**3GPP TSG-SA5 Meeting #145-e *S5-225551rev2***

e-meeting, 15 - 24 August 2022

**Source: Huawei**

**Title: Potential solution No.2, conclusion and recommendation for KI #1**

**Document for: Approval**

**Agenda Item: 6.9.2.1**

# 1 Decision/action requested

**Include the proposed changes in TR 28.913**

# 2 References

[1] 3GPP TR 28.913: "Study on new aspects of EE for 5G networks phase 2"

[2] SP-211440: "New Study on new aspects of EE for 5G networks Phase 2"

# 3 Rationale

During SA5#142e, S5-222024 introduced a new key issue ‘Considering additional virtual resources usage metrics in EC estimation’, which proposed to consider vDisk usage, in addition to vCPU usage, to estimate the energy consumption of VNF/VNFCs. The key issue and potential solution #1 are captured in clause 4.1 of [1].

During SA5#144e, S5-224093 proposed to consider the input/output traffic volume of virtual resources, in addition to vCPU and vDisk usage, to estimate the energy consumption of VNF/VNFCs. This proposal has been rejected, and it was mentioned that incoming/outgoing traffic is already impacting vCPU or vDisk processing, meaning that, whatever processing vCPUs and vDisks are doing, it is for handling traffic volumes. Hence considering traffic volume again in the equation as separate influencing factor has been deemed irrelevant, as it would make traffic volume impact to be considered twice. During offline discussions, it was also said that the vMemory usage of virtual compute resources has also no significant impact on their energy consumption.

Therefore, this pCR proposes to capture this (see Potential solution No. 2) and add a conclusion and a recommendation for this key issue.

# 4 Detailed proposal

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| **First change** |

## 4.1 Key Issue #1: Considering additional virtual resources usage to estimate VNF energy consumption

### 4.1.1 Description

In Release 17 (see [2] clause 6.7.3.1), the Energy Consumption (EC) of VNFs is obtained by summing up the estimated energy consumption of its constituent Virtualized Network Function Components (VNFC), where the estimated energy consumption of a VNFC is obtained by taking the estimated energy consumption of the virtual compute resource instance on which the VNFC runs. The energy consumption of a virtual compute resource instance X is estimated as a proportion of the energy consumption of the NFVI node on which the virtual compute resource instance X runs. This proportion is obtained by dividing the vCPU mean usage of the virtual compute resource instance X, by the sum of the vCPU mean usage of all virtual compute resource instances running on the same NFVI Node as X, during the same observation period.

This key issue investigates how additional performance measurements of virtual compute resources, also provided by NFV MANO, can be considered in the estimation of the energy consumption of VNFCs, and consequently of VNFs.

### 4.1.2 Potential solutions

#### 4.1.2.1 Potential solution #1: Estimated virtual compute resource instance energy consumption based on mean vCPU and vDisk usage

##### 4.1.2.1.1 Introduction

In this potential solution #1, it is proposed to consider the mean virtual disk usage of the virtualised compute resource instance, in addition to the mean vCPU usage, to estimate the energy consumed by the virtual compute resource instance. Thus, the definition of the estimated energy consumption of a virtual compute resource instance combines both virtual CPU mean usage and virtual disk mean usage.

##### 4.1.2.1.2 Description

In this potential solution #1, the energy consumption of a virtual compute resource instance X is estimated as a proportion of the energy consumption of the NFVI node on which the virtual compute resource runs. This proportion is obtained by multiplying relative mean virtual CPU usage and virtual disk usage of the virtual compute resource instance X. The relative mean virtual CPU usage of the virtual compute resource instance X is obtained by dividing the vCPU mean usage of the virtual compute resource instance X, by the sum of the vCPU mean usage of all virtual compute resource instances running on the same NFVI Node as X, The relative mean virtual disk usage of the virtual compute resource instance X is obtained by dividing the vDisk mean usage of the virtual compute resource instance X, by the sum of the vDisk mean usage of all virtual compute resource instances running on the same NFVI Node as X. This is defined by the equation below:



, where:

- VCpuUsageMean is the mean virtual CPU usage of the virtual compute resource instance during the observation period, provided by NFV MANO,

-  is the sum of the mean virtual CPU usage of all virtual compute resource instances running on the same NFVI Node during the same observation period, all separately provided by NFV MANO (see clause 7.1.2 of [3],

- VDiskUsageMean is the mean virtual disk usage of the virtual compute resource instance during the observation period, provided by NFV MANO,

- is the sum of the mean virtual disk usage of all virtual compute resource instances running on the same NFVI Node during the same observation period, all separately provided by NFV MANO (see clause 7.1.6 of [3],

- ECNFVINode,measured is the measured energy consumption of the NFVI node on which the virtual compute resource instance runs, during the same observation period, as per ETSI ES 202 336-12 [4],

#### 4.1.2.i Potential solution #2: Estimated virtual compute resource instance energy consumption based on mean vDisk usage

##### 4.1.2.i.1 Introduction

In this potential solution #2, it is proposed to consider the mean virtual disk usage of the virtualised compute resource instance only,

##### 4.1.2.i.2 Description

In this potential solution, the energy consumption of a virtual compute resource X is estimated as a proportion of the energy consumption of the NFVI node on which the virtual compute resource runs, this proportion being obtained by dividing the vDisk mean usage of the virtual compute resource X, by the sum of the vDisk mean usage of all virtual compute resources running on the same NFVI Node as X, as defined by the equation below:



where:

- VDiskUsageMean is the mean vDisk usage of the virtual compute resource during the observation period, provided by NFV MANO,

-  is the sum of the vDisk mean usage of all virtual compute resources running on the same NFVI Node during the same observation period, all separately provided by NFV MANO (see clause 7.1.6 of [3],

- ECNFVINode,measured is the measured energy consumption of the NFVI node on which the virtual compute resource runs, during the same observation period, as per ETSI ES 202 336-12 [4].

### 4.1.3 Conclusion

FFS.

### 4.1.4 Recommendation

FFS.

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| **End of changes** |