Media Operations Use Case for an Augmented Reality Application on Edge Computing Infrastructure

draft-ietf-mops-ar-use-case-01

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Draft’s Table of Contents

Table of Contents

New Update

Updates

- We have added a discussion on the allowable time budget beyond which the problem of motion sickness caused by motion-to-photon delay occurs.

The Motion Sickness Problem with AR/VR devices

- Motion sickness results from a time-lag between when the user moves their head and when the appropriate video scene is rendered. This time lag is often called "motion-to-photon" delay.
- Studies have shown [PER_SENSE], [XR], [OCCL_3] that this delay can be at most 20ms and preferably between 7-15ms in order to avoid the motion sickness problem.

Available time budget

- Out of the 20ms, display techniques including the refresh rate of write displays and pixel switching take 12-13ms [OCCL_3], [CLOUD].
- This leaves 7-8ms for the processing of motion sensor inputs, graphic rendering, and RTT between the AR/VR device and the Edge.

Some Mitigating Strategies

- The use of predictive techniques to mask latencies has been considered as a mitigating strategy to reduce motion sickness [PREDICT]
- In addition, Edge Devices that are proximate to the user might be used to offload these computationally intensive tasks. Towards this end, the 3GPP requires and supports an Ultra Reliable Low Latency of 0.1ms to 1ms for communication between an Edge server and User Equipment(UE) [URLLC].

Next Steps

- Reviewers and contributors are invited to improve the draft.
- We would like to capture and document the current understanding of operational/deployment requirements for AR/VR applications such as our use case. This goes beyond the current focus of the draft on ABR algorithms. These issues include (but are not limited to):
  - Design space of *application mechanisms* in practice for AR/VR applications: e.g. Client Buffering, Adapting media quality and playout, Pre-fetching etc.
  - Design space of *system-level* techniques in practice for AR/VR applications such as using Edge Cloud designs like “Central Office Re-architected as a Datacenter(CORD), protocols and architectures suitable for “Contribution” and “Distribution” networks for the acquisition and delivery of AR/VR media, impact on the design of Overlay Networks etc.
- We welcome other pertinent issues that the WG would like to include in the draft…

Informative references

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[URLLC] 3GPP, "3GPP TR 23.725: Study on enhancement of Ultra-Reliable Low-Latency Communication (URLLC) support in the 5G Core network (5GC).", https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=3453, 2019.