

Agenda item: 10.3.4.2
Source: ZTE
Title: Discussion on the SDAP PDU format
WID/SID: NR_newRAT-Core
Document for: Discussion and Decision

1 Introduction

This contribution discusses the SDAP PDU format.

2 Discussion

The QoS flow ID will be included in the uplink packets over Uu for the purpose of marking forwarded packets to the CN and included in the downlink packets over Uu for the purpose of NAS reflective QoS or AS reflective mapping. But whether to use the QoS Flow ID (QFI) defined at SA2 directly over the radio or to use a shorter ID is left for stage3 study.

First, the size of QFI is not determined at SA2 yet. However, considering that the QFI can be reused between different PDU sessions, or in other words, the QFI is just needed to be unique within a PDU session, the size will be not that large, for example 8bits. And due to the fact that the SDAP header should be byte-aligned, so in this way, the bits saved with the using of a short ID over the radio will be very limited.

Observation1. The bits saved with the using of a short ID over the radio will be very limited.

Second, the adoption of a shorter ID over the radio needs the introduction of mapping mechanism between the QFI and the shorter ID both in the gNB and UE. And the mapping rule should keep in sync between the gNB and the UE. Given the above, the limited bits saved over the air are at the cost of complexity introduced both in the gNB and UE.

Observatio2. The limited bits saved over the air are at the cost of complexity introduced both at the gNB and UE.

Last, according to the achievement at SA2 [1], if the NAS reflective QoS is used, the UE needs to rely on the DL packets to derive the QoS rules. The derived QoS rule includes Packet Filter, QFI, precedence value, among which, the Packet Filter and QFI can be derived only from the DL packets. So obviously, the simplest way is to include the QFI received from 5GC to the DL packets over the radio directly. Or else, with the reception of the DL packets, the UE should transfer the shorter ID to the original QFI first. Similarly, for the purpose of marking forwarded packets to the CN, if the UL packets are marked with a shorter ID, with the reception of the UL packets, the gNB should transfer the shorter ID to the original QFI first.

Observatio3. For the sake of simplicity both at the gNB and UE, the best way is to include the QFI instead of a shorter ID in the DL/UL packets directly.

With the above observations, we propose:

Proposal1. Use the QFI defined at SA2 directly over the radio.

At RAN2#97bis [2], it is agreed that:

New AS layer PDU is PDCP SDU

Confirmed that RoHC will remain in PDCP

As the RoHC entity will be kept in the PDCP layer, then the impact of SDAP header on the RoHC function should be considered. The issue is analyzed in [3] with two possible solutions:

Option1. SDAP header added at the beginning of the SDAP PDU;

Option2. SDAP header added at the end of the SDAP PDU;

Either option has the two sides of a coin as analyzed in [3]. Option1 requires some cross layer interaction between SDAP and PDCP. Option2 requires the UE to change the PDU reading behaviour. Thanks to the fact that even for the CU/DU split options, the SDAP entity and PDCP entity will always be located in the same device, the cross layer interaction in Option1 can be left to implementation with no standardization impact. While for Option2, it should be noted that the similar discussion on whether the UE can parse the MAC PDU from the back is also considered and still kept in open. So instead of a duplicated discussion, we can wait for the final decision for the design of the MAC PDU format.

Observatio4. SDAP header can be added at least at the beginning of the SDAP PDU.

Observatio5. Avoid a duplicated discussion but wait for the final decision for the design of the MAC PDU format to determine whether the SDAP header can be added at the end of the SDAP PDU.

Proposal2. SDAP header can be added at least at the beginning of the SDAP PDU. However the determination can be made after the final decision for the design of the MAC PDU format.

At RAN2#97bis, it is agreed that “AS layer header include the UL “Flow ID” depending on network configuration”. Since for services with small data volume (e.g. VoIP, etc.), the relative overhead with the inclusion of QFI is significant. So from this perspective, the above agreement made for UL is also reasonable for DL. Thus for both DL SDAP PDU and UL SDAP PDU, SDAP PDU with no SDAP header should be defined. And for such kind of service, the QoS flow-DRB mapping should be semi- statically configured via explicit RRC signalling.

Observation6. For services with small data volume, SDAP PDU without SDAP header should be defined. And the QoS flow-DRB mapping should be semi- statically configured via explicit RRC signalling.

Proposal3. SDAP PDU without SDAP header should be defined both for DL and UL.

Given the above proposals, the UL and DL SDAP PDU format will be discussed following, with the assumption that the SDAP header is added at the beginning and the size of QFI is 8 bits.

2.1 UL SDAP PDU

According to the agreement at RAN2#97bis “AS layer header include the UL “Flow ID” depending on network configuration” and the discussion above, two types of UL SDAP PDU should be defined, which are illustrated in Figure 1 and Figure 2. Whether to use “UL SDAP PDU with no QFI” or “UL SDAP PDU with QFI” is depending on the network configuration.



Figure 1 UL SDAP PDU with no QFI

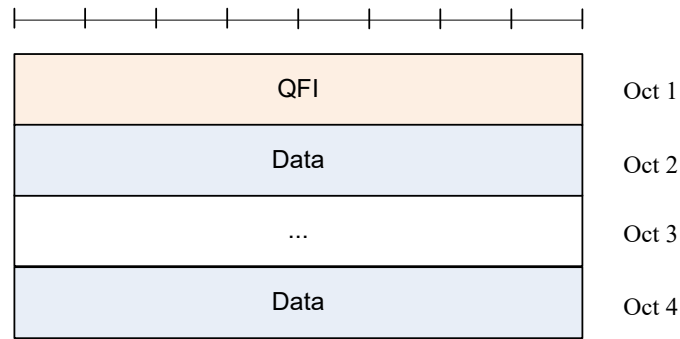


Figure 2 UL SDAP PDU with QFI

Proposal4. Define two types of UL SDAP PDU – “UL SDAP PDU with no QFI” or “UL SDAP PDU with QFI”.

2.2 DL SDAP PDU

In our companion contribution [4], a SDAP control PDU is introduced for the purpose of reflective mapping. The SDAP control PDU can be introduced either to replace or in addition to the reflective mapping via SDAP data PDU.

If the SDAP control PDU is agreed to be introduced to replace the reflective mapping via SDAP data PDU, then two types of DL SDAP data PDU should be defined, which are illustrated in Figure 3 and Figure 4. Whether to use “DL SDAP PDU with no QFI” or “DL SDAP PDU with QFI” is depending on the network configuration. The “DL SDAP PDU with QFI” here is used only for the purpose of NAS reflective QoS.

If the SDAP control PDU is agreed to be introduced in addition to the reflective mapping via SDAP data PDU, then two types of DL SDAP data PDU should be defined, which are illustrated in Figure 3 and Figure 5. Whether to use “DL SDAP PDU with no QFI” or “DL SDAP PDU with QFI” is depending on the network configuration. The “DL SDAP PDU with QFI” here is used either for the purpose of NAS reflective QoS and/or AS reflective mapping.



Figure 3 DL SDAP PDU with no QFI

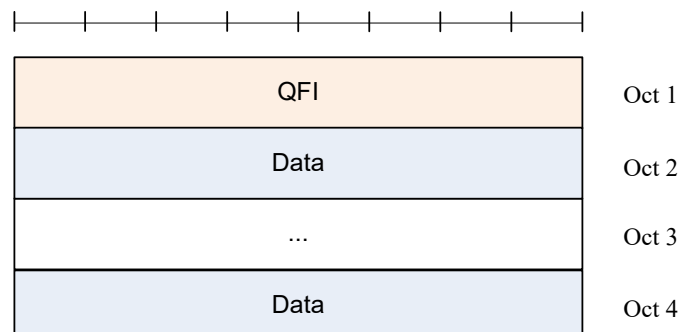


Figure 4 DL SDAP PDU with no QFI (for NAS reflective QoS)

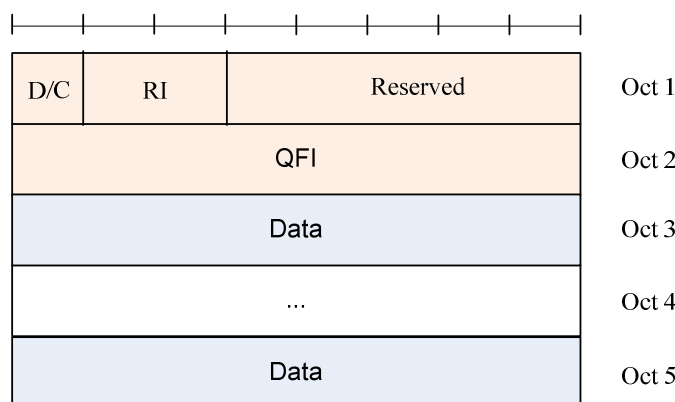


Figure 5 DL SDAP PDU with no QFI (for NAS reflective QoS and/or AS reflective mapping)

Table 1 Reflective indication (RI) field description

Value	Description
00	Neither for NAS reflective QoS nor AS reflective mapping
01	For AS reflective mapping
10	For NAS reflective QoS
11	Both for NAS reflective QoS and AS reflective mapping

Proposal5. Define two types of DL SDAP PDU – “DL SDAP PDU with no QFI” or “DL SDAP PDU with QFI”.

A SDAP control PDU is proposed for the purpose of reflective mapping in our companion contribution [4].The SDAP Control PDU for reflective mapping is illustrated in Figure 6

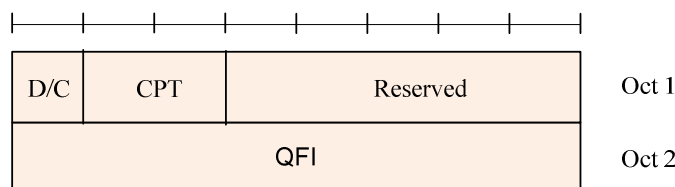


Figure 6 SDAP control PDU for reflective mapping

Table 2 Control PDU Type (CPT) field description

Value	Description
00	SDAP control PDU for reflective mapping
01~11	Reserved for extension

Proposal6. Define a SDAP control PDU for reflective mapping.

4 Conclusion

The SDAP PDU format is discussed in this contribution with the following observations and proposals:

Observations:

Observation1. The bits saved with the using of a short ID over the radio will be very limited.

Observatio2. The limited bits saved over the air are at the cost of complexity introduced both at the gNB and UE.

Observatio3. For the sake of simplicity both at the gNB and UE, the best way is to include the QFI instead of a shorter ID in the DL/UL packets directly.

Observatio4. SDAP header can be added at least at the beginning of the SDAP PDU.

Observatio5. Avoid a duplicated discussion but wait for the final decision for the design of the MAC PDU format to determine whether the SDAP header can be added at the end of the SDAP PDU.

Observation6. For services with small data volume, SDAP PDU without SDAP header should be defined. And the QoS flow-DRB mapping should be semi- statically configured via explicit RRC signalling.

Proposals:

Proposal1. Use the QFI defined at SA2 directly over the radio.

Proposal2. SDAP header can be added at least at the beginning of the SDAP PDU. However the determination can be made after the final decision for the design of the MAC PDU format.

Proposal3. SDAP PDU without SDAP header should be defined both for DL and UL.

Proposal4. Define two types of UL SDAP PDU – “UL SDAP PDU with no QFI” or “UL SDAP PDU with QFI”.

Proposal5. Define two types of DL SDAP PDU – “DL SDAP PDU with no QFI” or “DL SDAP PDU with QFI”.

Proposal6. Define a SDAP control PDU for reflective mapping.

5 Reference

[1] 23501-040

[2] Draft_RAN2-97bis_Final_Report_v1

[3] R2-1702522 Discussion on the header design of PDAP vivo

[4] R2-1704648 Discussion on reflective QoS ZTE