **Evaluate which layer is suitable for handling this feedback.**

What does the feedback mean? What is it used for?

Are you meaning you want PDCP status report for the radio link detection to trigger redundant transmission or stop redundant transmission?

2 – Beijing Xiaomi Mobile Software

For the coordination of multiple different data streams across the UEs, We had a paper (RWS-210251). We are wondering if you are interested in it? Thanks.

3 – Intel Technology India Pvt Ltd

How can layer 2 know application layer information are duplicated?

4 – Spreadtrum Communications

Thanks for the contribution, and we have a question: how to identify the same message/information of the same misson among different UEs in RAN level?

5 – Nokia Germany

- For this to work, one prerequisite is that RAN is aware that two or more UEs are deployed to provide backup for the same service (e.g. signalled by the core network). SA2 already studied the topic: Redundant user plane paths based on multiple UEs per device (TS 23.501 Annex F (informative)), and it was concluded not supporting such feature and it is only included for information.. Without support from CN, how RAN enhancements can work?
- What would be the benefit of standardized solutions compared to higher-layer/RAN-transparent solutions such as 2 or more UEs serving the application and using e.g. MPTCP to select the best UE at any given time or FRER based solution?

6 – HuaWei Technologies Co.

We have similar underStanding on this motivation, see RWS-210454. We have two questions:

1) We think the network needs to know which UEs are in a same group, and do you think this requires some RAN/CN level UE association mechanism?

2) We think PDCP layer is suitable for handing this feedback and a PDCP status report could be used to provide this feedback. Do you have any preference on the specifIc layer?

2.7.2 Answers

Feedback Form 14: Answers for RWS-210229, Inter-UE duplication avoidance

1 – LG Electronics Inc.

@Xiaomi

Regarding the coordination, we are considering the network controlled coordination. That is, for example, network indicates which information is received or not successfully received so that the UEs involved in the same mission decides whether to perform the transmission or not to the network.

Regarding the feedback, as explained above, feedback is to be used for coordination, i.e., for avoidance for inter-UE duplication. PDCP status report is only valid for one specific UE, hence, we don't think PDCP status report can be used for common feedback for multiple UEs for deciding whether to perform transmission or not. A new kind of feedback would be required which can be used commonly between the UEs.

Additionally, we're aware of that there are many proposals from other companies to rely on UE-UE interaction for coordination and open to discuss it.

@Intel

From layer 2 perspective, it may not be possible to identify the information itself, but it could be possible to deduce the information based on e.g., time information when the data is generated. So, in order to avoid inter-UE duplication, we think it is essential to define a mechanism in layer 2 that allows the network to provide a common feedback to multiple UEs and the UE, based on the common feedback, to know whether the data would be redundant or not.

@Spreadtrum

As responded above, from layer 2 perspective, it may not be possible to identify the information itself, but it could be possible to deduce the information based on e.g., time information when the data is generated. So, in order to avoid inter-UE duplication, we think it is essential to define a mechanism in layer 2 that allows the network to provide a common feedback to multiple UEs and the UE, based on the common feedback, to know whether the data would be redundant or not.

@Nokia

We're aware of the discussion in SA2, but that is more like multiple UEs within one terminal device. The targeted scenario in our paper is to support multiple terminal devices which are involved in the common mission/job. The support from CN would not be essential because each UE is the exactly the same as the normal UE, i.e., one UE in one terminal device. We think the scenario itself is valid in practice because there can be multiple terminal devices dedicated to monitoring the same area or the same object, which results in redundant transmission of the same information over the air.

Given that we consider multiple terminal devices which are physically separated, we don't think MPTCP, which can select the best UE within the same terminal device, would work. And, that is the reason why we need some mechanism in RAN to allow detection of the same information and provide feedback for avoiding redundant transmission.

@HuaWei

Regarding the grouping, we also think some RAN level UE association, which can be defined based on the mission given to the UE.

Regarding the feedback, the PDCP status report may not be feasible if RAN level duplication avoidance is done because the PDCP SN is independently managed by each UE and the network cannot identify from the PDCP SN whether the transmission is to be redundant or not. We think a new mechanism is necessary, which allows the network to guess whether multiple UEs would generate the same information and to indicate the necessity of the generated data.

3 Second Round

3.1 General aspects [RWS-210238]

3.1.1 Comments/Questions

Feedback Form 15: [Round2] General comments/questions on RWS-210238, LG's view on R18 5G-advanced: non-eMBB related.

1 – HuaWei Technologies Co.

Thanks for the answer. Some further questions below:

Q1: do you think the RAN level UE association requires the UE to indicate some information?

Q2: "a new mechanism allows the network to guss whether mulitple Ues would generate the same information and to indicate the necessity of the generated data" means that gNB needs to be aware of traffic data content of UEs?

3.1.2 Answers

Feedback Form 16: [Round2] Asnwers for RWS-210238, LG's view on R18 5G-advanced: non-eMBB related.

1 – LG Electronics Inc.

@Huawei

I guess the questions are for inter-UE duplication avoidance. Please let me provide the response in the corresponding section for easier tracking.

3.2 Enhancement for sidelink operation [RWS-210244]

3.2.1 Comments/Questions

Feedback Form 17: [Round2] Comments/questions on RWS-210244, Enhancement for sidelink operation

1 – Huawei Tech.(UK) Co.. Ltd

Thanks for the response. We noticed that you mentioned this co-channel coexistence as an extension of LTE/NR V2X in-device coexistence specified in Rel-16. What aspects do you have in mind to be extended or enhanced, or need to be added?

2 – Guangdong OPPO Mobile Telecom.

Thanks for the reply. For the co-channel coexistence, what is the scope of this work? For example, is it suppose to cover only LTE mode 4 and NR mode 2 dynamic resource sharing? Or is it meant to cover also LTE mode 3 with NR mode 2, LTE mode 4 with NR mode 1, and/or LTE mode 3 and NR mode 1?

3 – CATT

What is your view regarding unlicensed sidelink support and IIoT enhancement for sidelink in Rel18?

3.2.2 Answers

Feedback Form 18: [Round2] Asnwers for RWS-210244, Enhancement for sidelink operation

1 – LG Electronics Inc.

1 - Huawei Tech.(UK) Co.. Ltd

Thanks for the response. We noticed that you mentioned this co-channel coexistence as an extension of LTE/NR V2X in-device coexistence specified in Rel-16. What aspects do you have in mind to be extended or enhanced, or need to be added?

Answer> We think the main aspect would be the determination of time/frequency resources for transmissions of NR physical sidelink channels in a carrier shared with LTE sidelink under the constraint that these NR V2X transmissions shall not cause adverse impact on the LTE V2X performance. For PSCCH/PSSCH, we think the Rel-16 resource selection principle can be reused as the in-device coexistence already supports detecting LTE V2X SCI and delivering the contents to NR V2X module. So NR V2X can select the resources that can avoid interference to those that will be occupied by LTE V2X. We may need to investigate whether the difference in the waveform and numerology needs to be taken into account when designing the resource selection for the co-channel coexistence. PSFCH seems to require some consideration because its transmission resource determination relies on the linkage with PSSCH resources but such linkage may not work for the interference avoidance for LTE V2X. Possible solutions may include using a resource in the NR V2X dedicated carrier or additional consideration of collision in the PSFCH resource in PSSCH resource selection. As the in-device coexistence provides the timing alignment between LTE V2X and NR V2X, no NR S-SSB transmission seems necessary in the shared carrier.

2 – LG Electronics Inc.

2 - Guangdong OPPO Mobile Telecom.

Thanks for the reply. For the co-channel coexistence, what is the scope of this work? For example, is it suppose to cover only LTE mode 4 and NR mode 2 dynamic resource sharing? Or is it meant to cover also LTE mode 3 with NR mode 2, LTE mode 4 with NR mode 1, and/or LTE mode 3 and NR mode 1?

Answer> We believe there should be no change to LTE V2X specifications. As the receiver cannot distinguish the LTE sidelink transmission mode, we think the solution will be the same for the coexistence with LTE mode 3 and with LTE mode 4. NR mode 2 should be able to share the channel with LTE sidelink in Rel-18 in our view, and once this is supported, we think the coexistence of LTE mode 3 and NR mode 1 can be automatically supported as the interference avoidance across RATs is up to the network implementation (i.e., eNB/gNB scheduling these sidelink transmissions can coordinate the resource allocation). We can consider the LTE mode 3 and NR mode 2 case if there is enough market needs.

3 – LG Electronics Inc.

3 – CATT

What is your view regarding unlicensed sidelink support and IIoT enhancement for sidelink in Rel18?

Answer> These two topics are certainly interesting from the technical point of view and we generally welcome the enhancements that can expand the usage of sidelink in various verticals. But for the workload management, we think they can be considered if WGs still have rooms after supporting the topics of higher priority. For IIoT enhancement for sidelink, we think the scope needs to be elaborated as it seems to cover various aspects such as power saving, reduced UE capability, further enhanced latency/reliability, etc.

3.3 Enhancement for RAN slicing [RWS-210230]

3.3.1 Comments/Questions

Feedback Form 19: [Round2] Comments/questions on RWS-210230, Enhancement for RAN slicing

1 – ZTE Corporation

Thanks for your answers to the round 1 questions.

For the slice aware RRC relaxation, we understand the intention is to let UE skip measurement on certain frequencies or cells where the UE's intended slices are not supported or not allowed to be used. Is it possible to do that via UE implementation if UE is aware of the supported slice info or the restricted slice info?

For DRX optimization, we understand that UE should follow the DRX cycle configured by NW and cannot adjust by itself. Do you intend to have slice specific DRX cycle or allow UE adjust the configured DRX cycle by itself?

2 – Samsung Electronics Co.

Could you please give more specific use cases or scenarios that slice #2 is not allowed to be used simultaneously with slice #1 by a UE?

3.3.2 Answers

Feedback Form 20: [Round2] Answers for RWS-210230, Enhancement for RAN slicing

1 – LG Electronics UK

@ZTE

Thank you for further question. For RRM relaxation, we are not sure if we could leave it to UE implementation if specific operations are needed.

For DRX optimization, we could consider slice level DRX configuration for a particular slice. We'd like to first discuss possible impacts based on SA output and whether slice level DRX configuration could be beneficial or not.

@Samsung

Thank you for further question. We take the example from the scenario in NG.116 attribute "Simultaneous use of the network slice". SA2 is updating TS 23.501 for Rel-17 and we'd like to further investigate possible RAN impacts based on SA requirements.

3.4 Enhancement for SDT [RWS-210231]

3.4.1 Comments/Questions

Feedback Form 21: [Round2] Comments/questions on RWS-210231, enhancement for SDT

1 – Fujitsu Limited

Thank you for the contribution.

We have interest in SDT in DL. The Rel-17 SDT also somewhat considers DL data reception (e.g. RLC feedback, TCP ACK) mainly in response to UL data, which is received by the UE during "subsequent data transmission" phase. We understand that such a subsequent data reception and pure DL data reception (e.g. SNS message) are different. Having said that, do you think that the DL data reception during "subsequent data transmission" phase is not enough, so that you are proposing DL SDT?

3.4.2 Answers

Feedback Form 22: [Round2] Answers for RWS-210231, enhancement for SDT

1 – LG Electronics Inc.

Yes, your understanding is correct. What we want to support is to handle DL data triggered while UL SDT is not on-going.

3.5 Enhancement for NTN [RWS-210232]

3.5.1 Comments/Questions

Feedback Form 23: [Round2] Comments/questions on RWS-210232, Enhancement for NTN

3.5.2 Answers

Feedback Form 24: [Round2] Answers for RWS-210232, Enhancement for NTN

3.6 Factory IAB [RWS-210228]

3.6.1 Comments/Questions

Feedback Form 25: [Round2] Comments/questions on RWS-210228, Factory IAB

1 – Huawei Technologies France

Thansk for the contribution.

Question: regarding Controlled duplication based transmission, does it mean we need to preconfigure dual pathes and activate/deactivate the duplication dynamically? Do we need to have dual N3 tunnels to achieve low latency for URLLC in donor gNB migration case?

3.6.2 Answers

Feedback Form 26: [Round2] Answers for RWS-210228, Factory IAB

1 – LG Electronics Inc.

@Huawei

Regarding the 1st question:

We think that pre-configuration is needed to have dual paths and activation/deactivation of controlled duplication based transmission can be also controlled by (pre)configuration from the IAB donor CU, i.e., duplication can be activated when the status of IAB node, e.g., buffer load/link quality, meets the configured condition. If ”dynamically” in your question means dynamic control like Duplication Activation/Deactivation MAC CE as in NR Rel-15, the answer is NO because we don’t think that (pre)configuration for duplication is dynamically changed. Having said that, we are open to discuss more dynamic approach.

Regarding the 2nd question:

We think that enhanced zero-interruption mobility is more essential to achieve low latency for URLLC in donor gNB migration case than having dual N3 tunnel. We are not sure whether dual N3 tunnel is needed to achieve low latency for URLLC in donor gNB migration case.

3.7 Inter-UE duplication avoidance [RWS-210229]

3.7.1 Comments/Questions

Feedback Form 27: [Round2] Comments/questions on RWS-210229, Inter-UE duplication avoidance

1 – Nokia Germany

Thanks for the detailed 1st round answers.

1. For this to work, one prerequisite is that RAN is aware that two or more UEs are deployed to provide backup for the same service (e.g. signalled by the core network). SA2 already studied the topic: Redundant user plane paths based on multiple UEs per device (TS 23.501 Annex F (informative)), and it was concluded not supporting such feature and it is only included for information. Without support from CN, how RAN enhancements can work?

2. What would be the benefit of standardized solutions compared to higher-layer/RAN-transparent solutions such as 2 or more UEs serving the application and using e.g. MPTCP to select the best UE at any given time or FRER based solution?

2 – Beijing Xiaomi Mobile Software

Thanks for the response!

2 questions for clarification:

1)It seems the purpose is to define a mechanism in layer 2 that allows the network to provide feedback to multiple UEs for redundant transmission or not. Is it only for the UP link?

2) According to the reply to Intel ”it could be possible to deduce the information based on e.g., time information when the data is generated’. Do you mean you want to timestamp every packet?

3.7.2 Answers

Feedback Form 28: [Round2] Answers for RWS-210229, Inter-UE duplication avoidance

1 – LG Electronics Inc.

@Xiaomi

Answer to Q1. Yes, the purpose is to avoid redundant transmission in the uplink.

Answer to Q2. We basically think adding a timestamp to everypacket and transmitting it is not practically desirable. Our assumption is that the UE internally mange the timer/timestamp with synchronized to the network, and use it when e.g., requesting resource allocation, may be sufficient.

@Huawei

Answer to Q1. Yes. UE may need to indicate in which service it is involved.

Answer to Q2. It would be beneficial if the gNB is aware of the content of data, which may not be possible without the support of CN. Alternatively, some timestamp based approach can be considered in RAN level and we are of course open to discuss other mechanisms.

@Nokia

Thank you for further questions. However, it seems that the same questions are provided as the first round questions and we suggest to see the respone in the first round.