**3GPP TSG-WG SA2 Meeting #162 S2-2404976r1**

**15th – 19th April 2024, Changsha, China (merged with x4183)**

**Source: Meta USA, Huawei, HiSilicon**

**Title: KI #1c: Sol #23 update and conclusion proposals**

**Document for: Approval**

**Agenda Item: 19.3**

**Work Item / Release: FS\_XRM Ph2 /Rel-19**

***Abstract of the contribution:****update sol#23 and propose conclusion*

# 1 Discussion

Proposal#1: to delete these two EN’s as they are meant for alternative solutions (to be provided by someone if anyone).

Editor's note: Whether an existing parameter can be reused as correlation value is FFS.

Editor's note: It needs to be determined whether the action is included as part of PDU Set Information over N3 or it is included as part of PDU Set QoS parameters over NGAP.

The following points are clarified:

1. Clarification on other implementation options of PDU set correlation information in the PDU set information.
2. Clarification on the action also for independent PDU set
3. Clarification on the provision of dependent treatment actions via CP

Many solutions in the TR contain statements like “SA WG2 will reach out to SA WG4, SA2 with reach out to RAN WG2 and RAN WG3, etc”, how to address this type of issue should be common across all solutions. Maybe a common LS to other WG needs to be drafted together for any solutions that can be agreed in SA2. In other words, don’t wait for other WG input before SA2 can make any decision.

Proposal #2: to conclude this solution as way forward in conclusion section.

# 2 Proposal

\*\*\* begin change \*\*\*

\* \* \* \* First change \* \* \* \*

## 6.23 Solution #23: PDU set discard based on PDU sets correlation info from AS/AF

### 6.23.1 Key Issue mapping

This solution is for Key Issue #1, which enhances the PDU set based QoS handling by using the additional information (i.e. PDU set correlation info) provided by AS/AF for better congestion handling.

### 6.23.2 Description

For real time application, the stale data if received by the device may not be useful for rendering and is only wasting the battery on the UE due to transceiver usage and computation processing. Considered that AR glass is limited in form factor, any radio transmission that does not produce any meaningful outcome to end-user should be avoid.

The additional information comprising the PDU set information for this solution are labelled below with **\*\***. Other PDU Set information are carried from Rel-18.

The PDU Set Information comprises:

- PDU Set Sequence Number.

- Indication of End PDU of the PDU Set.

- PDU Sequence Number within a PDU Set.

- PDU Set Size in bytes.

- PDU Set Importance, which identifies the relative importance of a PDU Set compared to other PDU Sets within a QoS Flow.

**\*\*** PDU Set correlation, which identifies how this PDU set is related or depended with other PDU Set within the same QoS flow.

For example, AS encodes video using 15fps with I,P1,P2,P3,I,… structure. Each frame is encoded as its own PDU set from AS. The decoder needs previously encoded I/P-frames for proper rendering.

In this example, if RAN discards the first I-frame during congestion then the following three P-frames are useless to the receiver/decoder. Likewise, if RAN discards P2 then P3 is also useless to the receiver/decoder.

NOTE: When frame(s) are missing, decoder has its own implementation on how to minimize the bad QoE to the end-user.

This solution proposes that AS can provide PDU Set correlation info as part of the PDU Set information to allow RAN to make better discarding decision during congestion.

Avoid sending useless payload to device can help prolong battery life and also allowing RAN to use those available resources in an effective manner.

### 6.23.3 Procedures

Rel 18 procedure for sending PDU Set information to RAN is reused (i.e. via additional information carried by RTP extension header over N6 and GTP-U extension header over N3).

This solution proposes to introduce PDU Set correlation information as part of PDU Set information. PDU Set correlation information identifies the related PDU set(s) that are part of a PDU set group. For example, the intra-coded (I) frames/slices followed by related predicted (P) frames/slices are part of a same PDU set group. These related PDU sets include the correlation value, correlation sequence number, or the "PDU Set sequence number" to which the dependent PDU Sets are related to.

PDU set correlation information can also be implemented using an “independent indicator” which indicates independent PDU set (e.g., IDR frame) as well as the starting/ending of a dependent PDU set group. Within a dependent PDU set group, all the PDU sets without the independent indicator have dependency to the PDU set with the independent indicator. The independent indicator can be for example a certain PSI value.

Rel. 18 procedure for sending PDU set QoS parameters to RAN is reused for providing PDU set correlated treatment actions. The correlated treatment actions comprise:

a) Action for independent PDU set within a dependent PDU set group:

- Extend the transmission even if the PSDB can’t be met until the end of the dependent PDU set group.

b) Action for dependent PDU set within a dependent PDU set group:

- Discard if previous PDU set has failed to be delivered to receiver (e.g. due to congestion or retransmission timeout, etc).

- Discard if PSDB can't be met.

NOTE: Uplink handling is assumed to be UE implementation.

### 6.23.4 Impacts on services, entities and interfaces

**AS/AF:**

- If required, include PDU Set correlation info as part of the PDU Set Information

NOTE: RTP extension header will need to be extended by SA4.

**SMF/PCF:**

- If "action to be performed" (i.e. discarding) for independent and dependent PDU set is signalled via SMF/PCF. Include PDU set correlation detection information (optional).

**UPF:**

- Map new PDU set correlation info from N6 to N3 using GTP-U extension header (optional).

**RAN:**

- Utilize the PDU set correlation info for PDU set transmission and discarding decision during congestion.

Editor's note: SA WG2 will reach out to SA WG4 to get feedback on this solution.

Editor's note: SA WG2 will reach out to RAN WG2 and RAN WG3 to get feedback on this solution.

\*\*\* 2nd change \*\*\*

# 8 Conclusions

For KI#1 related to PDU set and QoS enhancements, the following solution principles are used for normative phase:

1. PDU set information can be enhanced to include PDU set correlation (see Sol#23 as basis). This information may assist RAN to perform discarding operation during congestion.

Editor’s note: Feedback from SA4/RANx may change this conclusion.

\*\*\* end of 2nd change \*\*\*