3GPP RAN 5G-ACIA Evaluations Week 1

October 12th – 16th 2020

Source: Moderator (Ericsson)

Title: Final proposals on URLLC features and simulation assumptions

Document for: Discussion, Decision

# 1 Introduction

AT RAN#89, the following was agreed in [RP-202069](https://protect2.fireeye.com/v1/url?k=41a5db26-1f051960-41a59bbd-86fc6812c361-73f443258ff773bf&q=1&e=bc078f84-983d-45f3-ab31-19e60d911036&u=https%3A%2F%2Fwww.3gpp.org%2Fftp%2Ftsg_ran%2FTSG_RAN%2FTSGR_89e%2FDocs%2FRP-202069.zip) on providing evaluations for 5G-ACIA:

* Start an offline email-based activity to provide evaluation results for 5G-ACIA
* One company volunteers as moderator
  + Proposes a work plan to follow
  + Ericsson is willing do this
* Discussions are on the RAN1\_NR reflector
  + Email activity only during short periods (< week) distributed across the time allocated to the activity
  + No email activity in weeks before/during/after RAN1 meetings or RAN defined inactive periods
  + All companies should strive to limit email activity as much as possible
  + Outcome of the offline discussion will directly go to RAN without need for discussion in RAN1 nor need for LS from RAN1 to RAN
* Target completion by RAN#91
* At RAN#91, RAN will decide on a response LS to 5G-ACIA

The moderator made the following proposal on a timeline:

1. 12-16 October 2020
   * Discussion on which URLLC features to include in the evaluations and simulation assumptions
2. 14-18 December 2020
   * First round of simulation results
3. 22-26 February 2021
   * Second round of simulation results
4. 8-12 March 2021
   * Finalization of the report to RAN#91

A summary of the inputs provided by companies with first proposals for agreements was provided with companies adding their proposals[9]. Updated proposals were provided in[11].

In this contribution final proposals for agreement are made.

# 2 Simulation assumptions

## 2.1 Final proposal

Based on the discussions during the week, the final proposals for each parameter is listed in the table.

|  |  |  |
| --- | --- | --- |
| Parameters | 5G-ACIA LS | **Proposal for agreement** |
| Factory hall size | 120x50 m | As in 5G-ACIA LS |
| Room height | 10 m | As in 5G-ACIA LS |
| Inter-BS/TRP distance | Depending on the number of TRPs, which are evenly deployed in the factory hall. Simulation company should provide the number of BSs/TRPs used in the simulation. | According to proposed layout below |
| BS/TRP antenna height | 1.5 m for InF-SL and InF-DL 8m for InF-SH and InF-DH | As in 5G-ACIA LS |
| Layout – BS/TRP deployment | Depending on the number of TRPs | 12 TRPs within area with the same 2D placement as in TR 38.901 and TR 38.824. |
| Channel model | UC-2: InF-DH > InD-DL > InF-SH > InF-SL | Mandatory: InF-DH  Optional: InD-DL, InF-SH, InF-SL |
| Carrier frequency and simulation bandwidth | TDD 4 GHz: 100 MHz 30 GHz: 160 MHz | As in 5G-ACIA LS |
| TDD DL-UL configuration | Simulation company should report the used DL-UL configuration. | Companies should report the used DL-UL configuration. 1:1 DL-UL configuration is recommended. |
| Number of UEs per service area | Up to 50 per service area, e.g., 10, 20, 40, and 50 | As in 5G-ACIA LS |
| UE distribution | All UEs randomly distributed within the respective service area. | As in 5G-ACIA LS |
| Message size | 48 bytes | 48 bytes |
| DL traffic model | DL traffic arrival with option-1, option-2, and option-3. | 5G-ACIA Option 1 is mandatory. Companies are also encouraged to provide results for option 3 |
| UL traffic model | UL traffic is symmetric with DL, and DL-UL traffic arrival time relationship with option-1 and option-2 | As in 5G-ACIA LS with Option 1 as mandatory |
| CSA requirements | UC-#2: 99.9999% | UC-#2: 99.9999% |
| Performance metrics | 1) CSA: single CDF of CSA distribution of all UEs in factory hall 2) Latency: single CDF of latency distribution of all UEs in factory hall 3) Percentage of UEs satisfying requirements  4) resource utilization | As in 5G-ACIA LS with 3) and 4) as low priority  Note: For metric 2) it is clarified that a packet transmission cannot be performed after the latency deadline. The collected statistics cannot exceed the latency requirement. The packets exceeding the deadline are visible in the UE packet error statistics |
| E2E latency & air interface latency | E2E latency: 1 ms for UC#2 | E2E latency: 1 ms for UC#2  Air interface latency: 1ms |
| UE speed | Linear movement | Linear movement: 75 km/h  No explicit UE mobility (nor handovers) are modeled in the evaluations. |
| BS antenna mount |  | Option 1 (1 sector per BS) from 38.824 is used |
|  |  |  |

1. Agree on the proposals for simulation assumptions given in the table
2. Additional simulation parameters are taken from TR 38.824.

## Companies comments to proposals

Companies can add comments on the proposals in the table.

|  |  |
| --- | --- |
| Company | View |
| Qualcomm | Regarding DL traffic model Option 1, the following need to be clarified:  1. The random scheduling failure for a UE due to random arrival should be absorbed into the CSA requirements. In other words, random scheduling failure should happen with probability << 10-6.  2. DL packets for a UE arrive every 1ms deterministically after the first transfer interval of 1ms. |
| HW/HiSi | **Layout – BS/TRP deployment**  We acknowledge Nokia’s comment from the previous round and also think that might not be feasible that we agree among companies on exact simulation assumptions for modelling the interference of an outdoor macro. But we still think it is important to capture that when outdoor-macro inteference is not modelled, the achievable results would become somwhat meaningless in case of full cooperation among all cells.  We therefore propose tto add the foilowing note the proposal:  *Note: If M-TRP or cooperation among all the 12 cells is considered, then company report if and how interference from an outdoor macro station has been considered in the simulations.*  **Regarding DL traffic model.**  We agree with comments given by ITRI that Option 3 should be mandatory in the next round since it is more realistic. We also think that Qualcom and ZTE raised important points in the email exchange, that Option 1 would show a lower bound of the achievable performance when the application generates data in a non-random manner.  Therefore we suggest to update the proposal as follows:  **5G-ACIA Option 1 is mandatory. Companies are also encouraged to provide results for option 3, because it reflects more realistic traffic conditions when multiple actuators work in a cooperative manner.**  **Performance metric**  Since a packet transmission after the deadline is not allowed, as also Intel has pointed out, Metric#2 becomes less valuable. Therfore, we propose to give metric #4 more priority. We suggest the follwoing update:  As in 5G-ACIA LS with 2) and 3) ~~and 4)~~ as low priority  Note: For metric 2) it is clarified that a packet transmission cannot be performed after the latency deadline. The collected statistics cannot exceed the latency requirement. The packets exceeding the deadline are visible in the UE packet error statistics    **E2E latency & air interface latency**  Reading the comments from other companies, it seems that we are the only company that has the view that the CN latency should have a non-zero value  For progress we are fine with the proposal as it reflects the majority view.  But we think that Intel has raised a valid point that one further agreement could needed on the relationship between the E2E latency and the transmission interval, this relationship seems not to be given clearly in the LS. For clarity it could be good if we add one assumption into the proposals.  In our view, we could either add E2E latency = Transmission interval or E2E latency = 0.9\*Transmission interval, we have no strong view which one to add, but think it would be good to spell out their assumed relationship. |
|  |  |

# 3 Features to include in simulations

## 3.1 Final proposals

Based on the discussion during the week, the final proposals are provided here.

For the Rel-15 baseline, the following is proposed:

1. Rel-15 URLLC features included in the baseline are

* UE Processing capability 2
* UL Configured grant
* DL Semi-persistent scheduling

Regarding Rel-16 features, it is proposed to leave it up to each individual company which features to include in addition to the baseline. This can be revisited after the first round of simulations have been provided in December.

1. It is up to each to decide on which Rel-16 features to provide simulations results for in addition to the Rel-15 baseline. This can be revisited after the first round of simulations have been provided in December.

Again, companies are as always free to submit additional results that they find relevant to the evaluations.

## 3.2 Companies comments to proposals

Companies can add comments on the proposals in the table.

|  |  |
| --- | --- |
| Company | View |
| Qualcomm | Please clarify whether the UE pocessing capability 2 is restrcited to FR1 only. |
| HW/HiSi | According tor QC questions. UE cap#2 is only defined for FR1, so it should be restricted to that.  Fine with the proposal. |
|  |  |

# 4 Conclusions

The following proposals are made:

Proposal 1 Agree on the proposals for simulation assumptions given in the table

Proposal 2 Additional simulation parameters are taken from TR 38.824.

Proposal 3 Rel-15 URLLC features included in the baseline are

 UE Processing capability 2

 UL Configured grant

 DL Semi-persistent scheduling

Proposal 4 It is up to each to decide on which Rel-16 features to provide simulations results for in addition to the Rel-15 baseline. This can be revisited after the first round of simulations have been provided in December.

# References

1. [RP‑201279](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_88e/Docs/RP-201279.zip), “LS on 3GPP NR Rel-16 URLLC and IIoT performance evaluation”, 5G-ACIA
2. [RP-202069](https://protect2.fireeye.com/v1/url?k=41a5db26-1f051960-41a59bbd-86fc6812c361-73f443258ff773bf&q=1&e=bc078f84-983d-45f3-ab31-19e60d911036&u=https%3A%2F%2Fwww.3gpp.org%2Fftp%2Ftsg_ran%2FTSG_RAN%2FTSGR_89e%2FDocs%2FRP-202069.zip), “Way forward on RAN work for 5G ACIA requested simulations“, Ericsson
3. “[Simulation Assumptions and URLLC Features for 5G-ACIA Performance Evaluation](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_90e/Inbox/Drafts/5G-ACIA%20October/Company%20Inputs/Ericsson%205G-ACIA%20URLLC%20simulation%20assumptions%20%26%20features.docx)”, Ericsson
4. “[Discussion on URLLC and IIoT features for performance evaluation in response to 5G-ACIA”,](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_90e/Inbox/Drafts/5G-ACIA%20October/Company%20Inputs/HWHiSi%20-%205G%20ACIA%20URLLC%20simulation%20assumptions%20and%20features.docx) Huawei, HiSilicon
5. “[5G-ACIA LS – Phase 1 input](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_90e/Inbox/Drafts/5G-ACIA%20October/Company%20Inputs/INTEL%20-%205G-ACIA%20LS%20-%20Phase%201%20inputs.docx)”, Intel Corporation
6. “[Features and simulation assumption for 5G ACIA URLLC LS response](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_90e/Inbox/Drafts/5G-ACIA%20October/Company%20Inputs/NOKIA%20-%205G-ACIA%20URLLC%20features%20and%20sim%20assumptions.zip)”, Nokia, Nokia Shanghai Bell
7. “[Features and simulation assumption for 5G ACIA URLLC LS response](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_90e/Inbox/Drafts/5G-ACIA%20October/Company%20Inputs/QUALCOMM-5G-ACIA%20URLLC%20features%20and%20simulation%20assumptions%20.docx)”, Qualcomm CDMA Technologies
8. “[Views on URLLC features and simulation assumptions for 5G-ACIA evaluations](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_90e/Inbox/Drafts/5G-ACIA%20October/Company%20Inputs/ZTE-Views%20on%20URLLC%20features%20and%20simulation%20assumptions%20for%205G-ACIA%20evaluations.docx)”, ZTE
9. “[5G-ACIA URLLC features and simulation assumptions](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_90e/Inbox/Drafts/5G-ACIA%20October/Company%20Inputs/vivo-5G-ACIA%20URLLC%20features%20and%20simulation%20assumptions.docx)”, vivo
10. “[Summary of company inputs on URLLC features and simulation assumptions v6](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_90e/Inbox/Drafts/5G-ACIA%20October/First%20summary%20and%20proposals/Summary%205G-ACIA%20evaluations%20v006_Nokia_Moderator.docx)”, Moderator(Ericsson)

1. [“Updated proposals on URLLC features and simulation assumptions v8](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_90e/Inbox/Drafts/5G-ACIA%20October/Updated%20proposals/Updated%20proposals%205G-ACIA%20evaluations%20v008%20Nokia_Moderator.docx)”, Moderator(Ericsson)