**3GPP TSG-SA WG4 Meeting #129-eS4-241560\_r1**

**E-meeting, 19 - 23 August 2024**

**Source: Samsung Electronics Co., Ltd.**

**Title: [FS\_MediaEnergyGREEN] Pseudo CR on Use case on scheduled green media processing for reducing GHG**

**Spec: 3GPP TR 26.942 v0.2.1**

**Agenda item: 8.7**

**Document for: Agreement**

**1. Introduction**

This contribution is a revision of S4-241032\_r01 submitted, revised and presented at SA4 #128. Updates in this contribution reflect changes made according to the comments received, in particular clarification on the factors which may affect the selection of an edge server for computing, as well as refining the requirements relevant to SA4.

**2. Reason for Change**

Clause 5.14 of TR 22.882 describes a “Use case on reducing GHG footprint of Application Services”, where the training of an AI model is performed by a computing node provided by an operator, according to energy consumption information associated with the operator’s computing nodes and application servers.

In this document we present a refined use case based on the above, in the SA4 context.

**3. Proposal**

It is proposed to agree the following changes to 3GPP TR 26.942 v0.2.0.

\* \* \* First Change \* \* \* \*

5.2 Additional use cases defined by SA4

### 5.2.x Scheduled green media processing for reducing GHG

Pre-conditions:

- A Mobile Network Operator (MNO) provides the computing services through computing nodes owned by itself or a third party via Service Level Agreement (SLA), which execute compute tasks (e.g., offloaded by users). Each computing node is powered by renewable energy (e.g., solar energy), non-renewable energy (e.g., coal) or mix of both. The highly variable nature of renewable energy sources means that the resulting GHG emissions by each computing node varies considerably by time and location. The high cost of large-scale energy storage systems (e.g., battery) incentivises the MNO to consume the renewable energy immediately when it is produced (e.g., to reduce the cost of installing a battery system). The ratio of renewable energy measures the ratio of the power used that comes from renewable energy sources as a percentage of total power usage in a given time unit.

NOTE: A computing node is the resource that executes compute tasks belonging to Application Service Providers, e.g., a server node hosted by an Edge Computing Service Provider (ECSP) in the Edge Data Network based on PLMN operator service agreement. Alternatively, the ECSP and the PLMN operator may be part of the same organisation.

Details:

1. User subscribes to the "green compute and communication service (to minimize the amount of non-renewable power used" subscription offering of the MNO.

2. User A is an influencer and creates content of reasonably long duration (typically around 30 minutes) for publication on a on a weekly basis, at the same time every week, indicated in advance to the MNO using an API on the 5G System.

3. User A captures and edits the weekly content in advance of the release time and contributes it to a social media platform via the MNO's Media Delivery System from a UE, offloading the transcoding compute task of the content to the MNO's Media Delivery System.

4. In the MNO's Media Delivery System, typically the computing resource (e.g. edge server) closest to User A is selected to execute User A’s task, but since User A is subscribed to the "green compute and communication service", the selection of a computing node for the computing task to be executed is based on the following factors:

- *Computing node green energy status.* Where a computing node has green energy available to it at the time of computation request.

- *Computing node green energy reserve.* Where a computing node has surplus green energy available to it in the form of stored renewable energy.

- *The delivery path between the computing node and User A, taking into account the inter-site shipping distance over which the data has to be transmitted, as well as the green energy rating of the sites through which the data has to be transmitted.*

- *The type of task and the most optimized computing resource available for the task*. For example, a hardware video encoder for a transcoding task, GPU accelerators for an AI inferencing task).

- *The urgency of the task.* Based on the deadline for publishing the final media asset.

- *Preferences on the minimum green energy ratio:* The proportion of green energy used to generate and encode the final published media asset.

5. Depending on the factors above, the "green compute and communication service" may also delay or schedule the uplink of the source media asset to the MNO's network, and the computation of the media transcoding task according to green energy availability.

6. No matter which computing node is selected for execution of User A’s computational task, the task is always completed by the publication deadline specified by User A.

7. By scheduling and selecting a computing node with available green energy for the task provided by the “green compute and communication” service, the computing tasks requested by User A can be nearly carbon-free, at the same time satisfying the weekly publication deadline.

\* \* \* Second Change \* \* \* \*

### 6.1.2 Potential requirements

Subclause 6.4 in [22882] contains the consolidated requirements extracted from use cases, related to information exposure related with this Key Issue:

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| [CPR 6.4-1] Subject to operator’s policy and agreement with 3rd party, the 5G system shall be able to expose information on energy consumption forserving this 3rd party.  [CPR 6.4-2] Subject to operator’s policy, the 5G system shall support a means to expose energy consumption to authorized third parties for services, including energy consumption information related to the condition of energy credit limit (e.g. when the energy consumption is reaching the energy credit limit).  [CPR 6.4-3] Subject to operator policy, the 5G system shall provide means for the trusted 3rd party, to configure which network performance statistic information (e.g. the data rate, packet delay and packet loss) for the communication service provided to the 3rd party, needs to be exposed along with the information on energy consumption for serving this 3rd party.  [CPR 6.4-4] Based on operator policy and agreement with 3rd party, the 5G system shall be able to expose energy consumption information and prediction on energy consumption of the 5G network per application service to the 3rd party.  [CPR 6.4-5] Subject to operator’s policy and agreement with 3rd party, the 5G system shall support a mechanism for the 3rd party to provide current or predicted energy consumption information over a specific period of time. |

Additional potential requirements identified from clause 5.2:

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| [PR 1-1] The UE shall support the reporting of the media characteristics and type of media processing task for the selection and scheduling of a green energy optimised network computing resource (e.g. edge server) for network media processing.  [PR 1-2] The scheduling of uplink media data delivery with green energy as a criteria shall be supported such that use of green energy is prioritised for a media delivery session.  [PR 1-3] The scheduling of computing tasks at a computing node (e.g. edge server) for media processing with green energy as a criteria shall be supported such that use of green energy is prioritised for a network media processing task.  [PR 1-4] The exposure of computing resource information from available computing nodes (e.g. edge servers) shall be supported such that the optimised source (in terms of energy efficiency) can be selected based on the media processing task. |

\* \* \* End of Changes \* \* \* \*