

3GPP TSG RAN Meeting #93e

RP-212339

Electronic Meeting, 13-17 September 2021

Rel-18 NR XR

Agenda Item: 9.0.2

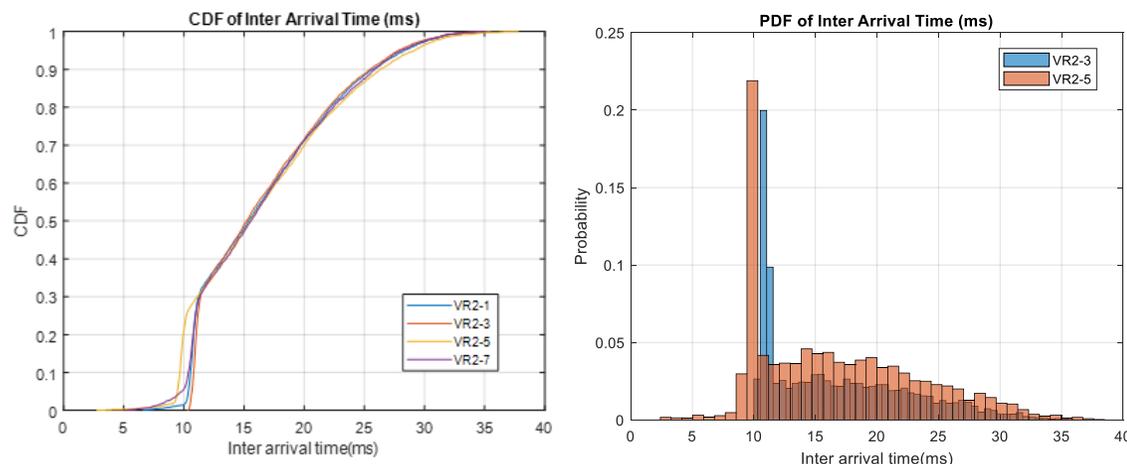
Source: Intel Corporation

Document for: Discussion



Inter arrival time and jitter handling

- Packet inter-arrival time and jitter statistics

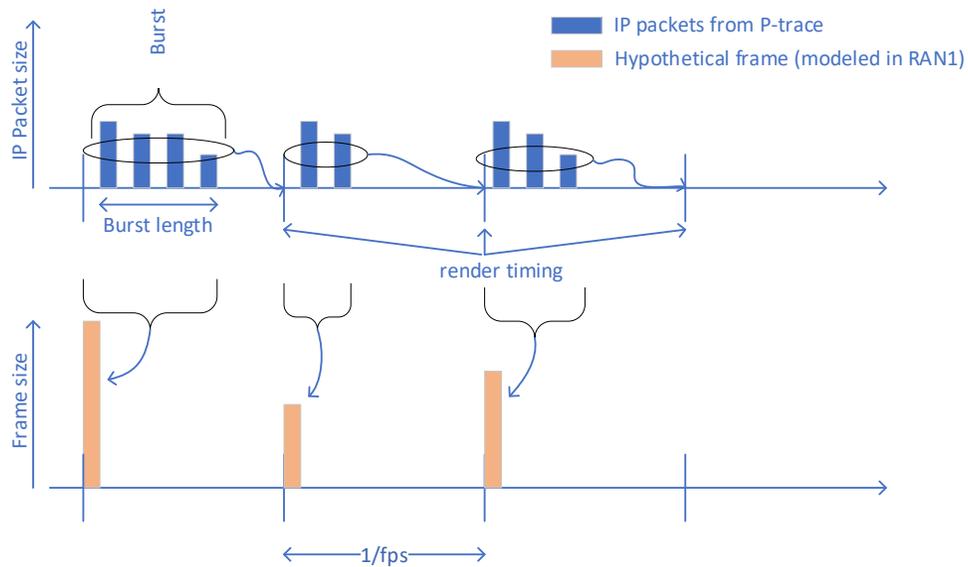


	VR2-1	VR2-3	VR2-5	VR2-7	VR2-2	VR2-4	VR2-8
Mean (ms)	16.67	16.67	16.67	16.67	16.67	16.67	16.67
STD (ms)	6.03	5.83	6.55	6.13	6.14	5.84	6.22
Min (ms)	6.60	10.30	2.76	5.16	6.61	7.87	4.81
Max (ms)	35.53	35.42	37.79	35.08	35.47	35.53	35.29

- Periodicity of XR traffic is 1/fps with a jitter component that is quite significant and variable in both standard deviation and range
- Multiple (active) configurations of SPS/CG (Rel-16) is beneficial to handle such traffic, including multi-stream (e.g., pose + scene + video on UL)
- Study CDRX enhancements to align CDRX to XR traffic periodicity
 - Jitter handling by CDRX optimization can be challenging and should consider practical traffic characteristics

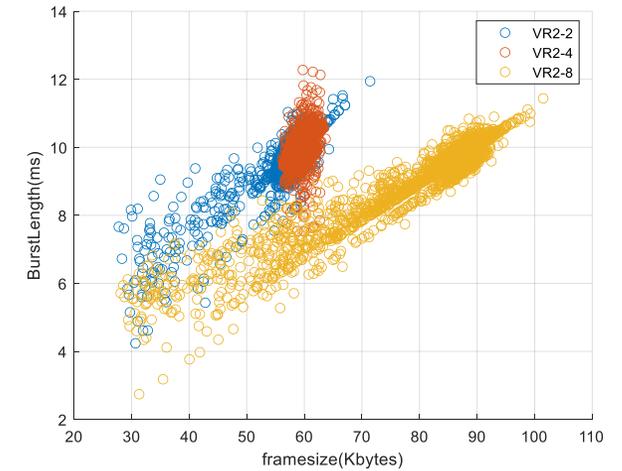
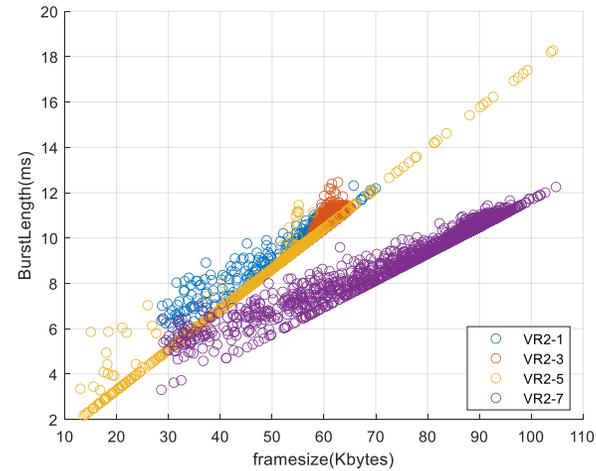
Burst-length variation handling

- IP packets and frame-size model



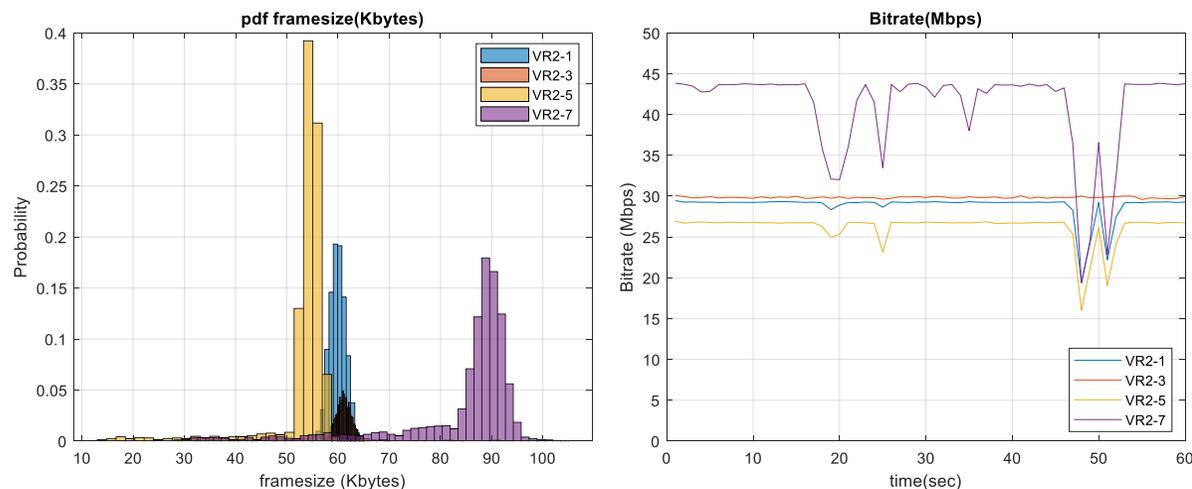
- Frame is a hypothetical unit in L1 defined as an aggregation of IP packets for the same rendering time-instant

- Burst-length



- Large burst-length variation (even for the same frame-size)
- L1 based indication for PDCCH monitoring adaptation can be beneficial for handling such burst length variation – whether the network can be aware of burst length for this to be effective in practice
- Rel-17 PDCCH monitoring adaption in PS discussions can be a basis

Frame-size variation handling



- Large frame-size variation even for given bitrate (depending on VBR, CBR)
- Frame-size can be quite large, much larger than URLLC traffic
- XR specific, such as frame level QoS can be studied and specified

- Rel-16 SPS/CG is enhanced by introduction of multiple configurations in an active BWP
 - Activation/update/de-activation by DCI
 - Across different serving cells in a cell-group
 - Rel-17 SPS HARQ-ACK skipping/compression
 - Combination of SPS/CG with DG to handle large frame-sizes
 - Beneficial for XR traffic (multi-stream, jitter etc.)
- Study and enhancements
 - SPS/CG enhancements, such as dynamic parameter updates, e.g., matching SPS/CG periodicities to 1/fps XR traffic
 - Multi-PDSCH/PUSCH scheduling (Rel-17 in >52.6), e.g., multi-TB SPS/CG
 - Study possible integration with SPS/CG framework to reduce PDCCH overhead

Traffic awareness at RAN

- Video decoder is less robust against packet loss than Voice as the quality of decoded frames (or picture) depends on the preceding frames. For example:
 - If an I-frame (critical video data) is not fully received, it is typically perceived as small video freeze or jump up to few seconds.
 - I-frame (Intra Coded Picture): key frame not relative to any other frame in the sequence
 - Critical Video data
 - P-frame (Predictive Coded Picture): compressed frame relative to previously decoded frames
 - Non-critical Video data
 - Some RTCP feedbacks (FIR, PLI, NACK) can also be considered as critical data.
- It is beneficial if network configuration, e.g., SPS, CG, DRX can match traffic patten, e.g.. periodicity
- Study and enhancements
 - Methods for the gNB to be made aware that the UE has upper layer critical data within its buffers so that the gNB can take the information into account in UL scheduling decisions.
 - Methods for the gNB to identify XR traffic characteristics and application layer attributes beneficial/feasible for the gNB to be aware of X specific and/or frame level QoS
- Coordination with SA2
 - Existing QoS framework already enables QoS requirement awareness in RAN, e.g., based on QoS flow, additional information from CN, etc.
 - Study whether to extend existing QoS framework to support the traffic awareness at RAN or enhance the Uu interface to achieve this

Summary

- KPI/QoS
 - XR specific, frame level QoS
- Capacity
 - SPS/CG enhancements, e.g., dynamic parameter updates, multi-TB transmission
 - Periodicity of XR traffic
 - Reflect video frame-size distribution, and XR specific multi flow aspects
 - Understand benefits compared to existing URLLC/IIoT features (including DG)
 - Traffic awareness at RAN
 - Scheduling optimization for packets with XR specific, frame level QoS
 - Awareness of XR related information (e.g., traffic characteristics including periodicity) in RAN
 - Coordination with SA2
- Power savings
 - CDRX enhancements
 - Align CDRX to XR periodicity
 - DCI – based enhancements
 - Taking into account Rel-17 outcome
- Mobility
 - DAPs HO enhancements to support consistent data rate during mobility (suggest to handle separately in mobility enhancement WI)

intel®