


For expanded coverage of this month's topic "Immersive Storytelling," you can find the following paper in the Digital Edition. Visit the SMPTE digital library at <http://journal.smpte.org> to access the issue and to read this additional paper.

State-of-the-Art Virtual Reality Streaming: Solutions for Reducing Bandwidth and Improving Video Quality

By Thierry Fautier

Virtual reality (VR) 360 video applications typically require bandwidths of at least 15–20 Mbits/s while providing a limited video quality. This is because users only observe a small part of the VR panorama at any time: about 12%–15%. However, the full panorama needs to

be provided to users on a continuous basis. This paper summarizes the state of the art in VR streaming, detailing how tiled VR streaming technology can reduce bandwidth requirements by an order of magnitude while improving the video quality. This is achieved by dividing a VR panorama into tiles and streaming only those tiles that users actually look at while wearing head-mounted displays. This solution is based on HEVC tiling features as well as the dynamic adaptive streaming over HTTP (DASH) extension. A major challenge for any viewport-dependent VR streaming technology is motion-to-photon delay. Using a combination of selective tile transfer, a low-resolution base layer, smart packaging, and very low-latency protocols, tiled VR streaming can offer extremely low motion-to-photon delay even when streaming from existing CDNs. This paper will conclude by showing the tradeoffs between quality and bitrate when tiling from 4K or 8K sources to produce HD and UHD experiences, respectively, on HMDs, based on field trials and realistic use cases. 

Digital Object Identifier 10.5594/JMI.2018.2849638
Date of publication: 1 August 2018

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