

Source: CATT
Title: NR SDAP header format
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Document for: Discussion and Decision

1. Introduction

In the previous RAN2#97bis meeting, the following agreements regarding to SDAP PDU are reached [1]:

Agreements on QoS layer:

- New AS layer PDU is PDCP SDU
- AS layer header is byte-aligned
- DL packets over Uu are not marked with "Flow ID" at least for cases where UL AS reflective mapping and NAS reflective QoS is not configured for DRB.
- AS layer header include the UL "Flow ID" depending on network configuration

In this contribution, we will discuss the detailed formats of SDAP data PDU and QFI presence. And our proposals will be given.

2. Discussion

In SDAP layer, UL and DL have different characteristics. First of all, DL PDU should carry RQI (Reflective QoS Indicator) field as UP activation indicator of reflective QoS function. However UL PDU doesn't need it. Secondly, UL PDU should always carry QFI (QoS Flow Indicator) information either by explicit header field or by implicit configuration with 1-to-1 mapping. However DL PDU can be not marked with QFI for cases where AS reflective mapping and NAS reflective QoS are not activated.

Proposal 1: NR SDAP layer may have different PDU format for UL and DL.

In the following subsections, detailed PDU formats design will be discussed.

2.1. UL SDAP PDU

For UL SDAP, if there is 1-to-1 mapping between QoS flow and DRB, it can be not marked with QFI in principle. Network can derive the QFI from DRB tunnel. But the issue of mapping reconfiguration caused by QoS flow addition and deletion arises, where PDUs without QFI field and PDUs with QFI field may be mixed in buffers and in the air. It brings extra complexity and confusion for SDAP layer processing.

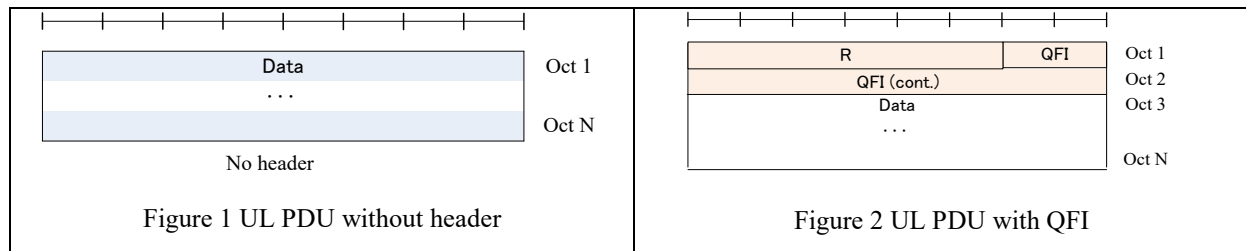
In our view, there are two typical cases and their corresponding expected operations:

- First one is for some special services, e.g. VoIP, which has a big purpose of guaranteed efficient transmission with minimize overhead. In this case, always ensuring 1-to-1 mapping is the easiest way.
- Second one is for ordinary services, e.g. best effort services, where overhead is not a big problem and flexibility and multiplexing is more necessary. For example, when PDU session establishes, there is only one QoS flow in a DRB. Later some other QoS flow(s) activation or arrival, mapping relationship between QoS flow(s) and that DRB can be changed from 1-to-1 to many-to-1 mapping. In this case, it is an easy way that network configures UE always carrying QFI from the beginning of DRB establishment, even in 1-to-1 mapping period. This can avoid re-organization of PDUs and other re-establishment operation triggered by mapping relationship reconfiguration.

For the above cases, the detailed configuration and decision is left to network implementation. But from the perspective of specification, there needs to support explicit UL QFI presence indicator even in 1-to-1 mapping.

Proposal 2: It is proposed to support explicit UL QFI presence indicator in RRC signaling and allow carrying UL QFI even in 1-to-1 mapping.

Hence there are UL PDU formats: one is no any header fields and other is carrying QFI field in header. Following figures give the detailed formats.



Note: in [1], we suggest having 10 bits QFI, but the length of QFI is up to CT1 progress and agreements eventually.

2.2. DL SDAP PDU

The biggest difference between DL PDU and UL PDU is that DL PDU may carry the indicators of NAS reflective QoS or AS reflective mapping activation/deactivation. The indicator of NAS reflective QoS activation/deactivation is up to CN decision. In the last meeting, an LS [2] was sent to SA2 to ask whether there are some QoS flows, e.g. VoIP service, that are never marked with NRQI (Reflective QoS Indicator in NAS layer). For these flows that never use NRQI, RAN may configure 1-to-1 mapping between flow and DRB and omit any header similar to Figure 1. If there is a QoS flow never applies NAS reflective QoS, then 1-to-1 mapping can apply, and in this case, if a 1-to-1 mapping is configured, the RRC can configure the 1-to-1 mapping in explicit signalling, and SDAP can have no header.

Proposal 3: If there is a QoS flow never applies NAS reflective QoS, then 1-to-1 mapping can apply, and in this case, if a 1-to-1 mapping is configured, the RRC can configure the 1-to-1 mapping in explicit signalling, and SDAP can have no header.

For those flows that can use reflective function either in NAS layer or in AS layer, the potential activation/deactivation methods of reflective function can be listed as following table:

	Activation/ deactivation via UP	Activation/ deactivation via CP
NAS reflective QoS	RQI in N3 header and carried by SDAP header to UE	UE NAS signaling/N2 signaling notification per PDU session or per flow level
AS reflective Mapping	If supported, a specific indicator in SDAP header is needed	If supported, via RRC signaling per DRB or per UE level

For two methods of NAS reflective QoS activation, SA2 had agreed to support [2]. It is not yet discussed how to activate AS reflective mapping function, i.e. via UP or via CP or both. But from our view, since RQI is present now and there is at least 1 byte of SDAP header, another bit can be used as AS RQI and not increase any overhead. Furthermore, activation of AS reflective mapping via UP can have more flexibility than activation via CP.

Proposal 4: In addition to RQI field for NAS reflective QoS activation/deactivation, 1 bit ARQI for AS layer is also needed in SDAP DL PDU.

The fields of RQI and ARQI can not be directly used to indicate whether QFI field follows up or not. When neither NAS reflective function nor AS reflective mapping activate via UP, QFI may be also needed because of activation of NAS reflective function via CP. Hence a separate bit is needed to indicate whether QFI field follows up or not.

Proposal 5: A separate bit is needed to indicate whether QFI field follows up or not.

An example of DL SDAP PDU is shown in the following figure:

