3GPP TSG-RAN WG3 Meeting #110-e R3-206844

E-meeting, 2 – 12 November, 2020

**Agenda item: 8.3.1**

**Source: Nokia (moderator)**

**Title: CB: # 1\_QoSmonURLLC - Summary of email discussion**

**Document for: Approval**

# 1 Introduction

This paper provides summary of discussions at RAN#110-e on:

**CB: # 1\_QoSmonURLLC**

**E/// 6546:**

**- RAN does not report UL RAN part delay on NGAP.**

**- No impact on 38.415 is needed to satisfy SA5 requirement on RAN to provide UL packet delay result excluding UL D1 packet delay.**

**Nok 6377:**

**- Activation per PDU session; ENUMERATED enabling request of N3 packet delay reporting; measurement and reporting already supported by UP (N3/N9 packet delay requires an additional field; updating procedure text is needed); align st3 accordingly**

**HW 6423:**

**- introduce a reporting frequency configuration for RAN part delay reporting over NG on NG, Xn, F1 and E1 interfaces.**

**- discuss whether the reporting frequency in RAN should support the same definition as in TS 29.244 or a single periodic reporting frequency is sufficient.**

**- If a single periodic reporting frequency is agreed, the definition could reuse the reporting interval of M6, i.e., ENUMERATED (ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, ms20480, ms40960, min1, min6, min12, min30 …)**

**- Chair: note LS; first clarify how reporting should work and foreseen specification impact**

(Nok - moderator)

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Initial comments would be appreciated by Thursday, Nov. 5, EOB.

# 2 For the Chairman’s Notes

**Reporting of RAN delay on NG-C is not needed.**

**Reply back to SA5 that no further changes to RAN3's specifications are needed (draft LS in 6545 can be taken as baseline).** WI code: NR\_SON\_MDT

R3-206545 rev in R3-20xxxx (WI code: NR\_SON\_MDT) **agreed**

**Introduce reporting frequency configuration for RAN part delay reporting over NG on NG, Xn and E1**

NGAP: R3-207074 **agreed**

XnAP: R3-207075 **agreed**

E1AP: R3-207076 **agreed**

**Introduce reporting frequency configuration for RAN part delay reporting over F1:**

Send LS to SA2 (request for clarification) in R3-20xxxx?

or **to be continued**

**Update of 38.415 for GTP-U path**

R3-207111 **agreed**

**Handling of UEs without D1 delay reporting capability - to be continued**

**Stage 2 (TS 38.460):** R3-207077 **agreed**

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**Synchronisation with CT4 concerning requirement on RAN to report the N3 delay:**

Modification of this requirement is discussed in CT4, and if agreeable by CT4 and RAN3 the modification will also require alignment of stage 2 (new CR to TS 23.501).

Impact on RAN3 work at this meeting:

- submitted CRs to NGAP (6379) and E1AP (6380) are probably not needed

- submitted CR to TS 38.415 (6378) needs update: N3 delay not any more requested to be measured by the NG-RAN and reported over N3, but to be measured by the I-UPF and reported over N9 accumulated with N9 delay. Revised CR is uploaded in file "draft R3-20xxxx 38415 CR GTP-U path - option 2".

**Proposed discussion points for second round (please provide your comments in section 4)**

- LS to SA5 (no further changes to RAN3's specifications are needed): any update needed in 6545?

- Handling of UE without D1 delay reporting capability: Inclusion of D1 delay indication from the RAN to the CN?

- Stage 2: editorial updates of 6093

- Reporting of N3/N9 delay: is the updated solution agreeable? Any comments on "draft R3-20xxxx 38415 CR GTP-U path - option 2"?

- QoS Monitoring reporting frequency information on F1: is further clarification from SA2 needed (LS)? Other comments?

# 3 Discussion - first round

## 3.1 Reporting of RAN delay

### 3.1.1 Reporting of RAN delay over NG-C

As mentioned in 6546 and 6377, previous SA2 has agreed in CR to TS 23.501 [1]: "RAN measures the RAN part of UL/DL packet delay and calculates packet delay of N3 interface. RAN provides the packet delay of RAN part and N3 interface towards UPF (via N3)."

**Proposal: Reporting of RAN delay on NG-C is not needed.**

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| Company | Comment |
| Nokia | Agree |
| Huawei | Agree |
| Ericsson | Agree |
| ZTE | Agree |

### 3.1.2 Reporting of UL packet delay result excluding UL D1 packet delay

An LS from SA5 [2] received at previous meeting contains the following action to RAN3:

"SA5 respectfully requests RAN3 to also provide an UL packet delay result by NG-RAN with focus on network side excluding the UL D1 packet delay occurred in the UE (UL PDCP queuing delay, as defined in the clause 4.2.1 of TS 38.314) for QoS monitoring."

Discussion can be found in 6546 (and already discussed at RAN3#109-e). 6546 indicates that measurements relative to the RAN part of the packet delay, excluding the UL D1 packet delay, are already defined in TS 28.552, and propose to reply back to SA5 that no further changes to RAN3's specifications are needed (6545). Support of SA5's request would require additional information to be defined in TS 38.415 (for NG-U and N9).

**Proposal: Reply back to SA5 that no further changes to RAN3's specifications are needed (draft LS in 6545).**

**Please provide your view.**

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| Company | Comment |
| Huawei | Agree. No further changes to RAN3 specs are needed for RAN part delay measurement without D1 for PM.  However, the RAN part delay reporting to UPF for Qos monitoring for URLLC may not include D1 in a certain case, which is when the UE does not support D1 reporting. Reporting D1 is an optional UE capability as per RAN2 agreement.  In such case, maybe better to indicate to UPF via NG-U about the absence of the DL in the UL RAN part delay result? |
| Ericsson | Agree. No further changes to RAN3 specs are needed for RAN part delay measurement without D1 for PM and draft LS in 6545 can be taken as baseline. As UEs capabilities are known to the CN we see no need to indicate absence of the D1 delay to UPF, as CN can deduce that UE does not report D1. |
| Huawei 2 | Reply to E///’s comment:  What sure what UE capabilities that you are talking about. We are talking about the ul-PDCP-delay-r16 capability which is part of the UE radio capability defined in TS 38.306.    Therefore, the CN obviously will not deccode the UE radio capability. c |
| Ericsson2 | It has been assumed in many other frameworks that the CN can decode the UE radio capabilities if that is needed. In any case, if the value of D1 is absent, CN can simply deduce that this is not supported, we do not need to make our specifications over complex for that. |
| ZTE | Agree, The RAN delay measurement defined in TS 28.552 can satisfy SA5 requirement, no further changes to RAN3 specs are needed.  We agree with HUAWEI, It is better to indicate absence of the D1 delay to UPF. |
| Nokia | Agree that we can't assume that the CN doesn't know the UE radio capability, so will indeed not know whether D1 is included or not. |

## 3.2 Configuration and reporting of N3/N9 delay

### 3.2.1 Reporting of N3/N9 delay over user plane

As mentioned in 6377, TS 23.501 contains a requirement to report N3 (NG-U) delay over N3 (see 3.1.1), as well as accumulated N3/N9 packet delay reporting up to the PSA UPF.

N3/N9 packet delay reporting requires additional support in TS 38.415, and a CR is proposed in 6378.

**Please provide your view on support of N3/N9 packet delay reporting over user plane, and whether the CR in 6378 is agreeable.**

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| Company | Comment |
| Nokia | N3/N9 packet delay reporting over user plane is needed. CR to TS 38.415 in 6378 can be agreed. |
| Huawei | OK to report the per interface delay to UPF via NG-U.  Comment on the 38.415 CR in 6378:  If a new indication is used, why to also use the UL delay indicator? Maybe better to use a separate indicator for the interface level delay reporting? |
| Ericsson | We think that the requirement on RAN to report the N3 delay is not necessary. 23.501 mentions that:  “The UPF calculates the UL/DL packet delay of N3/N9 interface (N9 is applicable when I-UPF exists).”  Namely, the UPF is also tasked to measure the GTP-U RTT and calculate the N3/N9 delay. UPF would report the delay to SMF.  It is not necessary for RAN to measure the N3 delay because this measure consists of a GTP-U based RTT measure, i.e. this is exactly equivalent to the N3 delay measurement the UPF would take.  We suggest to send an LS to SA2/CT4 to clarify that this requirement on RAN is not needed |
| ZTE | Similar view with Ericsson, we can send an LS to SA2/CT4 to clarify that this requirement on RAN is not needed . |
| Nokia | If I understand the comments well, the following is acknowledged so far for the CR to 38.415: need for enhancements to enable transport of N3/N9 packet delay and RAN packet delay for GTP-U path monitoring.  I think the comments on requirement on RAN to report the N3 delay more relates to the NGAP/E1AP CRs for triggering of this measurement, so commenting under section 3.2.2.  Comment to HW on the CR to 38.415: I understand that it would be OK to reuse the existing data field for the RAN delay (UL Delay Result)? Probably no strong view from my side, but what would be the advantage of creating a new indicator and not reuse UL Delay Ind.? |
| Ericsson | Comments to Nokia: We believe that 23.501 already requires that the N3/N9 delay is calculated by the UPF. This is done by calculating RTT over GTP-U. Hence the N3/N9 delay derived by the UPF has exatly the same validity as a delay that the RAN would enentually calculate. Given that it is the UPF to ultimately need this delay measure, there is no need for the RAN to measure this delay and report it to the UPF, given that the UPF already calculated it. |

### 3.2.2 Activation of N3 delay measurement

CRs for activation of N3 packet delay reporting for QoS monitoring using GTP-U path can be found in 6379 (NGAP) and 6380 (E1AP).

**Please provide your view on activation of N3 packet delay reporting and the submitted CRs (6379, 6380).**

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| Company | Comment |
| Nokia | 6379 (NGAP) and 6380 ( E1AP) can be agreed. Similar CR is also needed for XnAP. |
| Huawei | 6379 (NGAP) and 6380 ( E1AP) are implanted on top of the per Qos monitoring indication for Qos flow level.  As we know that the N3/N9 delay is measured per interface. The question is do we need to active the per interface level RAN delay measurement on a per Qos flow granularity? |
| Ericsson | As mentioned above, we do not think the requirement on RAN to report the N3 delay is justified. We do not agree with the need for these CRs |
| ZTE | See above |
| Nokia | Replying to Huawei, the RAN delay measurement as it is defined only makes sense in case of a QoS flow, in the sense that it will depend on UE specific conditions like the cell it is connected to, radio conditions, QoS, and even on UE internal UL delay (D1). Hence the proposal to activate this measurement in the RAN per QoS flow (CR to NGAP, E1AP).  Comment to E/// and ZTE: SA2's requirement to trigger the N3 measurement for a given PDU session comes from that the UPF has no overview of the CU-UPs to which it may become connected before a PDU session is set up towards the UE. So I believe that SA2 considered triggering from the RAN side to be a clean solution, and I expect they already evaluated the option of triggering the measurement from the UPF side (or actually the "final" I-UPF in case multiple UPFs are involved). I don't see a strong reason why we should not follow SA2's requirement here. |
| Ericsson | Reply to Nokia: The N3/N9 delay measurement is done on the basis of GTP-U, hence it is done only when a PDU session is established between UPF and CU-UP. This is not a measurement taken before the PDU Session is established, but a measurement on the traffic for a given PDU session. As explained above, UPF already calculates this delay and RAN does not need to calculate it again. |

## 3.3 QoS Monitoring reporting frequency

LS from SA2 is received in 6838, and discussion is provided in 6423.

Please provide your view on the proposals in 6423:

**Proposal 1: To introduce a reporting frequency configuration for RAN part delay reporting over NG on NG, Xn, F1 and E1 interfaces.**

**Proposal 2: To discuss whether the reporting frequency in RAN should support the same definition as in TS 29.244 or a** **single periodic reporting frequency is sufficient.**

**Proposal 3: If a single periodic reporting frequency is agreed, the definition could reuse the** **reporting interval of M6, i.e., ENUMERATED (ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, ms20480, ms40960, min1, min6, min12, min30 …).**

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| Company | Comment |
| Huawei | Agree. As per the SA2 LS, we need to define a reporting frequency for the RAN part delay reporting.  We are open to the two options mentioned in the discussion paper. For simplicity reason, reusing the report interval for M6 seems better. |
| Ericsson | We note that in 29.244 it is specified that the UPF can report delay measurements to SMF with a minimum period of 1 second. This is captured in the description in 29.244 of Reporting Frequency, which relies on the measurement period parameter. See below: *8.2.42 Measurement Period* *The Measurement Period IE contains the period, in seconds, for generating periodic usage reports or the periodic QoS monitoring reports.*  Also note that the Minimum Wait Time is defined in seconds, see below: 8.2.170 Minimum Wait Time The Minimum Wait Time IE contains the minimum waiting time between two consecutive reports for event triggered QoS monitoring reporting.  […]  The Minimum Wait Time field shall be encoded as an Unsigned32 binary integer value. It shall contain the duration in seconds.  Therefore, there is no reason to ask the RAN to report measurements with periods lower than 1 second. Also, the reporting period from RAN should be set in seconds, e.g. (s1, s2, s4, s8, …)  Finally, there is no need to signal the reporting period to the gNB-DU. The gNB-DU collects its measurements and reports it to the gNB-CU-UP independently from the reporting period signalled by the CN. This is well stated in the LS from SA2 in 6838 as:  *The measurement period of RAN part of delay is up to RAN’s implementation*  To summarise we propose:   * Signalling of the QoS Monitoring reporting frequency from AMF to NG-RAN over NG and from CU-CP to CU-UP over E1. * A reporting period measured in seconds |
| Huawei 2 | Reply to E/// comment above:  First, OK to define the reporting interval as seconds level, with minimum 1s.  Regarding reporting freq to DU, I don't understand why it is not needed? What you cited from the LS is the measurement period. And what we need to send to the DU is the reporting frequency which is the same as the one to CUUP. |
| Ericsson2 | DU generates measurement reports to the CU-UP according to the periods with which its measurements are collected. DU shall not respect any other period for signalling measurements to the CU-UP as this is not requested in any specifications.  CU-UP, at the time of reporting the measurements to the UPF, takes the measurements received from DU info account to build the delay measurement reply.  We do not need to make our specifications over complex with unnecessary signalling of reporting periods to DU. |
| Nokia | Based on your comments above, is it expected that no F1AP CR would be needed? Even if the measurement period in the DU is based on implementation, at least the DU should be aware of the RAN packet delay reporting frequency to the CN? The feature would not work if the DU collects every 30 minutes, while CU-UP reports measurements every second… |
| Ericsson | Reply to Nokia: The LS in R3-206838 mentions that “The measurement period of RAN part of delay is up to RAN’s implementation”.  A measurement period is the period with which measurements are collected. Measurement frequency == 1/Measurement Period. Hence, the LS clarifies that RAN takes measurements at a frequency that is implementation dependent. The reporting frequency configurable from the CN has a period measured in seconds, as per 29.244. IF the CN requests a reporting frequency of e.g. 1 second, but the RAN is measuring every 2 seconds, the RAN will measure every 2 seconds and report the latest available measurement every second. This is agreed in SA2 to avoid that the reporting frequency requested from CN impacts the measurement processes in the RAN, e.g. implies too heavy measurement processing |

## 3.4 Stage 2

CR to TS 38.460 for completion of work at last meeting (D1 measurement transfer over E1) is provided in 6093.

**Please provide any comments on 6093 "Introduction of D1 measurement transfer on E1AP".**

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| Company | Comment |
| Huawei | Agree. |
| ZTE | Agreed. |
| Nokia | OK, but maybe a few editorials on cover-page (including need to check RAN box) and in the CR. |

# 4 Discussion - second round

## 4.1 LS to SA5

See (proposed) agreement in section 2. Any update needed in 6545?

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| Company | Comment |
| Huawei | The content of the LS looks OK. Just one comment, should the WI code be TEI16? |
| Ericsson | The LS seems ok. Open to suggestions on the WI code. |
| Nokia | When the initial CRs were agreed in RAN3#107-e the CRs + LS all used NR\_SON\_MDT WI. Later maybe TEI16 was used for some corrections, but I suggest we use NR\_SON\_MDT or NR\_SON\_MDT-Core. For CRs at this meeting we should probably use NR\_SON\_MDT-Core. |

## 4.2 Handling of UEs without D1 delay reporting capability

Do we need to include a D1 delay indication from the RAN to the CN (impacted spec TS 38.415)?

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| Company | Comment |
| Huawei | I just realized this issue when commenting on the reporting delay without D1 to OAM.  It seems better to have if we don't want the AMF to decode UE radio capability. Maybe can also check with SA2 if they want an indication when the reporting delay does not contain D1 and whether we can rely on AMF decoding UE radio capabiliy. |
| Ericsson | Not needed. Decoding capabilities is not needed. A UE that supports reporting of the D1 delay is mandated to report it, hence this UE will always report the delay. A UE that does not support D1 reporting will not report it. Hence, if the UPF receives a RAN delay measurement without D1 delay, the only reason is that the UE is not capable of such reporting. |
| Nokia | To me we can't rely on the CN decoding UE radio capabilities, but let me check again internally. |

## 4.3 Stage 2

Please provide editorial updates of 6093 as mentioned in first round. Additional comments:

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| Company | Comment |
| Ericsson | It looks ok as it is |
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## 4.4 Reporting of N3/N9 delay

Is the updated solution agreeable (see description in section 2)? Any comments on "draft R3-20xxxx 38415 CR GTP-U path - option 2"?

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| Company | Comment |
| Huawei | In general, the CR looks good.  One comment on 5.4.2.1 section, should the ‘I-UPF’ be NG-RAN? Or use the passive state like” the UL PDU SESSION INFORMATION frame may also include….” |
| Ericsson | CR is ok. We suggest the following rewording:  *If QoS monitoring with N3/N9 delay reporting has been ~~configured~~ requested for the included QFI field, the I-UPF may include in the UL PDU SESSION INFORMATION frame a N3/N9 Delay Ind. field, a N3/N9 Delay Result field and delay result for UL ~~or~~ and DL fields if received from RAN.* |
| Nokia | On HW's comment, the N3/N9 delay reporting is done by the I-UPF on N9, not by the NG-RAN (assuming this approach is also agreed in CT4). E///'s update looks fine with me. Will update the CR accordingly. |

## 4.5 QoS Monitoring reporting frequency information on F1

Is further clarification from SA2 needed (LS)? Other comments?

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| Company | Comment |
| Nokia | While SA2's request explicitly relates to the RAN's reporting frequency to the 5GC, it seems obvious that the functional entity that provides the measurement in case of split NG-RAN (the gNB-DU) should be aware of the requested reporting frequency. If not, non-split NG-RAN architectures will have an advantage compared to split architectures. Absence of such information in the gNB-DU could also in practice result in customer requirements that the "worst" case of 1s reporting frequency has to be assumed by the gNB-DU, even if the 5GC has configured less frequent reporting (e.g. 5s). If it can be ensured that the NG-RAN reporting frequency info is available in the gNB-DU, we're OK to introduce a statement in stage 3 or stage 2 that the actual measurement frequency is left to implementation. If not, further clarification from SA2 seems needed (LS). |
| Huawei | We are also OK with Nokia’s proposal above. Otherwise, confirmation from SA2 is necessary to avoid any misunderstanding to SA2 requiement. |
| Ericsson | We see no need for further clarification on the SA2 LS. The SA2 LS is very clear in stating that the CN provides to the RAN the measurement \*reporting\* frequency (not the measurement collection frequency), while the measurement period (i.e. the measurement frequency) is up to RAN implementation. Hence, the RAN will collect measurements at a frequency compatible with its implementation, while measurements will be reported to the CN as per reporting frequency signalled over NGAP. |
| Nokia | It doesn't make sense to me that the gNB-DU should not be aware of the RAN's reporting frequency. |

# 5 Conclusion, Recommendations [if needed]

If needed

# 6 References

[1] S2-2008236, *Correction to QoS monitoring for URLLC on GTP-U*, TS 23.501 CR#2475r1

[2] R3-205692 - S5-204537, *LS Reply on QoS Monitoring for URLLC*, SA5