**3GPP TSG RAN WG1 #104-e R1-20xxxxx**

**e-Meeting, January 25 – February 05, 2021**

**Source: Moderator (OPPO)**

**Title: Summary of LS discussion on NG-RAN support for new 5QIs**

**Agenda item: 5**

**Document for:** **Discussion and Decision**

Introduction

In RAN1#104-e meeting, an LS from SA2 was received on NG-RAN support of 4 new standardized 5QIs for 5G-AIS [1]. Several related contributions on discussion and draft reply LS were submitted in this meeting [2]-[7]. As guided by the Chairman, this contribution provides a summary of the submitted contributions, discussion points and outcomes of email discussion during this meeting.

[104-e-AI5-LS-04] Email discussion regarding LS in R1-2100015, including potentially a reply LS till 1/29 – (name TBD, OPPO)

Discussion points (phase 1 until 27-Jan)

Based on the submitted inputs [2]-[7], the following questions are devised in order to formulate a potential answer to SA2’s question. Companies are encouraged to provide their inputs below.

Question 1 (radio layer support for new standardized 5QI values):

**Based on past RAN1 evaluations (e.g., TR 38.824), do you agree from radio layer’s perspective, the 4 new proposed standardized 5QIs in Table 5.7.4-1 of [1] (New Value#1, 2, 3 and 4) can be supported by the existing design of NG-RAN? If yes, is there any underlaying assumption or conditions for this? If no, which of the New Values can be or cannot be supported?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| OPPO | Yes | Evaluation results in TR 38.824 demonstrated that key radio requirements (PDB, PER and default MDBV) of the 4 new standardized 5QIs in SA2’s LS can be met. |
| Tencent | Yes | Agree with OPPO’s view. |
| Ericsson | Maybe | In principle, NG RAN can fulfil the requirements, but depending on the traffic characteristics, which are still unknown, such support may come at a cost that is prohibitively high. We suggest to include this information in the LS response. |
| Nokia, NSB | Yes | Agree with OPPO’s view |
| Futurewei | Yes | Agree with OPPO’s view. |
| China Telecom | Yes | Agree with OPPO’s view |
| Apple |  | While meeting a single requirement, e.g. on throughput, or reliability or latency may be simple to decide, e.g. through analysis. Whether they can be supported jointly is more difficult to determine.  Note evaluation results in TR 38.824 were with 4096 bytes for packet size (not all the representative use cases were evaluated). Video frame size can be much larger than 4096 bytes, e.g. in split rendering.  So RAN1 study can confirm the New values 1/2/3/4  can be supported up to the evaluated throughput (4096 bytes/frame up to 120 fps).  For higher throughputs, whether they can be supported is not known at this time; and the cost may be prohibitively high as commented by Ericsson. |
| China Unicom | Yes | Agree with OPPO’s view |
| Huawei, HiSilicon | Yes | Agree with OPPO’s view |
| CATT | Yes | RAN1 can support all new parameters. TR38.824 is a reference for the evaluation in RAN1 but not necessary link to those 4 entries of 5QI. |
| MTK | Yes | In principle, NG RAN can support the 4 new standardized 5QIs in SA2’s LS.  New 5QIs Value#3 and 4 can be supported by NR-RAN due to looser data volume, latency and reliability requirements compared to those for Rel-15 enabled use case (e.g. transport industry).  NG-RAN should be able to support New Value #2.  New 5QIs Value#1 can at least be supported by NR-RAN under 1.5k byte packet size (common assumption of Ethernet MTU size) and 50Mbps data rate. |
| vivo | Yes | In general, the new 5QIs values can be supported by the existing design of NG-RAN.  However, the use cases and traffic data rate requirements for which of these new values are applied need to be further clarified. Although RAN1 had studied the performance based on the similar requirements in URLLC SI as in TR38.824, there might be challenges for NR to directly apply the new value 1/2 for high data rate case.  This information may need to be included in the reply LS. |
| Sony | Yes | Our understanding is that the result in TR 38.824 shows that the new proposed 5QIs can be supported. We suggest the reply also states that the ongoing study FS\_NR\_XR\_eval could potentially warrant further refinements or additional QoS classes in the future. |
| Intel | Depends | Similar view as Ericsson/Apple – if the interpretation is that whether the new 5QIs can be supported by L1 specifications then yes (for e.g. the best UE in the system). If the interpretation is whether *reasonable* *coverage* can be provided by L1 for the example services with these 5QIs, then we don’t know yet and subject to evaluation in XR. This information should be included in the LS. |

Proposed reply LS answers / outcome (phase 2 until 29-Jan)

TBD, based on outcome of phase 1 discussion.

Summary of contribution inputs

In [2], draft answer was provided as followed.

*For the new standardized 5QIs Value#1 and 2 defined for visual content of cloud/edge/split rendering, RAN1 in general will support them. On the one hand, both the latency and reliability requirements need to be satisfied. On the other hand, the resource types of them are GBR, and the traffic data rate could have a wide range. Therefore, for low data rate case, RAN1 thinks they can be supported based on TR 38.824. Meanwhile, there might be great challenges for high data rate case, e.g.,100Mbps, since the data rate of such case is much higher than the use cases of URLLC defined in TR 38.824. It should also be noted that the performance evaluation for high data rate case is now under the ongoing XR SI.*

*For the new standardized 5QIs Value#3 and 4 defined for motion tracking and sensor data of cloud/edge/split rendering, they have similar data volume, latency and reliability requirements to those for Rel-15 enabled use case (e.g., AR/VR) and transport industry as shown in the table below quoted from TR 38.824. According to the evaluations for URLLC in TR 38.824, RAN1 thinks they can be well supported by NR-RAN.*

Table A.2-1: Representative use cases for Rel-16 NR URLLC evaluation [TR38.824]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Use case | Reliability (%) | Latency | Data packet size and traffic model | Description |
| Rel-15 enabled use case (e.g. AR/VR) | 99.999 | 1 MS (air interface delay) for 32 bytes  1 mms and 4 mess (air interface delay) for 200 bytes | DL & UL:  32 and 200 bytes  FTP model 3 or periodic with different arrival rates |  |
| 99.9 | 7 mms (air interface delay) | DL & UL:  4096 and 10 K bytes  FTP model 3 or periodic with different arrival rates |  |
| Transport Industry | 99.999 | 5 mess (end to end latency)  Note: 3 ms air interface latency | UL:  2.5 Mpbs; Packet size 5220 bytes  DL:  1Mbps; Packet size 2083 bytes  Note: Data arrival rate 60 packets per second for periodic traffic model | Remote driving  (TS 22.186: 5.5) |
| 99.999 | 10 ms (end to end latency)  Note: 7ms air interface latency | UL&DL:  1.1 Mbps; Packet size 1370 bytes  Note: Data arrival rate 100 packets per second for periodic traffic model | Intelligent transport system (ITS)  (TS 23.501, TS 22.261) |

In [3], draft answer was provided as followed.

*In RAN1’s understanding, NG-RAN can in principle fulfil all the values in the table below. However, the resource consumption can be prohibitively high, which would make the services unattractive to deploy from an operator perspective, if the services also require a high data rate. In this sense, New Value#1, 2, 3 and 4 in the table would correspond to advanced services. The packet delay budget requirement would be particularly challenging for the uplink.*

*In RAN1’s understanding, additional QoS bearers with more relaxed requirements should be added as a complement to New Value#1, 2, 3 and 4. For example, a packet delay budget of 20ms and a packet error rate of 10-2 would be significantly more resource efficient.*

In [4], draft answer was provided as followed.

*Answer to Q1): Existing RAN1 evaluations, including those on AR/VR, power distribution and factory automation do not cover the traffic profiles suggested by the newly proposed 5QIs. For Rel-17, RAN1 is still waiting for important inputs from SA4 to start evaluation on the use cases included in the Rel-17 XR SID, i.e., VR1, VR2, AR1, AR2 and cloud gaming. RAN1 respectfully inform SA2 that RAN1 will communicate the study outcome on VR1, VR2, AR1, AR2 and cloud gaming to SA2 in due course.*

In [5] and [6], conclusion and draft answer were provided as followed.

*Conclusion: Given the performance evaluations and results captured in TR 38.824 and the work done during Rel-16, it can be concluded that the 4 new proposed standardized 5QIs in SA2’s LS can be supported by the existing NR radio design.*

*Answer to Q1): Based on past RAN1 performance evaluations and the study done during Rel-16, it is concluded that the existing NR radio design is able to support the 4 new proposed standardized 5QIs in SA2’s LS.*

In [7], draft answer was provided as followed.

* *NG-RAN should be able to support New Value #1 and New Value #2.*
* *Considering the fact that the QoS requirement of the existing 5QI Value 86 is more stringent than the New Value #3 and #4 and 5QI Value 86 is already supported by NG-RAN, New Value #3 and #4 can also be supported by NG-RAN.*

References

1. [R1-2100015](C:\\3GPP\\RAN1_Meetings\\Tdocs\\2021\\R1-2100015.zip) LS on New Standardized 5QIs for 5G-AIS (Advanced Interactive Services) SA2, Tencent
2. [R1-2101157](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2101157.zip) Draft reply LS on New Standardized 5QIs for 5G-AIS vivo
3. [R1-2101319](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2101319.zip) Draft LS response on New Standardized 5QIs for AIS Ericsson
4. [R1-2101337](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2101337.zip) Draft reply LS on newly proposed 5QIs for 5G-AIS Apple
5. [R1-2101410](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2101410.zip) Discussion on new standardized 5QIs for 5G-AIS from SA2 OPPO, Tencent, China Mobile, China Telecom, China Unicom
6. [R1-2101411](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2101411.zip) [Draft] Reply LS on New Standardized 5QIs for 5G-AIS (Advanced Interactive Services) OPPO
7. [R1-2101753](file:///C:\3GPP\RAN1_Meetings\Tdocs\2021\R1-2101753.zip) Discussion on LS on new standardized 5QIs for 5G-AIS Huawei, HiSilicon

Appendix (SA2 question for RAN1 in [1])

SA2 has started Rel-17 WI 5G\_AIS (5G System Enhancement for Advanced Interactive Services) (SP-190564) which covers potential QoS parameters e.g., new standardized 5QI(s) corresponding to QoS requirements from SA1 NCIS (Network Controlled Interactive Service) work item in TS 22.261.

SA2 discussed the new standardized 5QIs proposed i.e., New Value#1, 2, 3 and 4 in the table below and the proposed 5QIs have not been approved yet in SA2.

Table 5.7.4-1: Standardized 5QI to QoS characteristics mapping

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 5QI  Value | Resource Type | Default Priority Level | Packet Delay Budget  (NOTE 3) | Packet Error  Rate | Default Maximum Data Burst Volume  (NOTE 2) | Default  Averaging Window | Example Services |
| New Value#1 | GBR  (NOTE 1) | 25 | 5ms | 10-3 | N/A | 2000 ms | Interactive Service - visual content for cloud/edge/split rendering, (see TS 22.261 [2]) |
| New Value#2 | 25 | 10ms | 10-3 | N/A | 2000 ms | Interactive Service - visual content for cloud/edge/split rendering, (see TS 22.261 [2]) |
| New Value#3 | Delay Critical GBR | 25 | 5ms  (NOTE 17) | 10-4 | 300 bytes  (NOTE 19) | 2000 ms | Interactive Service -Motion tracking data, (see TS 22.261 [2]) |
| New  Value#4 | 25 | 10ms  (NOTE 18) | 10-4 | 600 bytes  (NOTE 19) | 2000 ms | Interactive Service -Motion tracking data, (see TS 22.261 [2]) |
| NOTE 1: A packet which is delayed more than PDB is not counted as lost, thus not included in the PER.  NOTE 2: It is required that default MDBV is supported by a PLMN supporting the related 5QIs.  NOTE 3: The Maximum Transfer Unit (MTU) size considerations in clause 9.3 and Annex C of TS 23.060 [56] are also applicable. IP fragmentation may have impacts to CN PDB, and details are provided in clause 5.6.10.  NOTE 17: For interactive service with cloud/edge/split rendering, this 5QI is defined for motion tracking and sensor data. New value#3 can be together with New value#1 to support total UL+DL latency within 10ms. A static value for the CN PDB of 1 ms for the delay between a UPF terminating N6 and a 5G-AN should be subtracted from a given PDB to derive the packet delay budget that applies to the radio interface. When a dynamic CN PDB is used, see clause 5.7.3.4.  NOTE 18: For interactive service with cloud/edge/split rendering, this 5QI is defined for motion tracking and sensor data. New value#4 can be together with New value#2 to support total UL+DL latency within 20ms. A static value for the CN PDB of 1 ms for the delay between a UPF terminating N6 and a 5G-AN should be subtracted from a given PDB to derive the packet delay budget that applies to the radio interface. When a dynamic CN PDB is used, see clause 5.7.3.4.  NOTE 19: MDBV is calculated with 0.6Mbps service bit rate and corresponding 5G-AN PDB for motion tracking data as default values for New value#3 and #4. MDBV value for interactive services may be a range and other values can be signaled to the RAN according to service bit rate needed. | | | | | | | |

Q1): SA2 kindly asks RAN1 which of these proposed new standardised 5QIs can be supported by NG-RAN.