**3GPP TSG-SA5 Meeting #137e *S5-213140rev03***

**11 to 18 May 2021, E-meeting**

**Source: China Telecom**

**Title: pCR 28.813 on KPI of energy efficiency of URLLC type of network slice**

**Document for: Approval**

**Agenda Item: 6.5.1**

# 1 Decision/action requested

***The group is asked to discuss and endorse on the proposal.***

# 2 References

[1] 3GPP TR 28.813: "Study on new aspects of Energy Efficiency (EE) for 5G"

[2] 3GPP TS 28.554: "Management and orchestration; 5G end to end Key Performance Indicators (KPI)"

[3] 3GPP TS 23.501: "System architecture for the 5G System (5GS)"

# 3 Rationale

When the performance of the Network Slice is considered for EE KPI of the URLLC type of network slice as described in [1], a generic definition is preferred. And the scenarios where PSA UPF has only N3 interface and PSA UPF has only N9 interface should both be supported.

Moreover, notice that the *Network slice mean latency* supports the aforesaid two scenarios by using a weighted latency measured based on the PSA UPF's N3 interface and N9 interface, respectively [2], therefore, it is proposed that when the data volume is considered for the deriving the EE KPI of the URLLC type of network slice, a similar method can be applied that using the weighted data volumes measured on both N3 interface and N9 interface of the PSA UPF.

Therefore, we proposed the following update based on the following principles:

* the data volume used to derive the network slice performance as well as the EE KPI of the URLLC type of network slice should take the data volumes measured on N3 or N9 interface of the PSA UPF into account, according to the deployment.
* A weighted data volume based on data volume measured on the N3 and N9 interface of the PSA UPF can be used to provide a generic equation to cover both the case where the PSA UPF has only N3 interface and the case where the PSA UPF has only N9 interface.

# 4 Detailed proposal

#### 4.4.2.2a Potential solution #2a: Performance of network slice for URLLC

##### 4.4.2.2a.1 Introduction

This potential solution focuses on the Low Latency (LL) characteristic of the URLLC type of network slice. The ‘Ultra Reliable’ (UR) characteristic of the URLLC type of network slice is not addressed by this potential solution.

In this potential solution, data volume and latency are two factors considered for evaluating the performance of network slice, i.e. the performance of network slice (Pns) for URLLC type of network slice is the sum of UL and DL traffic data volumes multiplied by the inverse of the end-to-end User Plane (UP) latency of the network slice. This solution is applicable for the cases where, for example, the URLLC network slice is deployed and operators want to evaluate the Energy Efficiency of the slice at different periods of time, such as the busy hours in the morning and the idle hours in the mid night, in which both latency performance and the data volume performance can vary.

##### 4.4.2.2a.2 Description

The performance of network slice (Pns) for URLLC type of network slice is the sum of UL and DL traffic volumes at N3 interface or N9 interface of the PSA UPF on a per S-NSSAI basis multiplied by the inverse of the end-to-end User Plane (UP) latency of the network slice:



where





wN3 and wN9 are the weight for DVN3 and DVN9 respectively. wN3 and wN9 can be decided according to the deployment of PSA UPF. For example, in cases where PSA UPF has only N9 tunnels, such as the ones described in TS 23.501[2] clause 5.6.4 and clause 5.33.2.2, wN3 can be set to 0 and WN9 can be set to 1, so that only N9 interface is considered. In the cases where PSA UPF has only N3 tunnels, wN3 can be set to 1 and wN9 can be set to 0, so that only N3 interface is considered.

The final Network Slice EE KPI definition, based on both Latency and Data Volume (DV), would be defined as follows:



The following measurements, defined in TS 28.552 [4], are used:

- GTP.InDataOctN3UPF.SNSSAI: Number of octets of incoming GTP data packets on the N3 interface, from (R)AN to UPF), where SNSSAI identifies the S-NSSAI, as defined in TS 28.552 [4] clause 5.4.1.3;

- GTP.OutDataOctN3UPF.SNSSAI: Number of octets of outgoing GTP data packets on the N3 interface, from (R)AN to UPF), where SNSSAI identifies the S-NSSAI, as defined in TS 28.552 [4] clause 5.4.1.4.

- GTP.InDataOctN9PsaUpf.*SNSSAI*: number of octets of GTP data PDUs received on the N9 interface by the PSA UPF per S-NSSAI, where SNSSAI identifies the S-NSSAI, as defined in TS 28.552 [4] clause 5.4.4.2.3.

- GTP.OutDataOctN9PsaUpf.*SNSSAI,* number of octets of outgoing GTP data PDUs sent on the N9 interface by the PSA UPF per S-NSSAI, where SNSSAI identifies the S-NSSAI, as defined in TS 28.552 [4] clause 5.4.4.2.4.

NOTE: In cases of redundant transmission paths for high reliability as described in TS 23.501[2] clause 5.33.2.2, it is expected that only one of the multiple N3/N9 tunnels for redundant transmission connecting to PSA UPF is taken into account. The main reason for this is that, if the traffic is counted more than once, it will increase artificially the *EEURLLC,DV,Latency* KPI.

The following KPIs, defined in TS 28.554 [5], are used to calculate Network Slice Latency:

- DelayE2EUlNs: Average e2e uplink delay for a network slice, defined in TS 28.554 [5] clause 6.3.1.8.1 as the average e2e UL packet delay between the PSA UPF and the UE for a network slice;

- DelayE2EDlNs: Average e2e downlink delay for a network slice, defined in TS 28.554 [5] clause 6.3.1.8.2 as the average e2e DL packet delay between the PSA UPF and the UE for a network slice.