**3GPP TSG-SA5 Meeting #137e *S5-213143rev01***

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

**Source: China Telecom**

**Title: Discussion Paper on Useful Output Measurement Solutions**

**Document for: Endorsement**

**Agenda Item: 6.5.1**

# 1 Decision/action requested

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

# 2 References

[1] ETSI ES 203 539: "Environmental Engineering (EE); Measurement method for energy efficiency of Network Functions Virtualisation (NFV) in laboratory environment"

[2] 3GPP TR 28.813: "Study on new aspects of Energy Efficiency (EE) for 5G "

[3] 3GPP TS 23.501: "5G; System Architecture for the 5G System".

[4] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements"

# 3 Rationale

3.1 Background

In ES 203 539[1], the Useful Output was defined as the maximum capacity of the system under test which is depending on the different functions in both data plane/user plane or control plane.

In TS 28.813[2], an Editor’s note was left:

The measurement of the useful output for the 5GC NF is FFS.

In this contribution, the measurement of the useful output for the 5GC NF is discussed. And the Useful Output with regarding to the control plane of the 5GC is also discussed.

3.2 Discussion

From the operator’s point of view, the functions provided within user plane and control plane of the 5G network are mainly rooted in providing or supporting the data transmission of the user. In other words, the user and the data transmission are two main objects for which the functions provided within 5G are designed. And this understanding is also applicable to the 5GC.

The 5G system architecture [3] is shown as below:



**Observation 1:** Form the 5G system architecture, the information exchanged between 5GC and the UE is related to the information exchanged through N1, N2 and/or N3 interfaces.

In order to get a measurement of the capacity of the 5GC, the N1, N2 and/or N3 interfaces may be taken as start point for the discussion.

3.2.1 Useful Output of UPF

The N3 interface is provided by UPF. In TS 28.552[4], the performance measurements with regarding to UPF interfaces were defined, such as the number of GTP PDU packet and the number of octets of GTP PDU packet measured on N3 as well as N9.

When the number of octets of GTP PDU packet on UPF N3 and/or N9 interfaces changes, it is considered that the capacity of the 5G core network, or more specified the user plane of the 5G core network, as a system will change accordingly.

And based on this measurement, the Data Volume of UPF and 5GC has been proposed in the previous discussions.

**Observation 2:** Based on the number of octets of GTP PDU packet on UPF N3 interface, the measurement of Data Volume of UPF and the measurement of Data Volume of 5GC has been proposed in TR 28.813.

As described in [1] based on different network function, the Useful Output can be expressed as the number of Erlang (Erl), Packets/s (PPS), Subscribers (Sub) or Simultaneously Attached Users (AU). More specifically, the Useful Output may be the throughput (e.g. bps) of data plane VNF or capacity (e.g. subscribers, sessions) for control plan VNF.

**Observation 3:** The Useful Output may be the throughput (e.g. bps) of data plane VNF or capacity (e.g. subscribers, sessions) for control plan VNF.

Based on Observation 2 and observation 3, we proposed to reuse the definition of Data Volume of UPF as the Useful Output of the UPF.

**Proposal 1: Useful Output of the UPF may reuse the measurement of Data Volume of UPF.**

The measurement of the user plane of 5GC has already been proposed and it is based on the data volume of the UPF. In case the proposal 1 is endorsed, the Useful Output of the user plane of the 5GC is equivalent to the data volume of the user plane of the 5GC. The potential solutions on the data volume of the user plane of the 5GC can be reused.

3.2.2 Useful Output of AMF

The N1 and N2 interfaces are all provided by AMF. In [4], the performance measurement of the AMF is also defined, and the mean number of the registered state subscribers per AMF is one of the metrics.

Based on Observation 3 and above, we propose the following:

**Proposal 2: The measurement of mean number of the registered subscribers defined in TS 28.552 can be taken as the Useful Output of the AMF.**

When the mean number of the registered subscribers of (all instances of) the AMF changes, the capacity of the 5G core network as a system will change accordingly. The 5G core network can be considered as a system. Similar to Observation 2, the performance measurement of the AMF, such as the mean number of the registered subscribers may be taken into account as the capacity of the 5G core network. Moreover, as AMF is in the control plane of the 5GC, the performance measurement of the AMF may be used, more specifically, to describe the capacity of control plane of 5GC.

**Proposal 3: the mean number of the registered subscribers measured on AMF may be taken as the measurement of the Useful Output of the control plane of the 5GC.**

3.2.3 Useful Output of SMF

The UPF and 5GC control plane is related via N4 reference point between the UPF and SMF.

As SMF is within 5GC control plane, this relationship provides a possibility to investigate the capacity of the 5GC control plane via the performance measurement of SMF. In [4], the performance measurement of the SMF is defined, the mean of the number of PDU Sessions is one of those metrics.

Based on Observation 3 and above, we propose the following:

**Proposal 4: the measurement of mean of the number of PDU Sessions defined in TS 28.552 can be taken as the Useful Output of the SMF.**

And this metric can be taken into account for the capacity of control plane of 5GC.

**Proposal 5: the mean of the number of PDU Sessions measured in SMF may be taken as the measurement of the Useful Output of the control plane of the 5GC.**

3.3 Conclusion

It is proposed to take the following as the WF on Useful Output measurement of the 5GC.

**Proposal 1: Useful Output of the UPF may reuse the measurement of Data Volume of UPF.**

**Proposal 2: The measurement of mean number of the registered subscribers defined in TS 28.552 can be taken as the measurement of the Useful Output of the AMF.**

**Proposal 3: the measurement of mean number of the registered subscribers measured on AMF may be taken as the measurement of the Useful Output of the control plane of the 5GC.**

**Proposal 4: the measurement of mean of the number of PDU Sessions defined in TS 28.552 can be taken as the measurement of the Useful Output of the SMF.**

**Proposal 5: the measurement of the mean of the number of PDU Sessions measured in SMF may be taken as the measurement of the Useful Output of the control plane of the 5GC.**

# 4 Detailed proposal

SA5 is asked to endorse the followings as the way forwards for the discussions on the Useful Output of 5GC NFs and 5GC:

* Useful Output of the UPF may reuse the measurement of Data Volume of UPF.
* The measurement of mean number of the registered subscribers defined in TS 28.552 can be taken as the measurement of the Useful Output of the AMF.
* The measurement of mean number of the registered subscribers measured on AMF may be taken as the measurement of the Useful Output of the control plane of the 5GC.
* The measurement of mean of the number of PDU Sessions defined in TS 28.552 can be taken as the measurement of the Useful Output of the SMF.
* The measurement of mean of the number of PDU Sessions measured in SMF may be taken as the measurement of the Useful Output of the control plane of the 5GC.