**3GPP TSG-SA5 Meeting #148-e S5-233500rev2**

**e-meeting, 17th-25th April, 2023**

**Source: China Unicom**

**Title: Add new solution for support for performance measurements related on URLLC resource load**

**Document for: Approval**

**Agenda Item: 6.8.3 Study on Management Aspects of URLLC**

# 1 Decision/action requested

***The group is asked to approve the proposal.***

# 2 References

[1] 3GPP TR 28.832 v0.3.0: “Management Aspects of URLLC”

[2] 3GPP TS 38.213 “NR; Physical layer procedures for control”

# 3 Rationale

It was approved in SP-220146 to study the management aspects of URLLC and one of the objectives is to investigate performance measurements related to URLLC. In order to achieve the objective mentioned above, some performance measurements related to URLLC is proposed in this contribution.

# 4 Detailed proposal

This contribution proposes to make the following changes in [1].

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| **1st Change** |

# 3 Definitions of terms, symbols and abbreviations

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

PI Preemption Indication

CI Cancellation Indication

PB Power Boosting

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| **2nd Change** |

# 5 Key Issues Investigation and Potential Solutions

## 5.X Issue #X: Support for performance measurements related on URLLC resource load

### 5.X.1 Description

#### 5.x.1.1 It exists URLLC and eMBB coexistence scenarios

Under the new definition of 5G application scenarios, there are coexistence scenarios of URLLC and eMBB services, and 3GPP protocol also contains related contents of eMBB and URLLC multiplexing mechanisms.

Taking the uplink service scenario as an example, TR 38.824 evaluates the performance of URLLC and eMBB services under enhanced UL inter UE Tx prioritization/multiplexing mechanisms, and proposes potential enhancements for UL inter UE Tx prioritization/multiplexing, which includes UE UL cancelation mechanisms and enhanced UL power control.

Corresponding to the UE UL cancelation mechanisms, there is a definition of Cancellation Indication (CI) in TS 38.213. The Cancellation Indication instructs other UE services to cancel their transmissions, which can realize resource preemption for different services in the uplink transmissions. Corresponding to enhanced UL power control, there is a related definition of power boosting (PB). By increasing the uplink transmission power of the UE, it can resist the interference caused by the transmission of other UEs.

At the same time, preemption indication (PI) is also defined for resource preemption of different services in the downlink transmission, and PI can be used to indicate to other UEs that their resources are preempted.

The contents of the above protocols confirm the existence of URLLC and eMBB coexistence scenarios.

#### 5.x.1.2 Support for performance management related on URLLC resource load

At present, the network resource load is mainly evaluated through resource usage-related measurements. Referring to TS 28.552, the evaluation measurements are mainly PRB usage rate-related measurements, which measures usage (in percentage) of physical resource blocks (PRBs). Although these measurements can evaluate the overall resource load of the cell, they cannot effectively evaluate the resource load of the URLLC service under the eMBB and URLLC multiplexing scenarios.

For example, in a statistical time period, the PRB usage rate of the network is low. Because the URLLC service has high requirements for delay sensitivity, it needs to be transmitted immediately. If the URLLC service has data transmission requirements on the resources scheduled by eMBB, the URLLC service will preempt eMBB service resources. In this case, since the PRB usage rate only reflects the overall resource load of the cell, it cannot reflect the situation that the resources of the URLLC service are insufficient at this time.

Therefore, the existing PRB related measurements cannot effectively evaluate the resource load of URLLC services under eMBB and URLLC multiplexing scenarios. And what this issue needs to solve is to propose measurement method for evaluating the resource load of URLLC services in eMBB and URLLC multiplexing scenarios.

1. X.2 Potential solutions

Since the existing resource load measurements only reflect the overall resource load of the cell, they cannot be counted separately distinguishing URLLC and eMBB services. And when resource preemption occurs under eMBB and URLLC multiplexing scenarios, they cannot effectively evaluate the resource load of URLLC services. Therefore, relevant measurements below should be added to better evaluate the resource load of URLLC services under multiplexing scenarios.

#### 5.x.2.1 DL URLLC resource load measurements

Referring to TS 38.213, for resource multiplexing and preemption under multi-service coexistence scenarios, the downlink service scenario defines the PI (Preemption Indication, TS 38.213) feature. PI can be used to indicate to other UEs that their resources are preempted.

The requirements for performance management of radio network providing URLLC services is:

* The OAM should have the capability of performing measurement on DL (DownLink) resource load of URLLC services under eMBB and URLLC multiplexing scenarios.

Based on the requirement, a measurement on DL resource load of URLLC services can be defined as follows:

* **Measurement name:** DL PI Time Domain Proportion
* **Statistical method:** This measurement provides the proportion of time domain resources that use the PI (Preemption Indication) feature in the statistical period. Taking a fixed time duration as one sampling occasion, the numerator of this measurement is the number of sampling occasions that use the PI feature (when the number of preempted PRBs is greater than 0), and the denominator is the number of sampling occasions with DL data transmitted (eMBB, URLLC).
* **Measurement result:** Each measurement is a real value.
* **Measurement Object Class：**NRCellDU
* **Use case：**One usage of this measurement is for evaluating DL resource load of URLLC services under eMBB and URLLC multiplexing scenarios.

#### 5.X.2.2 UL URLLC resource load measurements

Referring to TS 38.213, for resource multiplexing and preemption under multi-service coexistence scenarios, the uplink service scenario defines CI (Cancellation Indication, TS 38.213) and PB (Power Boosting, TS 38.213) features. For CI, it can instruct other UE services to cancel their transmissions, which can realize resource preemption for different services in the uplink transmissions. For PB, by increasing the uplink transmission power of the UE, it can resist the interference caused by the transmission of other UEs.

The requirements for performance management of radio network providing URLLC services is:

* The OAM should have the capability of performing measurement on UL (UpLink) resource load of URLLC services under eMBB and URLLC multiplexing scenarios.

Based on the requirement, measurements on UL resource load of URLLC services can be defined as follows:

* **Measurement name:** UL CI Time Domain Proportion
* **Statistical method:** This measurement provides the proportion of time domain resources that use the CI (Cancellation Indication) feature in the statistical period. Taking a fixed time duration as one sampling occasion, the numerator of this measurement is the number of sampling occasions that use the CI feature (when the number of cancelled PRBs is greater than 0), and the denominator is the number of sampling occasions with UL data transmitted (eMBB, URLLC).
* **Measurement result:** Each measurement is a real value.
* **Measurement Object Class：**NRCellDU
* **Use case：**One usage of this measurement is for evaluating UL resource load of URLLC services under eMBB and URLLC multiplexing scenarios.
* **Measurement name:** UL PB Time Domain Proportion
* **Statistical method:** This measurement provides the proportion of time domain resources that use the PB (Power Boosting) feature in the statistical period. Taking a fixed time duration as one sampling occasion, the numerator of this measurement is the number of sampling occasions that use the PB feature (when the number of power boosted PRBs is greater than 0), and the denominator is the number of sampling occasions with UL data transmitted (eMBB, URLLC).
* **Measurement result:** Each measurement is a real value.
* **Measurement Object Class：**NRCellDU
* **Use case：**One usage of this measurement is for evaluating UL resource load of URLLC services under eMBB and URLLC multiplexing scenarios.

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| **End of changes** |