

Further enhancements for XR services: supporting material

Qualcomm Incorporated

Motivation: limitations of Rel-18 XRM



- Rel-18 XRM made significant progress on XR awareness in 5G by introducing the PDU Set based QoS handling framework.
- However, due to time constraints, some important features were left out of the Rel-18 XRM work item
- It is important to extend the framework to address:
 - Awareness of Application Layer Forward Error Correction (AL-FEC) at RAN can assist detection of PDU-set errors and allow scheduler optimization in delivery of PDU-sets
 - For certain types of XR flows, PSDB/PDB does not fully represent the actual latency requirements because applications care about the absolute delivery time of display.
 - Better adaptability of 5GS QoS level for XR traffic

Main objectives

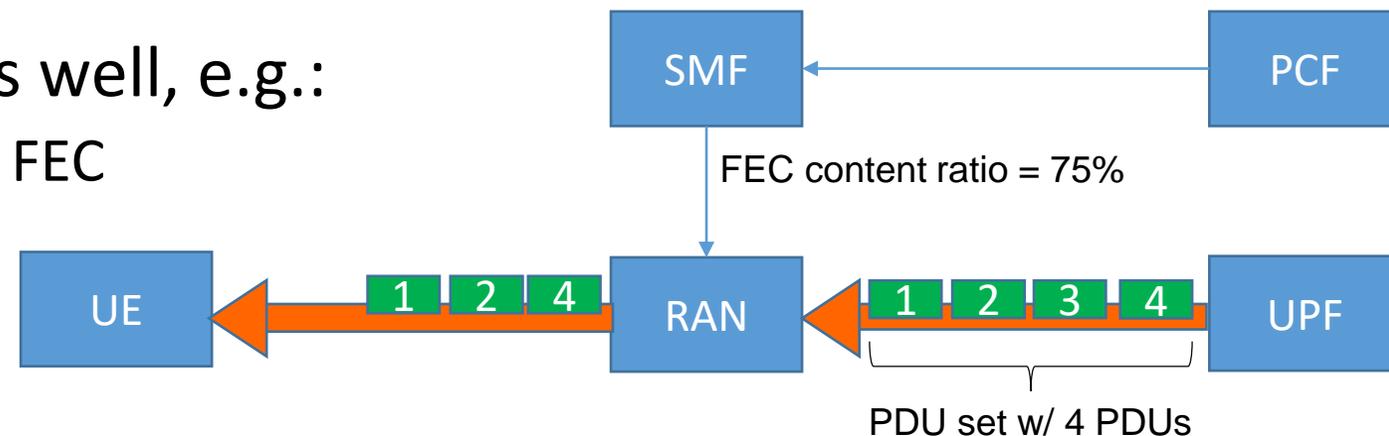


- Extend PDU Set based QoS handling to address scenarios with Application-level Forward Error Correction (AL-FEC)
 - Split XR solutions implement AL-FEC to achieve high reliability at low latencies without retransmissions
- Further refinement of QoS framework to address latency requirements
 - PDU-set latency requirement is a deadline in time for display as opposed to a latency bound between packet arrival and packet departure: promote Nominal PSDB to address this type of applications.
- Extend mechanism to adapt 5GS QoS level for XR traffic
 - Alternative QoS Profile applied to PDU Set based QoS handling

Application Layer Forward Error Correction



- There are requirements for XR application protocols to use Forward Error Correction (AL-FEC), see, e.g., [RFC 8854](#) for WebRTC, [RFC 8627](#) for RTP
- If RAN scheduler aware of AL-FEC details, it can improve scheduling, e.g.:
 - If content ratio = 75%, one out of four PDUs of the PDU Set can be dropped and the PDU Set is still considered successfully delivered;
 - Can decide to stop transmission when UE receives sufficient PDUs.
- RAN to AF indication useful as well, e.g.:
 - RAN can ask to enable/disable FEC



Addressing XR latency requirements

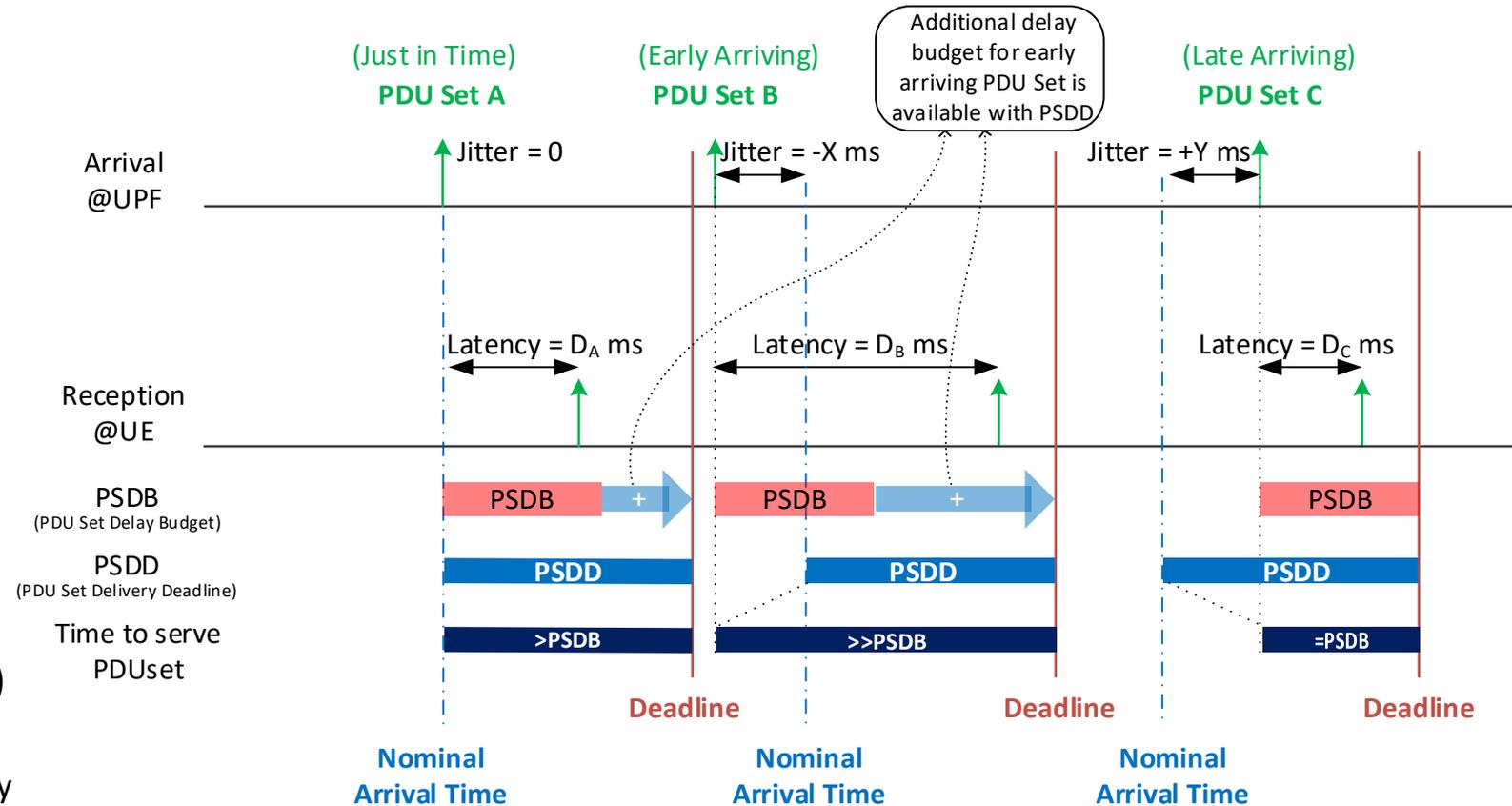


Issue

- XR Traffic arrivals can be quasi-periodic
 - Arrivals can be early or late with respect to a nominal arrival time
- XR receiver starts packet processing for display at regular intervals
 - XR video traffic held in a buffer until time (deadline) when processing must start
- XR performance only requires that packets are delivered before deadline
 - Fixed PDB from arrival time is less useful

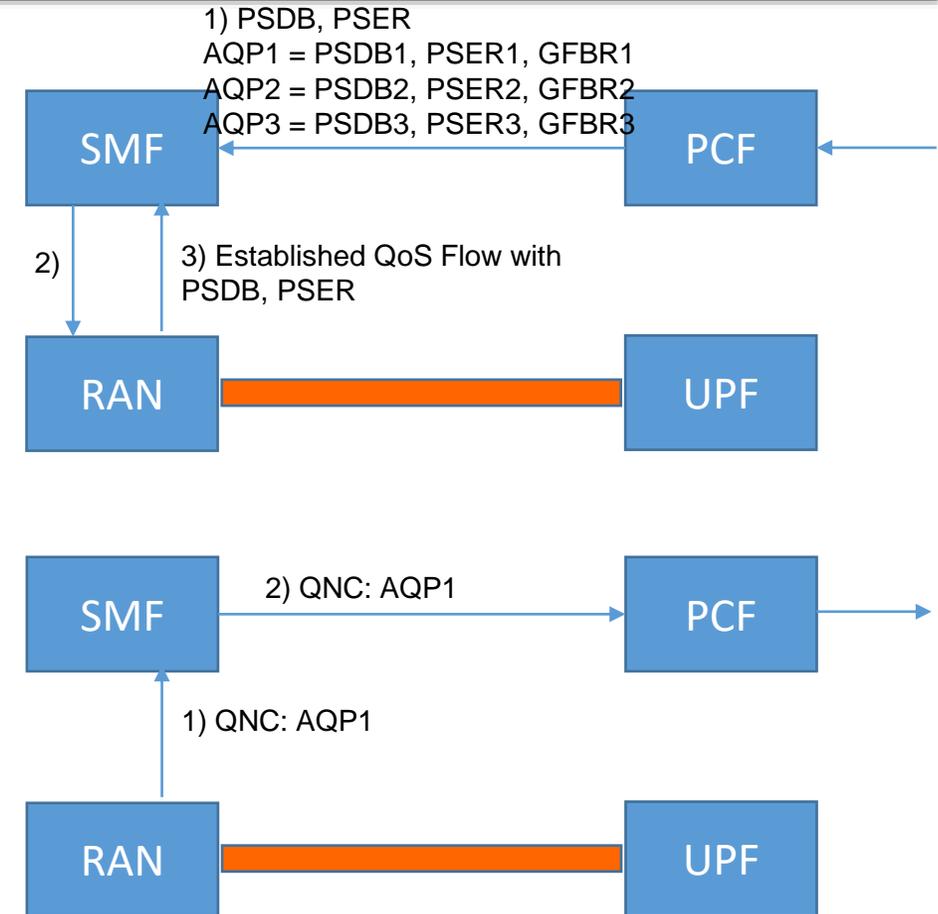
Proposal

- Introduce PDU-Set delivery deadline (PSDD) as an alternative to PSDB
 - Extra time to serve PDU-Sets improves XR capacity



Better adapt 5GS QoS level for XR traffic

- As of today, the concept of Alternative QoS Profile (to enable AF/AS to adapt to changed radio conditions) applies only to PDUs
 - AQP = {PDB, PER, GFRB, (MDBV)}
- In order to enable better adaptability also for PDU Set based traffic, it is useful to study how to extended the AQP concept to PDU Sets
 - E.g., AQP = {PSDB, PSER, GFBR, (MDBV)}



Thank you!