**Source: Huawei (Rapporteur)**

**Title: KI#4 and KI#5, key questions for company view collection**

This document is to collect company views on key questions of KI#4 and #5 to facilitate the following conclusion discussion. Please kindly provide your company views on the following questions before EoB of Sep 16th. The rapporteur will collect the views and propose summary/way forwards/SoH for further discussion afterwards.

### Q1: How does UPF identify DL PDU Set info?

* Option 1: use existing IETF RTP/SRTP RFC and draft
* Option 2: Define/extend N6 protocols to carry related info
  + Option 2.1: extend GTP-U protocol
  + Option 2.2: extend HTTP header (S2-2205830)
  + Option 2.3: extend RTP header
* Option 3: UPF implementation based on e.g. traffic characteristics.
* Option 4: UPF interacts with NWDAF(S2-2205838)

**[Nokia view]**

**Position:** Support Option 1 and Option 3. Option 2 should be pursued in the longer term

**Justification**:

Option 1 supports existing mechanisms for encoding PDU Set information on N6, and hence is likely to have the widest applicability and the greatest ease of adoption for applications. Option 1 has several sub-options, any of which may be supported according to implementation:

* Option 1.1: RTP is unsecured, frame marking extension header is not in use
* Option 1.2: RTP is unsecured, frame marking extension header is in use
* Option 1.3: RTP is secured (SRTP), frame marking extension header is not in use
* Option 1.4: RTP is secured (SRTP), frame marking extension header is in use

In Options 1.1 and 1.2 the 5GS can identify rich set of information about the application traffic, e.g., for video individual slices and their types (H.26x NAL units) can be identified as well as information about the frame and its dependencies. In Option 1.4 slice level information is not visible, but frame start, end, type and dependencies can be identified. In Option 1.3 the information is scarce, possibly only frame start and end can be identified. This means the GTP-U header should have optional fields and RAN will get a different level of information in the GTP-U header depending on the case.

Option 3 does not require standardization of PDU set identification and is thus supported by default.

Option 2 requires standardization on N6, which only adds to the many alternatives already defined in Option 1, and in the case of Options 2.2 and 2.3, creates a dependence on outside standards bodies. Option 2.3 is important as it can provide more information about the traffic, especially about the video slices which are not identifiable when Secure RTP is used (see Options 1.3 and 1.4 above). It should be done in collaboration between SA4 and the IETF . The same applies to Option 2.2.

Option 4 is beyond the current and planned (Rel. 18) scope and capability of the NWDAF. While eNA\_Ph3 (Rel 18, TR23.700-81 KI#2) is considering NWDAF assisted application detection, there is no consideration in the KI of real-time detection of media layer attributes that would be classified as a PDU Set.

### Q2. How to deliver PDU Set importance information to RAN:

* Option 1: use different QoS Flows with different priority level. PDU Set importance is mapped to existing QoS flow priority.
* Option 2: use one QoS flow for different PDU Set with different priority level
  + Option 2.1: use different sub-QoS Flow within one QoS Flow, and using sub-QoS flow Identifier in GTP-U header
  + Option 2.2: use PDU Set importance information in GTP-U header

**[Nokia view]**

**Position:** Support Options 2.1 (preferred) or Option 2.2.

**Justification**:

Options 2.1 and 2.2 are similar. Both have an indication that distinguishes PDU Sets in the GTP-U header. How PDU Sets are handled in the NG-RAN should be determined by PDU Set QoS parameters, such as PSDB, PSER and PDU Set Priority sent via NG-AP, where a separate set of QoS parameters may be provided for each “importance” or “QoS Sub-Flow” designation in the GTP-U header. Option 2.2 provides the additional feature that the UPF has knowledge of relative importance of PDU Sets it identifies.

Option 1 introduces out-of-order PDUs at the UE / application client, with possible unanticipated consequences.

### Q3: Support to PDU Set dependency-based scheduling

* Option 1: Identify accurate dependency relationship between PDU Sets for scheduling.
* Option 2: In some scenario (e.g. closed GOP), the decoding of the non-I frames between two successive I frames always directly or indirectly relies on the 1st I frame of the two successive I frames. If the 1st I frame is in error, the non-I frames can be dropped until the next I frame. (proposed in S2-2205839)
* Option 3: If a PDU Set is depended by others, it can be considered as more important during scheduling. But the scheduling will not further consider the accurate dependency relationship.

**[Nokia view]**

**Position:** Support Option 1.

**Justification**: The GTP-U header should support dependency information as optional parameter(s). Whether it is possible for an implementation to included dependency information depends on which Options in Q1 are supported by the implementation and what protocols the actual traffic is using, see the sub-options 1.1 to1.4 in the answer to Q1. Dependency should be explicitly indicated without assumptions in the NG-RAN of the media-type. The NG-RAN is not aware of the specific media (e.g. that a PDU set is an I-Frame or a P-Frame). Option 2 does not work, for example if the PDU Set is a slice (where slices within a Frame are independent) rather than a Frame. Option 3 does not allow the coupling of dependent PDU Set transmission on the successful transmission of the PDU Set on which it is dependent.

### Q4. Support to hierarchical PDU Set:

* Option 1: introduces PDU Set group. (S2-2205938)
* Option 2: not support.

**[Nokia view]**

**Position: Support Option 1**

**Justification**: PDU Set group is necessary to indicate dependency of P-Frames on I-Frames when the PDU Set is a Slice. In addition, the PDU Set Group concept is extensible to support independent and dependent Temporal and Spatial layers for scalable media.

### Q5. On “*Whether to drop a PDU Set in case PSDB is exceeded*”, do we need further define “*PDU Set Discard Time*” (A PDU Set shall be dropped in case this time is exceeded (sol 25 etc):

* Option 1: Support
* Option 2: not support.

**[Nokia view]**

**Position: Option 1: Support**

**Justification**: If the PDSB of an I-Frame is exceeded, it may not be useful for rendering, but it can be used for decoding of subsequent P-Frames. A separate PDU Set Discard Time or validity time should be provided as a QoS Parameter, where a separate “PDU Set Discard Time” or “PDU Set Validity Time” may be provided for each “importance” or “QoS Sub-Flow” designation in the GTP-U header (see response to Q2). This allows, for example, PDU Sets comprised of I-Frame PDUs (marked e.g. with importance=1) to have a different PDU Set Discard time from PDU Sets comprised of P-Frame PDUs (marked e.g. with importance=2).