**3GPP SA4#128 S4-240879**

**Jeju, Korea, 20-24 May 2024 Revison of S4aR240030**

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| *CR-Form-v12.0* | | | | | | | | |
| **PSEUDO CHANGE REQUEST** | | | | | | | | |
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|  | **26.822** | **CR** | pseudo | **rev** | **-** | **Current version:** | **0.0.1** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network |  |

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| ***Title:*** | **[FS\_5G\_RTP\_Ph2] PDU Set Size information correction by indicating the remaining PDU Set Size in RTP header extension** | | | | | | | | | |
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| ***Source to WG:*** | Qualcomm Incorporated | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5G\_RTP | | | | |  | ***Date:*** | | | 05/20/2024 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)*  *Rel-17 (Release 17)*  *Rel-18 (Release 18)* | |
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| ***Reason for change:*** | | This proposes a solution to Key issue #1: Inaccuracy of the PDU Set Size (PSSize) information | | | | | | | | |
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| ***Summary of change:*** | | Adding a solution based on indicating the remaning PDU Set Size in the RTP header extension for PDU Set marking. | | | | | | | | |
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| ***Consequences if not approved:*** | | We may miss a solution to Key issue #1 that requires minimal spec changes. | | | | | | | | |
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| ***Clauses affected:*** | |  | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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# Proposed changes

Add the following to the References.

\* \* \* \* 1st change \* \* \* \*

[TR23.700-70] 3GPP TR 23.700-70 V0.4.0, Study on architecture enhancement for Extended Reality and Media service (XRM); Phase 2, March 2024.

\* \* \* \* end of 1st change \* \* \* \*

Add the following to clause 6:

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

## 6.x Solution #x: PDU Set Size information correction by indicating the remaining PDU Set Size in RTP header extension

### 6.x.1 Key Issue mapping

This maps to Key Issue #1.

### 6.x.2 Description

According to the current TS26.522, all PDUs of a PDU Set carry the same information in the PDU Set Size (PSSize) field in the RTP header extension for PDU Set marking. Repeating the same information in general is a waste of resource.

We propose to reuse the PSSize field, giving it a new interpretation or a new name, to indicate the remaining PDU Set Size (rPSSize), i.e., how many bytes the PDU Set has after this PDU. As an example, if the PSSize is 4000 bytes consisting of 4 PDUs with 1000 bytes each. The rPSSize field of the first PDU in the PDU Set will indicate 3000 bytes instead of 4000 bytes.

This proposal allows a router to compare the indicated size of a PDU (by taking the difference in the rPSSize between two adjacent PDUs) and the observed size of the PDU and derive the PSSize error due to network operations such as NAT46/64 that alter the PSSize. Using the same example, we assume that there is NAT46 in the network unknown to the packet source. The router can derive the indicated size of the second PDU (PDU Sequence Number or PSN=1) by taking the difference between the rPSsize carried in the 1st PDU (PSN=0) and the rPssize carried in the 2nd PDU, as shown in Figure 6.X. The difference will be 3000 – 2000 = 1000 bytes. On the other hand, the router observes tha the 2nd PDU has an actual size of 1020 bytes. Then, the router knows that it needs to add 20 bytes for each PDU in the PDU Set to get the actual PSSize. 

Figure 6.x Deriving the indicated size of the 2nd PDU by taking the difference in the rPSSize between the 1st PDU and the 2nd PDU

One may argue that in the event of out-of-order delivery, with the current specification TS26.522, if every PDU carries the PSSize, the first received PDU (whose PSN may not be equal to 0) will provide the PSSize information needed by a router. This is not necessary. First, for low-latency applications, a reasonable design should not lead to severe out-of-roder delivery.

Second, if every PDU carries its respective rPSSize, the router can use the PSN filed in the RTP header extension together with the rPSSize to estimate the PSSize. As more packets arrive, the estimate will get more accurate.

Third, even if the packets arrive at a router out-of-order, it may not have a problem. To see this, consider two cases. Case (1) all packets arrive in an ideal burst (i.e., all PDUs arrive within a time slot or a transmission time interval (TTI) equal 1ms): in this case, the router can find the first PDU (PSN=0), get the indicated PSSize and do the correction in time for scheduling. Case (2) all PDUs are evenly distributed in time until the first PDU of the next PDU Set: in this case, not being able to get PSSize in the first time slot does not necessarily prevent scheduling the PDUs arriving in the first time slot. Under rare conditions (e.g., the first arrived PDU has the largest PSN among all PDUs of the PDU Set), the rPSSize obtained in the first time slot is less than the total size of the PDUs in the first time slot, the unscheduled PDUs can still be scheduled in the network time slot. What really matters is to timely deliver the PDU Set as a whole, an observation the motivated the notion of Nominal PDU Set Delay Budget (NPSDB) (see 6.20 of [TR23.700-70]). As long as the last few PDUs are scheduled on time, which is guaranteed, the timely delivery of the whole PDU set is not affected.

To implement this solution, we can replace the PSSize in the RTP header extension for PDU Set marking with rPSSize, updating the semantics of the field without changing the format. Alternatively, without changing the name, the PSSize field can be re-interpreted as the remaining PSSize during session setup.

**Pros:** compared to other solutions, it doesn’t incur additional signaling in the user plane or the control plane beyond what is needed for supporting the PSSize in the current TS26.522.

**Cons:** it assumes that the intermediate routers (e.g., UPF, gNB) use the rPSsize value to correct the PSSize, but when a router serves a large number of traffic flows

* such computation may not be scalable,
* the router needs to maintain a state variable (to store the rPSSize in the most recently received PDU) in the memory,
* it needs the inclusion of the optional *Number of PDUs in a PDU Set* (NPDS) field in the RTP header extension for PDU Set marking,
* this method cannot correct the PSSize when the first PDU is received, and it needs to wait for at least another PDU before it can correct the PSSize
* This solution would not work with current Stage 2 work when the first PDU of the PDU set is not delivered first (i.e. in order) and requires stage 2 update to address this issue.
* It also requires changing the semantics of PSSize as defined in TS 26.522.

\* \* \* \* End of 2nd change \* \* \* \*