3GPP TSG-RAN WG1 Meeting #105-e R1-21xxxxx

e-Meeting, May 10th – 27th, 2021

Agenda Item: 8.4

Source: Ericsson

Title: Discussion on how to reply to SA2 LS on new 5QI for NTN

Document for: Discussion

# 1 Introduction

SA2 sent an LS (R1-2104155) to RAN1 about a new 5QI for GEO satellite access:

SA2 has discussed the topic of QoS for 5G satellite access and has agreed to introduce a new 5QI for best effort traffic with the intention to be able to accommodate the worst-case Packet Delay Budget for GEO.

The 5QI is available in the latest version of TS 23.501, v17.0.0, and copied below for your convenience:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 10 | Non-GBR | 90 | 832ms  (NOTE 13)  (NOTE 17) | 10-6 | N/A | N/A | Video (Buffered Streaming)  TCP-based (e.g. www, e-mail, chat, ftp, p2p file sharing, progressive video, etc.) and any service that can be used over satellite access type with these characteristics |

NOTE 13: A static value for the CN PDB of 20 ms for the delay between a UPF terminating N6 and a 5G-AN should be subtracted from a given PDB to derive the packet delay budget that applies to the radio interface

NOTE 17: The worst case one way propagation delay for GEO satellite is expected to be ~270ms, ,~ 21 ms for LEO at 1200km, and 13 ms for LEO at 600km. The UL scheduling delay that needs to be added is also typically 1 RTD e.g. ~540ms for GEO, ~42ms for LEO at 1200km, and ~26 ms for LEO at 600km. Based on that, the 5G-AN Packet delay budget is not applicable for 5QIs that require 5G-AN PDB lower than the sum of these values when the specific types of satellite access are used (see TS 38.300 [27]). 5QI-<New Value> can accommodate the worst case PDB for GEO satellite type.

SA2 would like to verify with RAN1 and RAN2 whether the selected PDB value, resulting in a AN PDB of 812 ms, is reasonable for use with GEO satellite access.

Several companies provide discussion papers on how to reply to this SA2 LS.

* R1-2104726 Discussion on SA2 LS on new 5QI for NTN Ericsson
* R1-2104774 Discussion on LS on PDB for new 5Q OPPO
* R1-2105199 Discussion on LS on PDB for new 5QI ZTE
* R1-2105930 Discusion on PDB for new 5QI Huawei, HiSilicon

# Discussion

For the newly proposed 5QI, the following observations can be made:

* A PDB of 812 ms is about 1.5 RTT of the maximum round trip delay in GEO satellite access with transparent payload.
* 1.5 RTT can only cover one transmission with acknowledgement.

Delivering packets without retransmission(s) with a PER of 10-6 might appear challenging at a first glance. That said, according to TS 23.501, Section 5.7.3.4, for Non-GBR, the requirement is that 98 percent of the packets should not experience a delay exceeding the 5QI's PDB.

*Services using Non-GBR QoS Flows should be prepared to experience congestion-related packet drops and delays. In uncongested scenarios, 98 percent of the packets should not experience a delay exceeding the 5QI's PDB.*

*The PDB for Non-GBR and GBR resource types denotes a "soft upper bound" in the sense that an "expired" packet, e.g. a link layer SDU that has exceeded the PDB, does not need to be discarded and is not added to the PER. However, for a Delay-critical GBR resource type, packets delayed more than the PDB are added to the PER and can be discarded or delivered depending on local decision.*

In other words, the Non-GBR requirement is not stringent. One way to satisfy the new 5QI may go as follows.

* Configure 1% BLER at the PHY/MAC layer, then 99% of the packets would be correctly delivered in one shot, which is within the PDB of 832 ms.
  + For ease of discussion, a packet is assumed to be the same as a transport block.
* Meanwhile, these 99% of the packets are error free and thus meet the PER of 10-6.
* In conclusion, the 99% of the packets delivered error free within 832 ms meet the requirement that 98% of the packets should not exceed the PDB.

Based on the above discussion, an initial proposal is made as follows. Companies are encouraged to provide views on the proposal.

**Initial proposal 1 (Moderator):**

RAN1 to reply to SA2 that the selected PDB value, resulting in a AN PDB of 812 ms, is reasonable for use with GEO satellite access.

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| --- | --- |
| Company | Comments |
| APT | Support.  From RAN1 perspective, without (blind) retransmission, the initial transmisison can achieve 1% BLER by repetition and MCS configurations. If considering processing and scheduling delay, a AN PDB can be within 600ms as shown in R1-2101748. |
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