**3GPP TSG RAN2 #121bis-e R2-23xxxxx**

**Electronic, 17th – 26th April, 2023**

**Agenda Item:**  **XX.YY**

**Source: China Unicom (email rapporteur)**

**Title:** **[Post121][886][R17 SONMDT] New packet loss rate (China Unicom)**

**Document for: Discussion and Decision**

# 1 Introduction

This is the email report of [Post121][886]:

* **[Post121][886][R17 SON/MDT] New packet loss rate (China Unicom)**

Based on R2-2301855, Focus on the necessity of introducing the new packet loss rate and Figure out the proper method on when and how to introduce it if needed.

 Intended outcome: Report to the next meeting

 Deadline: 5th Apr, 10:00 UTC

Companies providing input to this email discussion are requested to leave contact information below.

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| **Company** | **Name** | **Email Address** |
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# 2 Discussion

## 2.1 Discussion on the necessity of introducing the new packet loss rate

In [1], two observations are provided:

**Observation 1: PER (packet error rate) is defined in TS 23.501 as a characteristic of a QoS Flow and it has different meanings for GBR QoS Flows with Delay-critical GBR resource type compared to other QoS Flows.**

**Observation 2: The numerator of the measurement for DL packet loss rate formula defined in TS 38.314 doesn’t contain the packets that are transmitted successfully but delayed, which is only suitable for QoS Flows with non-GBR resource type and GBR resource type, but not suitable for Qos Flows with delay-critical GBR resource type.**

Then, three conclusions are drawn:

* The existing measurement of packet loss rate in TS 38.314 is only suitable for QoS Flows with non-GBR resource type and GBR resource type which can’t cover all the types of QoS Flow.
* When it comes to QoS Flows with delay-critical GBR resource type, the measurement algorithm of packets loss rate doesn’t align with the definition of PER which is used as upper bound of the measurement.
* A new measurement needs to be introduced to meet the definition of PER for delay-critical GBR resource type which taking the delay threshold (AN-PDB, part of PDB as defined in TS23.501) into consideration.

In summary, for delay-critical GBR resource type (5QI value is 82~90 as defined in TS 23.501), the Packet Uu Loss Rate in the DL (as defined in section 4.2.1.5.1 in TS 38.314) does not contain the packets that are transmitted successfully but delayed above a threshold, and such packets have been reflected in TS 23.501, i.e. For GBR QoS Flows with Delay-critical GBR resource type, a packet which is delayed more than PDB is counted as lost, and included in the PER unless the data burst is exceeding the MDBV within the period of PDB or the QoS Flow is exceeding the GFBR.

**Q1: For GBR QoS Flows with Delay-critical GBR resource type, TS 23.501 has defined “a packet which is delayed more than PDB is counted as lost, and included in the PER”, however, the existing measurement packet loss packet has not taken such packets into account. Do companies agree with the issue?**

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| **Company** | **Yes/No** | **Comments** |
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## 2.2 Discussion on possible methods

If the issue in Q1 is valid, the next question is to figure out possible methods.

In [1], one method is provided. Details are copied as below. The principle of the method is that the following packets are counted as loss packets:

1. Packets that are not positively acknowledged
2. Or, positively acknowledged but the DL delay of the RLC SDU is more than corresponding 5G-AN PDB

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4.2.1.5.x Packet Uu Loss Rate with delay threshold in the DL per DRB per UE

The objective of this measurement is to measure the DL packets loss including any packets not successfully transmitted or delayed more than a delay threshold at Uu transmission, for OAM performance observability or for QoS verification of MDT.

Protocol Layer: RLC

**Table 4.2.1.5.x-1: Definition for Packet Uu Loss Rate with delay threshold in the DL per DRB per UE**

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| Definition | Uu Packet Loss Rate with daley threshold in the DL per DRB per UE: One packet corresponds to one RLC SDU. The measurement is done separately per DRB.Detailed definition:$$M\\_dt(T,drbid)=\left⌊\frac{[Dloss\left(T,drbid\right)+Dexd\left(T, drbid\right)]\*1000000}{N\\_dt\left(T,drbid\right)+Dloss\left(T,drbid\right)+Dexd\left(T, drbid\right)}\right⌋$$ Where explanations can be found in the table 4.2.1.5.x-2 below. |

NOTE 1: Packet loss rate with delay threshold can be used when the resource type of corresponding QoS Flow is Delay-critical GBR. It is expected to be upper bounded by the PER (packet error rate, as defined in TS 23.501[4]) of the DRB which takes values between 10-6 and 10-2. The statistical accuracy of an individual packet loss rate measurement result is dependent on how many packets have been received, and thus the time for the measurement.

NOTE 2: Delay threshold of this measurement is determined by 5G-AN PDB defined in TS 23.501.

NOTE 3: The granularity for Packet loss rate measurement is per DRB per UE, as defined in TS 28.552 [2].

**Table 4.2.1.5.x-2: Parameter description for Packet Uu Loss Rate with delay threshold in the DL per DRB per UE**

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| $$M\\_dt(T,drbid)$$ | Packet Loss Rate with delay threshold in the DL per DRB per UE. Unit: number of lost packets per transmitted packets per DRB \* 106, Integer. Lost packets here means the packets that delayed more than delay threshold or not successfully transmitted. |
| $$Dloss(T,drbid)$$ | Number of DL packets, of a data radio bearer with DRB Identity = $drbid$, for which at least a part has been transmitted over the air but not positively acknowledged, and it was decided during time period $T$ that no more transmission attempts will be done. If transmission of a packet might continue in another cell, it shall not be included in this count. |
| $$Dexd(T,drbid)$$ | Number of DL packets, of a data radio bearer with DRB Identity = $drbid$, for which is transmitted over air interface and positively acknowledged but the DL delay of the RLC SDU is more than corresponding 5G-AN PDB during time period T.The DL delay of a RLC SDU is calculated as defined in clause 5.1.1.1 in TS 28.552. |
| $$N\\_dt(T,drbid)$$ | Number of DL packets, of a data radio bearer with DRB Identity = $drbid$, which has been transmitted over the air and positively acknowledged and delayed no more than the threshold, 5G-AN PDB, during time period $T$.  |
| $$T$$ | Time Period during which the measurement is performed, Unit: minutes. |
| $$drbid$$ | The identity of the measured DRB. |

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**Q2: In order to solve the issue mentioned in Q1, do companies agree with the proposed method in [1] (also shown above)?**

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| **Company** | **Yes/No** | **Comments** |
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**Q3: In order to solve the issue mentioned in Q1, do companies have other methods? If yes, please provide short descriptions on the method and also possible specification impacts.**

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| **Company** | **Comments** |
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For the scope of this email discussion, it mentions “figure out the proper method on when and how to introduce it if needed”. During online discussions at RAN2#121, some companies thought that Rel-17 SONMDT has been completed, and thus any enhancements have to be discussed in Rel-18 or later release. So it is proposed to collect companies’ views on the proper release.

**Q4: If a measurement of packet loss rate is needed, which release is suitable for introducing the measurement, e.g. Rel-17/Rel-18?**

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| **Company** | **Rel-17/Rel-18** | **Comments** |
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In TS 38.314 the following sentence has been defined in the scope:

*Only the differences relative to TS 28.552 v16.2.0 [2] are specified in this specification.*

In Rel-16, it was agreed that TS 38.314 and TS 28.552 should avoid duplicate definitions or conflicts, so the email rapporteur thinks that it seems sufficient to only impact TS 38.314 due to new measurements, and thus there should be no impacts to other WGs (e.g. SA5). It is suggested to collect companies’ views on possible impacts to other WGs.

**Q5: Do companies observe any impacts to WGs other than RAN2?**

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| **Company** | **Yes/No** | **Comments** |
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# 3 Conclusion

[To be added]

# 4 References

[1] R2-2301855 Introduction of packet loss rate with delay threshold China Unicom, CMCC, CATT discussion Rel-17 NR\_ENDC\_SON\_MDT\_enh-Core

[2] R2-2301858 38.314 CR for the introduction of packet loss rate with delay threshold China Unicom, CMCC, CATT CR Rel-17 38.314 17.2.0 0026 - B NR\_ENDC\_SON\_MDT\_enh-Core