

RAN-R18-WS-non-eMBB-Bosch - Version 0.0.8

RAN

3GPP TSG RAN Rel-18 workshop RWS-21XXXX

Electronic Meeting, June 28 - July 2, 2021

Agenda Item: 4.2

Source: Bosch

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

1 Introduction

This email discussion/summary covers the following 4 documents (a, b, c, and d):

A proposal for SI: RAN-assisted Functional Safety Communication:

(a) RWS-210218: RAN-assisted Functional Safety Communication for Verticals

Sidelink Requirements:

(b) RWS-210216: Sidelink Positioning for Rel-18

(c) RWS-210217: Rel-18 Sidelink Enhancements for Verticals

General Enhancements for verticals:

(d) RWS-210215: 5G-Advanced RAN Enhancements for Verticals

1.1 Summary

Please refer to version 0.0.0

2 Comments to the Tdocs

Please provide your company comments, view, suggestion, concerns, etc. to each TDoc separately below. It will be very helpful if you can provide answer these general questions:

- Does your company support all, any (which?), or non of the proposals in the TDoc ? Why?

- Does your company have any concerns, suggestions, or enhancements to the proposals to be considered for Round 2?

2.1 Comments to RWS-210218: RAN-assisted Functional Safety Communication

Please provide your comments, view, suggestions, and concerns to the SI for RAN-assisted functional safety communication here. It will be helpful to consider answering to the two general questions in the section above in addition to this specific question for RWS-210218:-

- Does your company support a RAN (1,2,3, and/or 4) SI for: RAN-assisted functional safety communication? [yes, no].

- if [no], what is/are your main concern(s)?

- if [no], How can we address the fundamental objectives listed in RWS-210218 (section 3.2) in other SI/WI in Rel-18 to satisfy the verticals' requirements?

- if [yes], what is your suggestion for the timeline of SI/WI in Rel-18?

Feedback Form 1: Feedback on SI for RAN-assisted Functional Safety Communication

1 – Classon Consulting

A comment on presentation, it would be good to use inclusive language also in input docs to 3GPP.

2 – Volkswagen AG

Yes. A RAN-assisted functional safety communication can be an important enabler for some advanced use cases. Also advanced industry automation use case and railway systems may benefit from such feature.

A thorough SI should be part of Rel-18. The duration of the normative phase depends on the study outcome.

3 – Fraunhofer HHI

Thank you very much for the contribution on functional safety aspects to be supported/assisted by RAN. We'd appreciate if you could elaborate more on the mapping of safety related functions onto channels, measurement frame works etc provided by the RAN.

We see benefits of functional safety feature support for various use cases and industries. At least a study should be part of Release 18 to explore the impact on standardization further in more detail.

2.2 Comments to RWS-210216 (SL Positioning)

For sidelink positioning in RWS-210216, please provide your comments about the TDoc and the proposals in the field below. Please, try to address the two general questions in section 2.0 as much as possible.

Feedback Form 2: Feedback on Sidelink positioning RWS-210216

1 – CATT

In general We share the similar view that SL positioning needs to support both relative or absolute positioning for all coverage scenarios. The combination of Uu and SL positioning can be supported.

It is unclear the motivation to place FR1 as a higher priority. We assume we can work on both FR1 and FR2 in parallel.

2 – Beijing Xiaomi Mobile Software

1. Do you think the commercial and public safety use cases and requirements identified in SA1 Ranging WI(TR22.855/TS22.261) should be taken into account?

2. According to the definition and the KPI requirements of relative positioning and ranging in TS22.261(see below), do you agree that relative positioning and ranging are different, i.e. relative positioning requires to acquire the 2D/3D coordinates(e.g. the horizontal accuracy of relative positioning set requirements on both distance accuracy and angle accuracy) while Ranging requires to acquire only one component of 2D/3D coordinates(either distance or angle) and thereby only set requirements on one component(either distance or angle)?

- relative positioning: relative positioning is to estimate position relatively to other network elements or relatively to other UEs.

- Ranging: refers to the determination of the distance between two UEs and/or the direction of one UE from the other one via direct communication connection.

3. Do you think unlicensed band should be considered? If so, what frequency range is considered(e.g. 60GHz)?

4. What bandwidth do you think is needed to achieve 10cm distance accuracy and 2 degree angle accuracy?

5. For in coverage case, do you think UE based SL-positioning should also be supported?

6. Do you think power consumption and Redcap UE should be taken into account?

3 – Huawei Tech.(UK) Co.. Ltd

Why joint communication and sensing for 5GAA is considered as one of the motivations? Wouldn't a sensing scenario be different from a positioning scenario?

4 – Volkswagen AG

Positioning enhancements via sidelink in FR1 are important since the frequency spectrum at 5.9GHz is widely available. Further it can be utilized in all coverage scenarios (coverage, partial coverage and out of coverage). The feature should be supported for all types of V2X-UE.

In addition sidelink positioning can be used in other vertical industry application such as factory automation.

5 – Guangdong OPPO Mobile Telecom.

If SL positioning is agreed in R18, do you prefer to set up a separate topic for it, or merged into other SL topics, or merged into Uu positioning topic?

6 – Fraunhofer IIS

We fully agree to the importance of SL positioning.

Q1: How do you prioritize absolute or relative positioning, especially for safety related use cases?

Q2: We also support SL positioning for all types of VRUs. For SL positioning, how important would you consider power saving for VRUs?

7 – ZTE Corporation

We are supportive of sidelink positioning. Just one minor question, if FR1 is preferred to be prioritized, how to ensure the positioning accuracy due to BW constraint of sidelink PRS.

2.3 Comments to RWS-210217 (SL Enhancements)

For sidelink Enhancements in RWS-210216, please provide your comments about the TDoc and the proposals in the field below. Please, try to address the two general questions in section 2.0 as much as possible.

Feedback Form 3: Feedback on Sidelink Enhancements in Rel-18

1 – LG Electronics Inc.

Q1: Can you elaborate on "adaptive DRX alignment?" In unicast, RAN2 is currently working on how to negotiate DRX configuration between TX and RX UEs, and given this in Rel-17, what additional feature is necessary to support the adaptive DRX alignment?

Q2: The current spec already supports handling the variation of the period and size of packets, e.g., resource reselection is triggered in Mode 2 if the reserved resource is not suitable or not used several times. What additional functionality would be needed for adaptive/flexible reservations?

2 – Guangdong OPPO Mobile Telecom.

Q1: For configurable UE capability, is it to say that the UE capability will change before / after being mounted towards a vehicle? If no, how to understand it?

Q2: For SL-RedCap and SL-IIoT, which one has higher priority?

Q3: Do you think SL positioning can be merged into other SL topics?

3 – Volkswagen AG

As provided in earlier contributions: Advanced use cases will benefit from sidelink enhancements to increase reliability and to efficiently support small and large message sizes.

4 – Fraunhofer IIS

Q1: We fully support the importance of UE power saving. Do you think that UE position-based power saving (e.g. go-to-sleep when leaving critical areas) should be supported?

Q2: Which further enhancements (besides those mentioned by LG Q2) would you like to consider for periodic resource reservation?

5 – CATT

Can we consider Redcap sidelink and URLLC sidelink two separate enhancements on top of NR-redcap and NR-URLLC respectively ,instead of two enhancements for sidelink ?

6 – DOCOMO Communications Lab.

Could I ask what is 'adaptive configured grants/SPS-like reservations'? We are not sure concrete UE behavior. Reserved resources are updated after reservation?

7 – Huawei Tech.(UK) Co.. Ltd

For your proposal on IIoT sidelink: in mode 1, all the resources are allocated by gNB to ensure no resource collision, and type 1 and 2 CG are supported for low latency cases, so what is the benefit to have a "cooperation or common mode" with mode 2?

2.4 Comments to RWS-210215: RAN Enh. for Verticals

For the specific topics in RWS-210215 about IIoT and reduced capability IoT, please provide your comments/views/concerns/suggestion (trying also to answer the proposed Questions in Section 2.0) about:

Support for XR in IIoT [Slide 9]: latency, reliability, traffic-aware RAN, power saving

Cost/complexity reduction (IIoT) [Slide 9]: Reduced capability positioning and reduced capability infra-structure nodes for positioning

RedCap for IoT (Sensing and Media) [Slide 12]: further reduced power, bandwidth ($\geq 5\text{MHz}$), and latency (for specific use cases)

Feedback Form 4: Feedback on further RAN enhancements for IIoT and RedCap IoT

1 – Huawei Tech.(UK) Co.. Ltd

[XR]

We share the similar view that some traffic information awareness at RAN may be helpful to improve system performance. In terms of traffic awareness at RAN, what kind of traffic information can be useful? To achieve these, how SA2 and SA4 are involved?

2 – Volkswagen AG

RedCap devices may play a significant role in large scale IIoT deployment scenarios which also cover low-cost tools.

Cost savings can be realized if extra positioning solutions are replaced by 5G infrastructure.

3 – Qualcomm Incorporated

Clarification question : For the scenario of industrial use-case in slide 10, What kind of cooperation between mode-1 and mode-2 is expected ?

3 Questions to the Tdocs

Please provide your questions for the Q&A/email summary to each of the TDocs in the separate sub-section/field.

3.1 Questions to Tdocs: RWS-210218 (RAN-Assisted Functional Safety Comm.)

Feedback Form 5: Questions to RAN-Assisted Functional Safety Comm.

1 – Intel Corporation (UK) Ltd

Q1: Could you clarify the most important technical components which are missing for efficient functional safety operation over NR and whether it can be left up to UE/NW implementation or need specification support within and/or above radio-layer protocols?

Q2: Could you elaborate more on the target operation scenarios including specific deployment, latency, reliability, CSA requirements?

Q3: Could you elaborate more on enhanced retransmission or MCS selection operation? In Rel-17, the more accurate MCS selection with enhanced CSI is being already discussed, and we wonder whether there is some overlap or leftover.

2 – Qualcomm Incorporated

Functional safety is an important requirement to be satisfied for 5G IIoT systems.

Q1: Can you elaborate on the proposed objective (#5) of "RAN-aware scheduling"? Is it the intention to modify the scheduler behavior?

Q2: Objective 1c talks about new resilience mechanisms in the RAN. While we understand that RAN may need to provide more diagnostic/monitoring information, could you elaborate if there are any new requirements in Rel-18 behavior (outside of diagnostic/monitoring) arising from Functional Safety needs?

3.2 Questions to Tdocs: RWS-210216 (Sidelink positioning)

Feedback Form 6: Questions to Sidelink positioning

1 – Intel Corporation (UK) Ltd

Q1: Could you provide your view on support of the SL and Uu RAT-dependent positioning in unlicensed frequency band(s)?

Q2: Could you elaborate on the need to differentiate VRU types: pedestrian, eBike, 2-wheeler, etc. in terms of specific design considerations. Is there any specific assumption that need to be taken into account for VRU UEs (e.g. GNSS availability, etc.)?

2 – InterDigital Communications

For mode1/mode2 based scheduling of S-PRS, do you expect an entity like LMF in Uu, coordinating with gNB, for scheduling purpose? For example, for mode 2, the LMF may need to talk to gNB how much resources should be used among the UEs for S-PRS.

3 – Qualcomm Incorporated

What are the specific SL positioning requirements for VRU types of UE expected?

3.3 Questions to Tdocs: RWS-210217 (Sidelink enhancements)

Feedback Form 7: Questions to sidelink enhancements

1 – Classon Consulting

[for FUTUREWEI]

We also support sidelink FR2 and unlicensed enhancements, see RWS-210039 and <https://nwm-trial.etsi.org/#/documents/>. Do you feel that the sidelink enhancements for FR2 should include work on CSI feedback?

2 – Intel Corporation (UK) Ltd

Q1: Could you clarify what does adaptive DRX mean in this context? What criteria/conditions/events, etc. are used for adaptation?

Q2: Considering a wide scope of sidelink enhancements, could you elaborate whether and which features have higher priority in terms of standardization: 1) support of unlicensed band 2) power saving enhancements 3) FR2 centric enhancements 4) URLLC sidelink for I-IOT 5) etc. or features have equal priority?

3 – Huawei Tech.(UK) Co.. Ltd

Q1: Does the RedCap and/or adaptive UE sidelink capabilities need to be exchanged among UEs?

Q2: If yes to Q1, given there is only PC5 RRC defined for unicast, does this capabilities exchange apply only for sidelink unicast ?

Q3, Or, if no for Q2, does it mean additional signalling (e.g. PC5 RRC) for capabilities exchange is needed for sidelink groupcast and/or broadcast ?

4 – Nokia Denmark

It is not clear what type of UE capability is configured. The paper mentions UE connected to a CCU or u-mobility device and utilizing the Uu link of the UE but why and how needs to be clarified. More specifically, the paper mentions: A μ -mobility controller is connected to the mobile handset and uses its Uu connectivity capabilities. This can be easily extended to sidelink as well. The purpose is not clear.

3.4 Questions to Tdocs: RWS-210215 (RAN enhancements for Verticals (remaining IIoT/RedCap))

Feedback Form 8: Questions to RAN enhancements for IIoT/RedCap (Slide 9, 12)

1 – Classon Consulting

[for FUTUREWEI]

(I assume this is for RWS-210215) What latency targets do you have in mind for RedCap, and how do you plan to address?

2 – Intel Corporation (UK) Ltd

Q1: On sidelink IIOT, do you consider support of redundant/duplicated transmissions using Uu links and PC5 links for I-IOT reliability enhancements?

Q2: Which specific enhancements to CG/SPS you envision to support FuSa-aware RAN? As you may know, CG/SPS operation was enhanced in Rel-15/16/17, and is also considered for XR enhancements.

Q3: Regarding “Support identifying QoS loss via, e.g., periodic keep-alive-messages/heartbeats signaling”, do you consider signaling in application layer which is transparent to RAN or radio-layer signaling is needed?

3 – Nokia Germany

On slide 9 (IIoT & connected industries):

- Support for XR in IIoT: Should this be handled as an IIoT enhancement or as part of Rel-18 XR?
- Traffic aware RAN: What kind of enhancements are needed from RAN, especially considering the available TSCAI information at NG-RAN?
- Survival time & burst distribution: How is this different as comparing to survival time work in Rel-17? Currently in Rel-17 RAN mechanisms such as PDCP duplication is being considered to avoid survival time violation.

4 Answers [1st Round]

In this section, we provide our answers to the questions made to our 4 topics as indicated in the introduction section.

4.1 Answers to: RWS-210218 (RAN-Assisted Functional Safety Comm.) Questions

To Calsson Consultant:

Thank you for the valuable comment. Indeed, we considered this important issue and we noted in our TDoc RWS-210218 [Note 1], page 1. However, we referred to the channel naming as it is in TR 22.832 [section 5.8.1, R17.4.0 (latest on 3GPP server)], 5GAA TRs, and 5G-ACIA whitepapers. Additionally, we also proposed alternative names to consider for further discussions:

“open channel”, “controllable channel”, and “FuSa-aware channel”.

To Volkswagen AG:

Thank you for your support. We also believe FuSa is a cross vertical topic, i.e., at least: automotive, railway, and industrial automation. We appreciate if we can identify during the next round some possible requirement, use cases, and deployment scenario for these verticals. This will support better understanding the RAN impact.

To Fraunhofer HHI

Thank you for your questions. The intention is to start a FuSa SI on R18 based on R17 IIoT discussion in RAN2 (i.e., related to survival time).

- *Channels:*

Based on SA1 (TS 22.104, Table C.2.3-1), the values for survival time, burst packets, etc., need to be monitored for each TSCAI transmission on lower layers (L1/L2). In our understanding, it may be very difficult for a receiver (able to trigger survival time, e.g., RX gNB in UL or RX-UE in SL or RX UE in Uu) to identify the different traffic types, e.g., in the same CG, at physical layer without directly resolving all QoS

Flow containers. However, a simple physical layer identifier can easily achieve this! Furthermore, if this physical layer identifier is sent despite the TX traffic (e.g., as a keep-alive-signal to fulfill FuSa cyclic transmission requirement), the RX UE will avoid entering a survival time (safe) state by detecting, e.g., failing grants (empty packets).

Therefore, we propose to study identifying FuSa traffic transmission as early as possible, i.e., in physical channels. We need to study the feasibility and benefit of this proposal compared to the outcome in Rel-17.

Note: In order to partially handle some of the problems above in Rel17, RAN2 agreed on a reactive TX-UE Survival-Time strategy. This method does not rely on monitoring the survival time at RX; however, rather at TX. In this case, a TX UE can, on its own, detect failures of the specific FuSa traffic (TSCAI) and start survival time accordingly. However, this method may not be suitable for UE-2-UE(E2E) and/or SL communication. Moreover, this method also does not solve the "empty packets" problem mentioned here.

- *Measurements:*

Possible measurements for triggering functional safety communication can be based on one or more of the following:

- survival time value (as discussed in RAN2) in TX /RX entity
- irregularity of survival times (fits more moderate to long survival times), where a UE evaluates statistical value for survival times as monitored by the device. Hence, even
- communication service availability (CSA) monitoring, where the network (or a UE) may need to consider it for indicating required reliability.
- burst spread (which is not agreed for R17), which may give an indication to jitters, burst delays, and its relation to survival time

To Intel Corporation (UK) Ltd

A1: the most important technical components, which are missing for efficient realization of RAN-assisted FuSa communication, are:

- Survival time and enhanced reliability mechanism based on CSA are completely missed in sidelink. Enhancements for increased reliability in Rel-17 are not possible for SL.
- Survival time (and possible corresponding CSA/FuSa requirement) is (are) not implemented in RX entity (in Rel-17). This is needed for E2E (UE-to-UE) safety requirements.
- CSA / Survival time in SA1 (TS 22.104, Table C.2.3-1) is considered for deterministic periodic and ***deterministic aperiodic traffics***. The latter traffic pattern was not considered in R17, which is extremely crucial for several application, e.g., as V2X application.
- CSA and burst spread (indicating jitters, Sequential transmission of data does not overwrite each other as in periodic), was not considered due to lack of SA2 agreement. However, in our verticals, we identified the necessity of those aspects.
- The RX NW/UE may continuously qualify CSA/survival-time expiry, if the TX UE/NW sends a keep-alive control information with some periodicity and filling a lower layer container. This may avoid "empty packet"

cases (when a TX stops sending packets). Herewith, an RX UE/NW may trigger (or request) additional reliability mechanisms even before a TSC packet is failing

- Very limited mechanisms for reliability-increase are currently discussed in RAN2. The reason is the tight schedule of Rel-17 without expanding the topic over a study item or identifying feasibility of multiple options. We are even not sure if this can be easily solved without including RAN1.

- Feedback enhancements (e.g., CSI (statistics) enhancements) are not considered for the small safety discussion in IIoT R17.

- pQoS for FuSa, it worth studying how/what to conduct for pQoS to proactively adapt L1/L2 configuration based on CSA/ST/Burst detection.

- Survival time management (i.e., back to normal or also reduce reliability) needs to rely on the measured CSA and Survival time **statistics**, i.e., not only timers as proposed in R17 WI R2 discussions

- Above radio-layer protocols:

– discuss in SA2 the need to consider new traffic patterns for Functional safety e.g., **deterministic aperiodic traffics** as it is needed for automotive use cases and is defined for IIoT in TS 22.104

– Additionally, in our understanding, TSC packet can be FuSa (fulfilling safety integrity levels, SIL) or "quality management", i.e. still time sensitive but does not have a SIL. This needs to be addressed in SA2, which may need new identifiers.

A2: IIoT use cases, where we have internally evaluated transfer-time (TT) of 1ms and 2xTT survival time as lowest value, i.e., 2ms. Other values are not precluded.

Automotive, in platooning use case, TT of 10ms and ST of 2xTT= 20ms and 4xTT = 40 MCS; (i.e. over sidelink, Mode 2)

CSA in automotive is very difficult to evaluate, but we rely on #non-consecutive packet loss to evaluate the CSA. For IIoT, CSA values in TS 22.104 are acceptable.

A3: Based on Survival Time value/TT counts, the UE may have a pre-configured manner to reduce MCS for CG (even type 1) or for next possible dynamic grant (assuming that aperiodic traffic matters as we mentioned earlier). If CG type 1/DG are considered in this case, more enhancements need to be studied. In Uu communication, this may be still easy. However, in sidelink, some enhancements are needed to use existing reservation without, e.g., re-selection.

Qualcomm Incorporated:

Thank you for your valuable feedback! We answer your questions here in this section. However, we also encourage you to read previous answers (Fraunhofer/Intel) for better understanding.

A1- By "RAN-aware schedule" we rather mean "CSA-Aware RAN scheduling" or "RAN enhancements based on CSA/FuSa". For example, possible enhancements to CG/DG based on expected/feedback "statistically" computed Survival Time or CSA (e.g., value or threshold). These values can be estimated at TX or can be sent by RX in, e.g., enhanced CSI feedback. Additionally, the UE may autonomously restrict/relax transmission parameters/procedure (e.g., HARQ-retransmission) or autonomously adapt L1/L2 selected values. Indeed, more study need to be done on the top of current discussions in R17 (IIoT QoS in RAN2). Please refer to our answer to Intel A1.

A2- Objective 1c refers to more enhancements achieving link reliability increase in addition to what discussed in Rel-17-IIoT-QoS. Please refer to our answer to Intel A3 in the same topic.

In addition to this, we need also to enhance monitoring by introducing a lower layer identifier, heartbeat, or a.k.a keep-alive-signal (i.e., if deemed feasible and beneficial) (also ans. to Fraunhofer and Intel A1).

4.2 Answers to: RWS-210216 (Sidelink positioning) Questions

To CATT #1:

Thank you for your support and your question. Here is our answer:

At least for automotive scenarios, it is not clear whether the deployment in the time-frame of Rel-18 will consider FR2 deployment in vehicles. Additionally, it is not clear if an ITS spectrum in FR2 will be readily available for automotive soon, unless we can perform ITS on lic. FR2. However, Bosch generally supports the direction of FR2 SL and, specifically, for sidelink positioning. Therefore, our priority list is FR1 then FR2.

Beijing Xiaomi Mobile Software #2

A1- Bosch supports commercial use cases to use sidelink positioning. In this case, several factory and smart building devices (which are not IIoT) can use this functionality. Additionally, we also support expanding SL positioning for IIoT use cases, i.e., once SL is extended for IIoT. PS is not within our vertical domain and we may not be able to judge requirements and benefits in this case. However, we should strive for a unified solution for all use cases.

A2- In our understanding, design of SL positioning needs to start (and stay) with ranging according to the definition you stated in your Question or relative positioning as defined by 5GAA in TR A-200118 (V2XHAP).

A3- For IIoT use cases, we support unlic. bands for SL positioning, at least in 6 GHz band.

A4- in our understanding, FR1 ITS bands may not used to achieve cm level accuracy in some location or some channels. However, initial target of meter/ sub-meter is expected and is useful if combined with all inboard sensors in a vehicle.

A5- For in coverage case, SL-positioning can be used **independent** or **combined** with Uu positioning.

A6- Yes, we support RedCap and reduced power SL for FL positioning. Impact of power saving mechanism on SL positioning needs to be discussed during the WI.

Huawei Tech.(UK) Co.. Ltd#3:

In our understanding, if 5G-Advanced is able to perform sidelink positioning, i.e., while keeping communication not impacted, this could be seen as a steppingstone towards JCS. Even though sensing her may be redefined for sensing of active devices (i.e., SL active (not passive) TxRx). This may be the only possibility to conducted sensing (i.e., ranging) using existing 5G waveform without modifying it. From another perspective, sidelink direct ranging will be fused in the vehicle/u-mobility sensor fusion in order to increase sensing capability. Also in the latter case, this is a kind of sensor value.

Volkswagen AG#4:

We agree that SL positioning has to be supported in all coverage scenarios (i.e., in-coverage, partial coverage and out of coverage) and for all types of UEs: Vehicle UE, VRU-UE, eBike UE (RedCap). Sidelink should be also extended to Factory automation (IIoT).

Guangdong OPPO Mobile Telecom#5:

It is important to keep SL positioning separate as it requires lots of enhancements based on SL design, e.g., SPRS configuration, S-PRS allocation (either Mode 1/2), sensing/p-Sensing impact, enhancements based on the cast type, etc.

Fraunhofer IIS#6:

I assume you mean V2X safety use cases. In this case, ranging is faster to achieve and may be useful to early indicate collision with other V-UEs. For absolute positioning based on sidelink, the question will be: is it precise positioning in the cm/sub-meter level to identify, e.g., position inside a lane? We believe this depends on the used bandwidth and the availability of the fixed anchor UEs, e.g., RSUs. For industrial automation (with enough bandwidth), both relative and/or absolute can be used reliably for safety application.

ZTE Corporation #7:

As we mentioned above, we don't believe that cm-level accuracy cannot be easily achieved with the current/proposed ITS available BWs. However, meter(s) ranges can be considered for early identification of UE TxRx objects.

Intel Corporation (UK) Ltd#8:

A1: as answered before, we support unlicensed SL positioning for IIoT use cases-

A2: In our understanding, we need at least 3 UE types:

- Vehicular UE (based on R16/17)

- u-Mobility (e.g., eBike and our 2-wheeler) with a RedCap on-board UE, which supports SL. The UL/DL/SL bandwidth could be 5, 10, 20.

- VRU pedestrian: this is anormal handset.

If the latter is considered, a UE may change/switch its, e.g., power saving capability once the UE is connected to, e.g., eBike.

Additionally, we believe that all these devices should contain GNSS, at least, for synchronization. However, we may need to study if, e.g., RedCap SL UE does not have GNSS or accuracy is poor.

InterDigital Communications#9

LMF is not needed for V2X use cases.

Qualcomm Incorporated#10

Vulnerable Road User –Awareness Near Potentially Dangerous Situations: 0.5 to 1m accuracy

4.3 Answers to: RWS-210217 (Sidelink enhancements) Questions

LG Electronics Inc.#1:

A1: We believe this option needs to be extended to, at least, SL groupcast. Additionally, this functionality may rely on WUS, where adapts its DRX cycle based on WUS occasions sent by a group member UE.

B1: Thank you for this important question. In our understanding, re-selection (if decided after sending one period and before the next one) may result in over-booking resources. Additionally, frequent re-selection deteriorates sensing capability by switching the transmission patterns too quickly, making its detection/sensing very inefficient. Therefore, we need to strive for a solution that does not perform re-selection, i.e., deceptively updating SPS resources based on the reserved resources. **(please see our answer to Docomo)!**

Guangdong OPPO Mobile Telecom#2:

A1: yes, this is the case. The UE capabilities, e.g., power saving, SL capability, BWP, configuration, SL TxRx, sensing, etc. should be changed if a UE is connected (then configured) to the vehicle (e.g., also connected to its power source).

A2: For us, this question is very difficult to answer as it depends on the target market/vertical. The interesting aspect is that Bosch is considering both related verticals for RedCap and IIoT SL. E.g., for our eBikes/2-wheelers market and Smart Homes, RedCap SL is needed. For Industrial vertical SL-IIoT is very important. We hope that we will not be forced to down select between these two particularly.

A3: No, we prefer SL positioning to be a separate WI; see above for more details (SL- Positioning).

Volkswagen AG#3:

We also support further enhancements to SL resource allocation in Rel-18.

Fraunhofer IIS#4:

A1: We support SL power saving and SL positioning to be considered together as we are interested in SL positioning when SL power saving applies, e.g., for VRU/eBike. Details and impacts should be discussed in the WI.

A2: In addition to adaptive SPS (time, frequency, i.e., as described above) we are interested to have a keep-alive-signal/heartbeat signals carried on SL- CG/SPS to identify Functional Safety communication, i.e., in addition to the priority field. **(please see our answer to LG/Docomo)!**

CATT#5:

We believe that SL group can easily specify SL enhancements for RedCap and IIoT in a general SL enhancement WI. Thus, there is no need to have two separate WIs.

DOCOMO Communications Lab.#6:

In addition to my answer to LG, SPS can be configured to have possible updates in time and frequency. The UE only use what it needs until traffic changes suddenly; where the UE may expand or use additional resources. Therefore, reservation is relaxed to one of these possible configuration. In general, re-evaluation and pre-emption check can always be done before expanding to other configured (but not used) resources. **(please see our answer to LG)!**

Huawei Tech.(UK) Co.. Ltd#7:

- At least for industrial IIoT, Mode 1 and Mode 2 can be simultaneously active. In this case, transmission can be split between the two modes, e.g.,

- safe data on mode one and traffic off-load on Mode 2.
- Inter UE coordination is sent over Mode 1 and communication on Mode 2
- for CA, aggregate Mode 1 CC and Mode 2 CC (if they have two different CCs).

FUTUREWEI#8:

Yes, if FR2 SL enhancements is considered, further enhanced SL CSI should be specified.

Intel Corporation (UK) Ltd#9:

A1: In sidelink power saving, the UE may adaptively change its DRX or align it to another UE. Alignment can be based on signaling as agreed in R17 (RAN2) for unicast. In R18, this option needs to be extended to, at least, SL groupcast. Additionally, this functionality may rely on WUS, where adapts its DRX cycle based on WUS occasions sent by a group member UE.

A2: SL enhancements high-to-low: 1) Power saving enhancements, 2) RedCap SL, 3)SL IIoT, 4) SL-U, 5) FR2 centric.

Huawei Tech.(UK) Co.. Ltd#10:

A1: PC5-RRC signaling is not needed as far as the bandwidth limitation may be indicated by resource pool (pre-)configuration. If the network exist, capability can be exchanged with network as usual. One limitation for proposed RedCap-SL is to have it limited to GC (option 1 feedback) and/or BC.

A2: no PC5 RRC

A3: no extra signalling is needed for GC.

Nokia Denmark#11:

The TDoc mentioned two scenarios:

Scenario1: u-Mobility (e.g., eBike) with a built in RedCap UE supporting SL and Uu. UL/DL/SL bandwidth could be limited to 5, 10, and 20, limited cast types: e.g., GC (option 1 feedback) and/or BC, etc.

Scenario 2: Yes, the connected UE is for both, SL and Uu. A pedestrian UE when connected to, e.g., an eBike, it may change/switch its power saving capability to higher mode, e.g., perform SL TX and SL RX, NACKs, partial and contiguous sensing (i.e., after no sensing or only TX). The UE is also connected to Uu.

4.4 Answers to : RWS-210215 (RAN enhancements for Verticals (remaining IIoT/RedCap)) Questions

Huawei Tech.(UK) Co.. Ltd#1:

- E.g., non-integer periodicity, traffic pattern and burst values, expected jitters, multiple concurrent QoS flows ...

- Regarding SA, we have not deeply thought about it and it is a good exercise for Round2. However, what comes to our mind is some possible traffic irregularity parameters for XR and to be combined with QoS flows for example.

Volkswagen AG:

We agree that RedCap is crucial for IIoT concerning cost reduction. Additionally, some use case, like light-weight IIoT sensors and AGV may utilize it. For positioning cost, it may be useful to utilize SL positioning where anchor UEs are implemented to perform more infrastructure-like cheaper positioning.

Qualcomm Incorporated:

- At least for industrial IIoT, Mode 1 and Mode 2 can be simultaneously active. In this case, transmission can be split between the two modes, e.g.,

– safe data on mode one and traffic off-load on Mode 2

– Inter UE coordination is sent over Mode 1 and communication on Mode 2

– for CA, aggregate Mode 1 CC and Mode 2 CC (if they have two different CCs).

Classon Consulting:

For RedCap, either wireless microphones or AGV may require 5ms as a target latency. AGVs may go for 10 ms (depending on their speed and precise actions).

Intel Corporation (UK) Ltd:

A1: for IIoT with sidelink, we support path switching and path selection between SL /Uu. We also propose dual connectivity or duplication on the two interfaces.

A2: In short (as it is answered in FuSa in details), we support adaptive preconfigured extension to SPS, L1 configuration, etc. to allow for reliability increase if survival time/CSA is triggered. Additionally, we proposed imposing a control signaling to identify FuSa in SPS/CG periods.

A3: if the periodic keep-alive-messages/heartbeats signaling is done in upper layers, CSA cannot be monitored, Survival time may value is affected by "empty packets" (especially for UE to UE or SL), Survival time cannot be easily triggered at receiver (important for UE to UE or SL).

Nokia Germany:

- A1: We support that XR IIoT is handled in IIoT WI. We do not support a separate XR WI.

- A2: Traffic aware RAN: we have two different topics here:

– In IIoT XR traffic-awareness RAN: include non-integer periodicity, traffic pattern and burst values, expected jitters, multiple concurrent QoS flows ..

– "RAN-aware schedule" is not perfectly written in our TDoc. We rather mean CSA-Aware scheduling or

CSA-Aware RAN enhancements. For example, possible enhancements to CG/DG based on expected/statistically computed Survival Time or CSA. Additionally, UE autonomous restriction relaxation and autonomous L1/L2 adaptation. Indeed, more study need to be done on the top of current discussions in R17 (IIoT). Please refer to our answer to Intel A1 (FuSa).

- A3: Survival time and burst "spread"; How is this different as comparing to survival time work in Rel-17?
- Burst spread (indicating jitters, Sequential transmission of data does not overwrite each other as in periodic) was not considered due to lack of SA2 agreement. However, in our verticals, we identified the necessity of those aspects.
- Additionally, we want to consider CSA in Rel17.
- A3'p2: is Packet duplication enough?, short answer is no! Long answers are the following:
 - As in RWS-210218 (FuSa), Objective 1c refers to more enhancements achieving link reliability increase in addition to what discussed in Rel-17-IIoT-QoS. E.g., based on Survival-Time value or other FuSa/CSA metric, the UE may have a pre-configured manner to reduce MCS for CG (even type 1) or for next possible dynamic grant (assuming that aperiodic traffic matters as we mentioned in FuSa's answer). Additionally, HARQ-retransmission enhancements and autonomous TX-parameter adaptation are needed for FuSa study. Finally, sidelink may need more enhancements/focus to increase link reliability, e.g., use existing reservation without re-selection.

Please see more details in FuSa answers (section 4.1).

5 2nd Round: Questions

5.1 Question on: RWS-210218 (RAN-Assisted Functional Safety Comm.)

Feedback Form 9: RWS-210218 (RAN-Assisted Functional Safety Comm.)

1 – Intel Corporation (UK) Ltd

Further Q: Thanks for the comprehensive responses. Now it is clearer to us that there are different aspects mixed, e.g. Uu enhancements and PC5/sidelink enhancements. Do you think those could be handled in the same FuSa item, or some work split may be considered, e.g. PC5 FuSa in R18 SL enhancement and Uu FuSa in R18 URLLC/IIOT enhancement?

2 – LG Electronics Inc.

Q1: For FuSa, we wonder whether all the proposed objectives should be studied and specified in RAN. For example, issues like MCS selection and scheduling have been treated as network or UE implementation issues, and keep-alive-messages were defined as part of PC5-S signaling in SA. Do you think some of the proposed functions can be handled by a means outside RAN?

5.2 Questions on: RWS-210216 (Sidelink positioning)

Feedback Form 10: RWS-210216 (Sidelink positioning)

1 – Intel Corporation (UK) Ltd

Q1: Thanks for clarification on UE types. It seems additionally only RedCap Sidelink UE may be needed. We assume that RedCap Sidelink UE also implies support of RedCap Uu - Is that right? As for VRU, it seems that functionality for adaptation to sidelink power saving modes is needed. We hope it can be discussed/supported in R17 and may not require definition of new UE Type. Would you please confirm whether our understanding is aligned with your views?

5.3 Question on: RWS-210217 (Sidelink enhancements) Questions

Feedback Form 11: RWS-210217 (Sidelink enhancements)

1 – Huawei Tech.(UK) Co.. Ltd

Thanks for the response. It does appear that this proposal would be to re-open frozen releases, since this is a question that does not depend on hardware/software changes.

On the technical side, assuming it can be specified to have mode 1 and mode 2 simultaneously active, how will efficient resource allocation be achieved since UE does not perform sensing for mode 1?

2 – Intel Corporation (UK) Ltd

Q1: Thanks for indication of priorities. We assume that for power saving the main objective is to support sidelink WUS. Is that your primary motivation/intention? Other power saving benefits may potentially come together with introduction of RedCap Sidelink. Is that right or you also prioritize other objectives?

5.4 Question to: RWS-210215 (RAN enhancements for Verticals (remaining IIoT/RedCap)) Questions

Feedback Form 12: RWS-210215 (RAN enhancements for Verticals (remaining IIoT/RedCap))

1 – Nokia Germany

Thanks to Bosch for the detailed answers to our questions.

Our understanding about usefulness of CSA is, 5G RAN may relax a bit by itself in terms of supporting survival time as long as it can still maintain the required CSA. However, in Rel-17 RAN2 has already concluded that Communication Service Availability (CSA) is not needed, partially because RAN cannot always track how many times survival time requirement has been violated (at application message level) already especially if the failure occurred in network segments other than 5G RAN in the end-to-end path. So, CSA does not really help from 5G RAN perspective, it should just always make its best effort regardless the CSA. Why do you think CSA is crucial if 5G RAN should anyway strive to ensure survival time is not violated?

For the issues relating to UE's autonomous reduction of MCS for DG/CG, we would like to understand how the gNB is able to decode these DG/CG if the MCS of a grant is changed unexpectedly from gNB perspective?

6 2nd Round: Answers:

6.1 Answering: RWS-210218 (RAN-Assisted Functional Safety Comm.)

Feedback Form 13: RWS-210218 Answers

1 – ROBERT BOSCH GmbH

Answering Intel Corporation (UK) Ltd:

In our preference, we need to stud it in a separate study item. However, if this is not possible, we can have:

-

Further enhancements on IIoT/URLLC QoS parameters added to IIoT/URLLC WI

-

Sidelink enhancements including QoS/FuSa parameters, e.g., Survival time, CSA, CSR, burst, etc.

Answer to LGE:

We intended to handle only RAN related topics and further enhance existing discussion in RAN2 IIoT/URLLC QoS. This could be:

-

Further enhance survival time for aperiodic-deterministic traffic (Note, Rel-17 considered periodic-deterministic traffic only)

o

Note: this is important for V2X use cases and also identified for IIoT in TS 22.104

-	Further enhance survival time measurements and triggering in RX UE, this allows UE-2-UE (E2E) survival time monitoring. It is also useful when CSA/FuSa aware requirements is considered for SL.
-	Further enhance reliability increase mechanism based on survival time triggering, e.g., consider CSA aware reliability enhancements (see Nokia answer to RWS-210215). For Sidelink: we would like to extend this discussion to be studied for sidelink enhancements such that:
-	Study the impact of QoS parameters for TCS/FuSa, e.g., survival time, CSA, burst, on Sidelink. Study could be conducted in a general SL enhancement SI or together with an IIoT-SL enhancements.
-	Study Survival time for different SL cast types: unicast, GB, BC and different HARQ options
-	RX Survival time triggering mechanism: study mechanisms to enhance survival time triggering in End-2-End, UE-to-UE, or Sidelink communication monitoring
-	Study reliability increase mechanisms in SL according to survival time triggering Regarding keep-alive procedure for unicast in SA: we rather meant persistent heartbeats signals in lower layers. This could be a method to convey (persistently) indication of alive signal as far as TSCAI is identified to a traffic in the lower layer buffers. This could be also a way, which an RX can use to detect and indicate survival time issue from its side. It can also use it differentiate between different flows /data at lower layers (assuming the mapping to QoS floor is not always 1:1). Moreover, the heartbeats can be used to monitor channel availability and allow the RX UE to detect failures and predict TX-UE SL increasing reliability mechanism (e.g., duplication, as (pre)configured).

6.2 Answering: RWS-210216 (Sidelink positioning)

Feedback Form 14: Answering RWS-210216 (Sidelink positioning)

1 – ROBERT BOSCH GmbH

Answer to Intel:

Q1: Thanks for clarification on UE types. It seems additionally only RedCap Sidelink UE may be needed. We assume that RedCap Sidelink UE also implies support of RedCap Uu - Is that right? As for VRU, it seems that functionality for adaptation to sidelink power saving modes is needed. We hope it can be discussed/supported in R17 and may not require definition of new UE Type. Would you please confirm whether our understanding is aligned with your views?

Answer:

-
Yes for RedCap (in case a u-Mobility has a dedicated UE), yes: it should support SL and Uu.

-
Not exactly what we meant by adaptive VRU capability (in case a user uses the handset as a pedestrian or connected to moving device). In this case, we support varies capabilities in the UE, which need to be adapted/configured when the UE changes its status. This capability may be signaled to the network if the UE is in coverage. FFS: whether the capabilities need to be signaled to RX UE (in our understanding, we should not support this).

6.3 Answering: RWS-210217 (Sidelink enhancements)

Feedback Form 15: RWS-210217 (Sidelink enhancements)

1 – ROBERT BOSCH GmbH

Answer to Huawei UK:

Thanks for the response. It does appear that this proposal would be to re-open frozen releases, since this is a question that does not depend on hardware/software changes.

On the technical side, assuming it can be specified to have mode 1 and mode 2 simultaneously active, how will efficient resource allocation be achieved since UE does not perform sensing for mode 1?

Answer:

We believe this was an important enhancements in Rel-16, where simultaneous Mode 1 / Mode 2 operation was proposed but never agreed. For the sake of Functional safety communication and off-loading in, at least, SL-IIoT, it may be required now.

Regarding sensing of Mode 2 and resource grants of Mode 1, one easy assumption is to consider Mode 1 and Mode 2 resource pools are not sharing same frequency resources. They could be in same band or different bands (e.g., in IIoT, Mode 1 on 3.7GHz in some regions and Mode 2 in Unlic. bands). Furthermore, if the Mode 1 grants has time resource conflict, intra-UE prioritization may apply or any other solution that minimizes over-booking or resource wastage. FFS: Mode 1 and Mode 2 resource sharing.

Answer to: Intel Corporation (UK) Ltd

Q1: Thanks for indication of priorities. We assume that for power saving the main objective is to support sidelink WUS. Is that your primary motivation/intention? Other power saving benefits may potentially come together with introduction of RedCap Sidelink. Is that right or you also prioritize other objectives?

Answer:

We have similar priority for WUS/GTS and VRU (either variable capabilities or RedCap). The reason is that each enhancements has its own use case, where all are equiprobable in our verticals.

6.4 Answering: RWS-210215 (RAN enhancements for Verticals (remaining IIoT/RedCap))

Feedback Form 16:

1 – ROBERT BOSCH GmbH

Answering Nokia:

Our understanding about usefulness of CSA is, 5G RAN may relax a bit by itself in terms of supporting survival time as long as it can still maintain the required CSA. However, in Rel-17 RAN2 has already

concluded that Communication Service Availability (CSA) is not needed, partially because RAN cannot always track how many times survival time requirement has been violated (at application message level) already especially if the failure occurred in network segments other than 5G RAN in the end-to-end path. So, CSA does not really help from 5G RAN perspective, it should just always make its best effort regardless the CSA. Why do you think CSA is crucial if 5G RAN should anyway strive to ensure survival time is not violated?

For the issues relating to UE's autonomous reduction of MCS for DG/CG, we would like to understand how the gNB is able to decode these DG/CG if the MCS of a grant is changed unexpectedly from gNB perspective?

Answer:

In our understanding, CSA needs to be known to TX to avoid starving other CSA flows (e.g., with different CSA values, but could be more critical) if a survival time is triggered for one flow. In other words, the increased reliability (increase re-transmission, L1/2 parameters autonomous adaptation, duplication, etc.) when ST is triggered should be CSI aware. This also mean, we may not always measure CSA in RAN.

An RX (gNB) can easily expect survival time triggering from erroneous decoding of a previous messages. Thus, some pre-configured steps can be assumed with each NACK or packet failure. In case of SL, heartbeat signal may be needed to indicate to the RX a channel failure.

The heartbeats can be periodic-deterministic or aperiodic-deterministic, where the RX UE may indicate survival time, e.g., based on TS 22.104 (survival time for aperiodic-deterministic). Wherein, the SL TX UE can also have the agreed reactive survival procedure in IIoT Uu Rel-17.

7 Summary

Feedback Form 17: Final Summary

1 – ROBERT BOSCH GmbH

RWS-210215: (considering only IIoT (non-SL) and RedCap):

-

RedCap

o

RedCap devices may play a significant role in large scale IIoT deployment scenarios, which also cover low-cost tools

o

RedCap should be optimized for low-latency, with a target of, e.g., 5ms (e.g., wireless microphone, light-weight AGVs, etc.)

o

RedCap should support further reduced bandwidth, e.g., 5, 10, and 20 MHz for further power reduction

▪

FFS Whether the BW reduction is on RF or in Baseband

○ RedCap should support SL with at least the following reduced bandwidth, e.g., 5, 10 MHz (in addition to 20 MHz)

○ RedCap devices should support positioning over Uu and SL

○ For infra structure positioning cost reduction, may study:

▪ Option 1: Positioning assisting nodes (e.g., beacons positioning -like system), or

▪ Option 2: SL positioning, where anchor UEs are implemented to perform more infrastructure-like cheaper positioning.

- XR enhancements for IIoT should include:

○ CG/SPS enhancements to consider non-integer periodicity, traffic pattern, burst values, expected jitters

○ Scheduling enhancements should consider multiple concurrent QoS flows

▪ SA2 should consider further enhanced QoS flow for XR / IIoT /URLLC

○ We support that XR IIoT is handled in IIoT WI.

○ Support power saving for XR IIoT (e.g., CDRX)

RWS-210216 Sidelink positioning:

- SL positioning is supported for all coverage scenarios: in-coverage, out-of-coverage, and partial-coverage

- At least standalone SL positioning is supported for in-coverage scenario

- For RedCap and VRU

○ Study further the accuracy for at least 20 and/or 10 MHz

○ For SL positioning in this case, GNSS may only be optional

○ Support at least SL relative (ranging) positioning, absolute positioning is not precluded

○ SL positioning is supported with power saving

▪ Impact of power saving should be considered in the WI

○ Joint SL communication and positioning is supported as a baseline

-
For Automotive use cases:

○ Joint SL communication and positioning in the same carrier is supported as a baseline

○ Support both SL relative (ranging) and SL absolute positioning

○ SL positioning using FR2 is not the baseline

○ Study SL positioning accuracy for IST bands assuming 10, 20, 40 MHz channelization

○ LMF is not needed for V2X use cases at least for SL relative positioning Mode 1

-
For IIoT devices:

○ Encourage FR2 sidelink positioning together with FR1

○ Support relative and absolute SL positioning

○ Joint SL communication and SL positioning in the same carrier is supported as a baseline

RWS-210217: Sidelink Enhancements

-
The following SL devices should be at least assumed:

○
Vehicular-type UE (based on R16/17)

○
u-Mobility (e.g., e-Bike and our 2-wheeler) with a RedCap on-board UE, which supports SL. The UL/DL/SL bandwidth supported BW should be at least 5, 10, 20 MHz.

○
VRU pedestrian: assuming a normal handset; SL capability should be adaptive/configurable in this case.

-
For the VRU pedestrian with a handset, the UE may change/switch its, e.g., SL power saving capability, once the UE is connected to, e.g., eBike and charging

-
For RedCap/VRU SL UE, support of GNSS is optional or poor accuracy is should be at least assumed.

-
SL Power enhancements:

○
Adaptive DRX and DRX alignment should be supported for all cast types

○
WUS / GTS / adaptive BWP should be supported for vehicular scenarios supporting new use cases, e.g., AVP

○
VRU may need to switch their capability, e.g., SL-power saving, sensing, HARQ A/N reception, and RX capability, at least when the user status changes (e.g., switching to e-Bike).

▪
FFS whether capability has to signaled or configured

▪
E.g., SL capability can be signaled as inter-UE coordination signals

-
For IIoT:

○
Study further latency reduction and reliability enhancements

○
Support Mode 1 and Mode 2 simultaneous operation for at least

▪
TSC traffic should be used with Mode 1

▪
Off-loading should be on Mode 2

- Mode 1 and Mode two may at least coexist FDMed /TDMed

- FFS Mode 1 / Mode 2 cooperation / resource sharing

- FFS CA, e.g., Mode 1 CC1 and Mode 2 CC2

- For SL resource conflict for simultaneous Mode 1 and Mode 2, study intra-UE prioritization

- Support SL inter-UE coordination for IIoT SL

- Support SL Unlicensed for IIoT

RWS-210218: RAN-Assisted Functional Safety Communication

Consider studying the following on the top of Rel-17 IIoT WI:

- **□ Possible Study objectives for RAN-Assisted FuSa in Rel-18:
General (Uu and SL):**

- Study reporting of survival time to upper layers (if any, which information to convey and how)

- Enhance radio link monitoring

For support of RAN-Assisted FuSa communication in Sidelink:

- Extend survival time concept to Sidelink, hence: study it in a general SL enhanced or together with IIoT-SL

- Study Survival time for different SL cast types: unicast, GB, BC and different HARQ options

- Study possibilities to enhance survival time mode utilizing inter-UE assisting information

- Study reliability increase mechanisms in SL according to survival time triggering

- Study possible RX-UE Survival time triggering mechanism:

- study mechanisms to enhance survival time triggering in UE-to-UE or Sidelink communication monitoring (check whether it applies for Uu as well)

- e.g., study survival time heartbeat triggering option

For RAN-Assisted FuSa communication in Uu (Further enhancements):

- Further enhance QoS parameter for TSC on the top of Rel-17 IIoT (e.g., existing discussion in RAN2)

- Extend the analysis in RAN to aperiodic-deterministic traffic in addition to periodic-deterministic in Rel17 (as defined in SA1 TS 22.104)

- Study further QoS Parameters on the top of Rel-17, e.g., CSA, CSR, burst spread, etc.

- Study further reliability increase mechanism

- Study further monitoring in the RX UE for DL
 -