SOLUTION BRIEF

Communications Service Providers
Multi-Access Edge Computing

Lanner Video Streaming Tests Show Improved Latency Using MEC

Using Intel® processor–powered Lanner NCA-6210, company's tests showed improvement in key latency metrics that reduced buffering time, image jitter, and frame loss.[1]

Streaming video consumption is growing in popularity and communications service providers (CommSPs) want to differentiate their service with low-latency network functionality in order to deliver high-quality video. Augmented reality (AR) services are not as mature, but they too need the same low latency for high quality of service. Using multi-access edge computing (MEC) servers for content delivery network functionality is a leading solution for these services because MEC promises a dramatic reduction in transport latency. To demonstrate just how big this improvement can be, Lanner, an Intel® Network Builders ecosystem member, tested video and AR streams on both a MEC content delivery network (CDN) solution and a cloud CDN solution.

The Challenge

According to the Cisco Visual Networking Index, mobile network traffic will grow to nearly 77 exabytes per month by 2022—with an estimated 79 percent of that traffic being video.[2] Part of the reason for this high video data percentage is the popularity of streaming video, but it's also a reflection of the significant bandwidth needed for these files.

To deal with this increased streaming data, CommSPs are able to deploy CDN capabilities at the network edge using MEC servers. These servers perform the critical cloud network functions, including compute, storage, and connectivity, at the network edge. CDNs are proxy server virtual network functions (VNFs) that cache and serve any real-time content.

Initially, CDNs were placed in geographically distributed data centers, which moved them closer to the user than the origin server, which could be located anywhere in the world. With MEC, those CDNs are even closer to users, resulting in a bigger reduction of transport latency.

To show the performance advantage, Lanner set up a test using its NCA-6210 server as a MEC platform to show performance compared with video streamed from a cloud server.

Lanner NCA-6210 Overview

The Lanner NCA-6210 (see Figure 1) is a high-performance 2U-high rackmount server powered by dual Intel® Xeon® Scalable processors for network security and virtualization applications. Intel Xeon Scalable CPUs offer scale-out cloud performance for data-centric applications including edge computing, AI, analytics, cloud, and HPC.

Figure 1. Lanner NCA-6210.[3]

The Lanner NCA-6210 supports up to 640 GB of RAM, either DDR4 DRAM or Intel® Optane™ DC persistent memory. Intel Optane DC persistent memory can replace or augment costly memory DIMMs in high capacity applications, providing lower per-Gigabyte memory cost, and similar performance as DRAM. This performance allows CDNs to host more channels per node, reducing the cost per channel.

For fast cryptography performance, the NCA-6210 features Intel® QuickAssist Technology (Intel® QAT), a hardware acceleration technology that provides cryptographic and compression/decompression co-processing services.

For visual cloud applications like CDNs, Lanner and Intel have collaborated to integrate Intel® Media SDK on the NCA-6210. The software and hardware integration optimize critical cloud workloads by enabling robust, high-performance video transcoding and analytics while reducing the latency for immersive media enhancement, targeting AR/VR applications.

Test Setup and Software

The testbed was configured to establish a wireless connection between a user and a MEC server and a user and a cloud-based origin server. An OpenAirInterface[4]-based 4G eNodeB base station was configured to serve as the wireless link required for the tests (see Figure 2).

The video test utilized the open source VLC media player to stream video both from the MEC and the cloud. The Hello AR/VR platform[5] was used as the AR video player. Wireshark, an open source network packet and protocol analyzer, was used as the analysis tool in the tests.

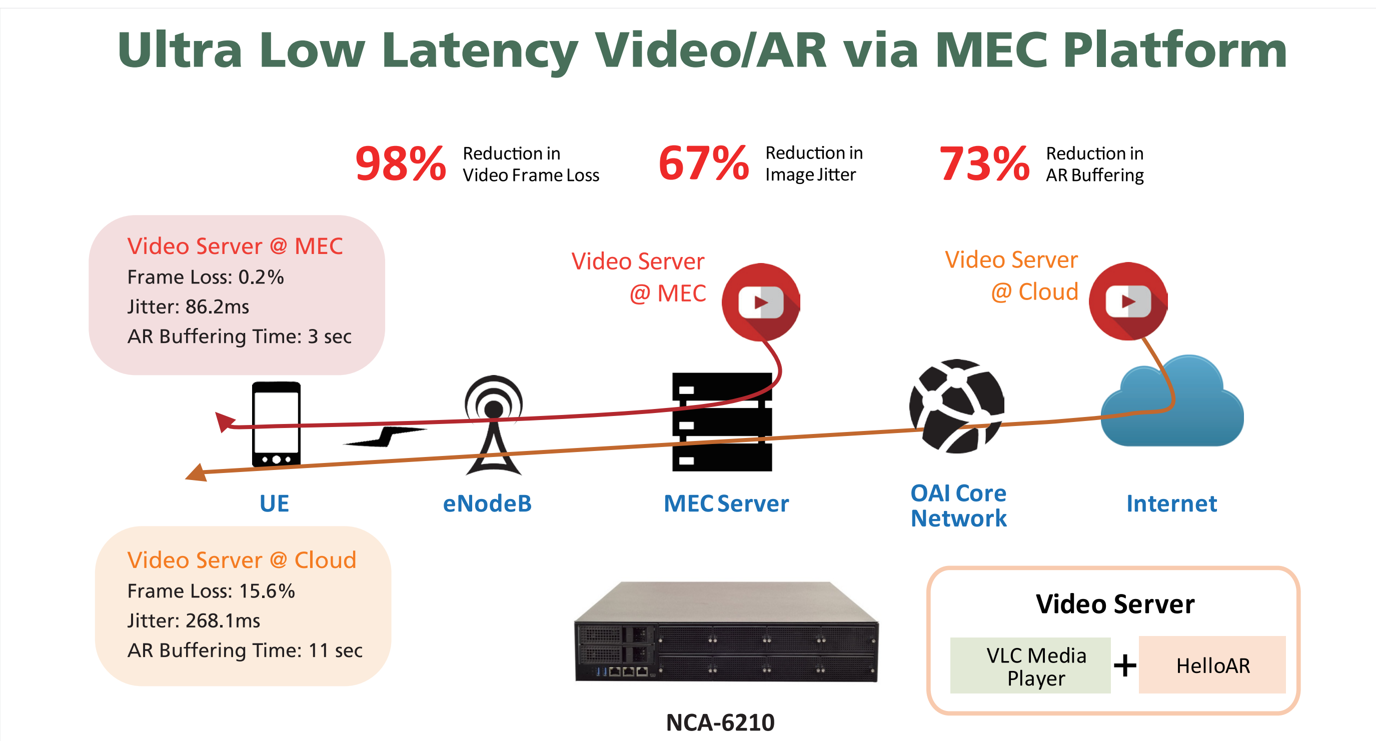

Figure 2. Testbed setup.[3]

Network Traffic Testing

In the tests, a 720 p movie trailer video was uploaded on the Google Cloud Platform (GCP) to represent the cloud server, and also on the Lanner NCA-6210 MEC server. The tests targeted time-to-start (TTS), web loading time (WLT), and round trip time (RTT) to demonstrate how each solution performed.

Time-to-Start: Once the videos have been uploaded to the respective servers, the TTS test measured the required time period (see time flow diagram in Figure 3) for the first synchronize (SYN) packet from a user's device to be routed to the video server that responds with "HTTP: status code 206 from video server." Using a Linux traffic control utility called qdisk, a series of 20 millisecond timing delays were added to the packets forwarded to the cloud server in the cloud tests. As shown in Figure 4, the time required for the cloud server to play back the videos gradually increased, while the MEC server recorded a consistent 400 ms TTS to perform the same task regardless of the delays.

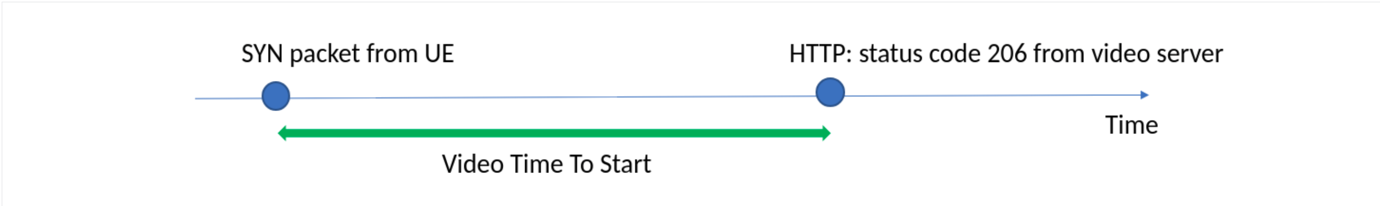

Figure 3. Time flow diagram for video tests.[3]

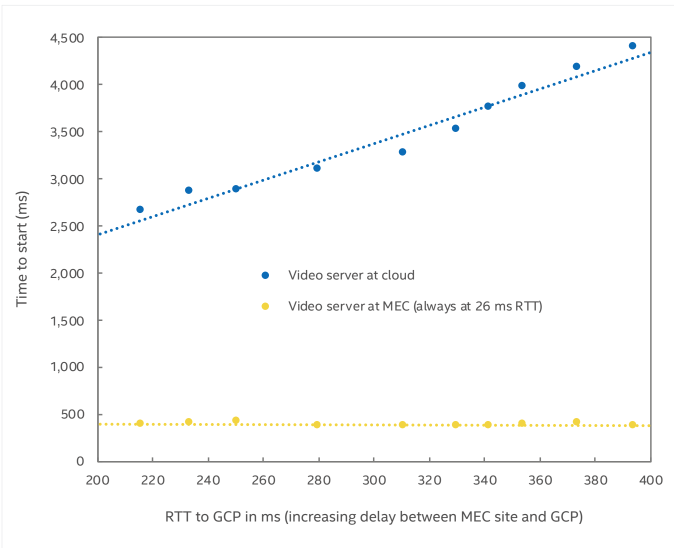

Figure 4. TTS test results.[6]

Web Loading Time: For this test, a Google search engine home page was deployed onto the GCP and the MEC server. With this in place, the tests calculated the required time period for the first SYN packet routed to the webserver. As shown in Figure 5, as the network delay increased, the web page load time gradually increased on the GCP, while it consumed a consistent 150 ms on the MEC server.

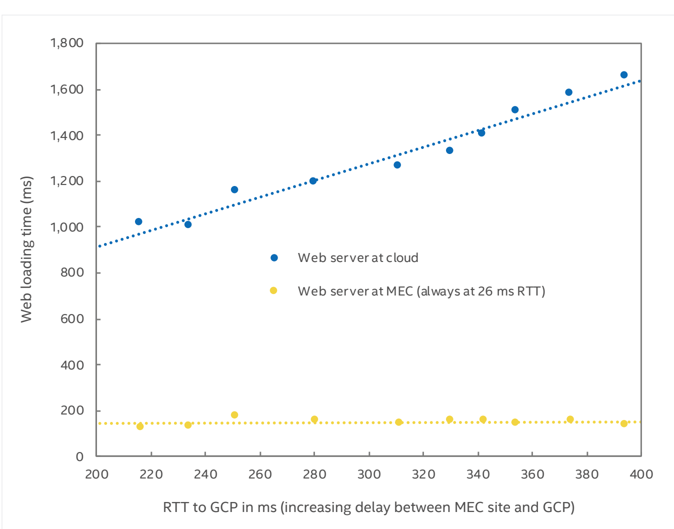

Figure 5. Web loading time test results.[6]

Round Trip Time: In the RTT tests, Ping packets were used to measure the round trip time (RTT) for the GCP and the MEC server respectively. As shown in Figure 6, with increasing network delay, the RTT on the GCP has gradually increased, while it remains a consistent 26 ms for the MEC server.

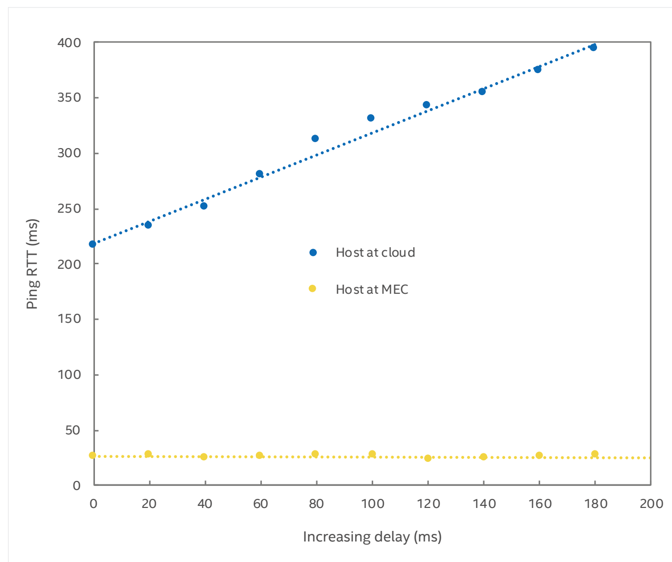

Figure 6. RTT test results.[6]

Video Quality Tests

The next phase of the tests focused on video quality metrics, which include video frame loss (which results in jerky movement during playback or a loss of audio sync) and image jitter (which results in skipping of the picture). As seen in Figure 7, frame loss was a significant problem for the GCP server, with 15.6 percent of the frames lost. This frame loss was reduced to just 0.2 percent of traffic when the video was served from the MEC DUT. Image jitter is measured in milliseconds, and the video from the GCP recorded 268.1 ms, compared to 86.2 ms for the MEC server.

In addition to low-latency playback, another benefit of using a MEC server in an augmented reality (AR) application can be a reduction in buffering time. At start up, AR programs buffer data to ensure smooth playback, and an extended buffering time means the AR player must wait while that buffer fills up.

The results of Lanner's tests are shown in Figure 8. When the AR program was served from the MEC server, AR buffering time was 3 seconds, compared to 11 seconds when served from the cloud, a more than 72 percent reduction in buffering.

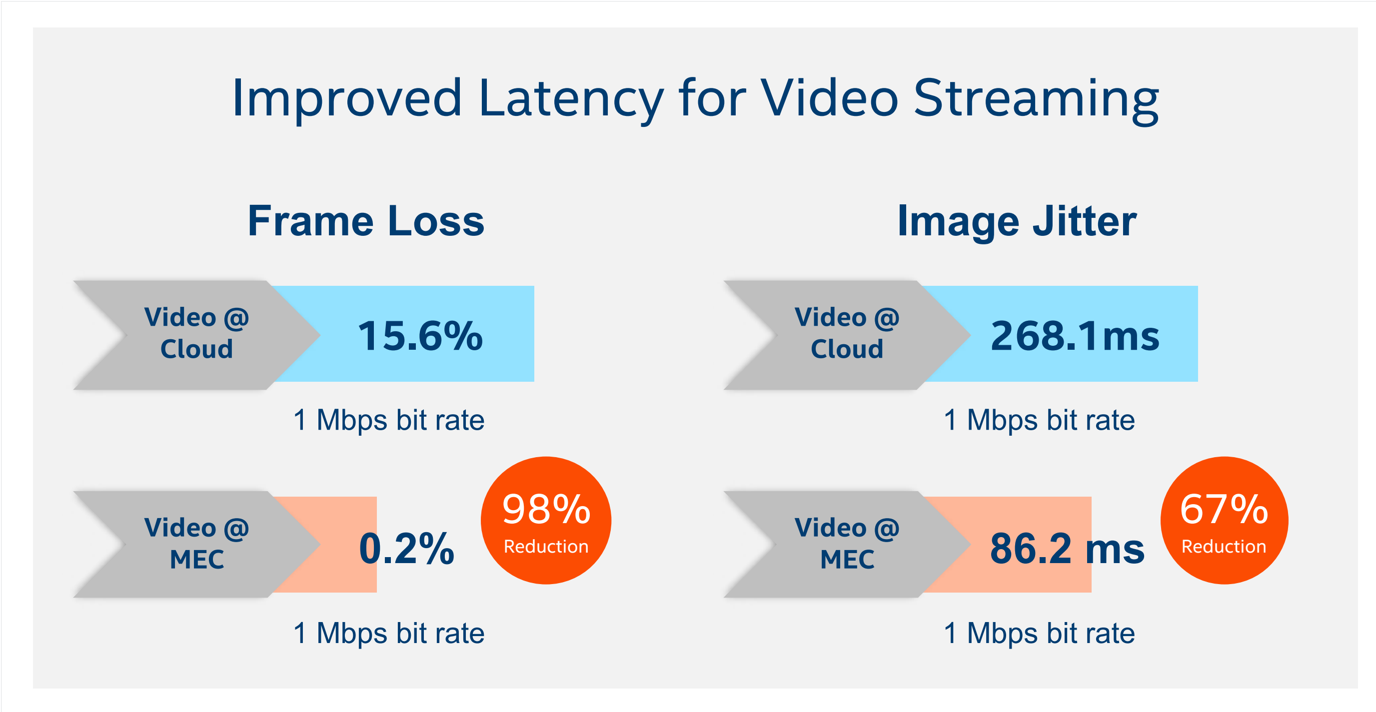

Figure 7. Frame loss and image jitter test results.[6]

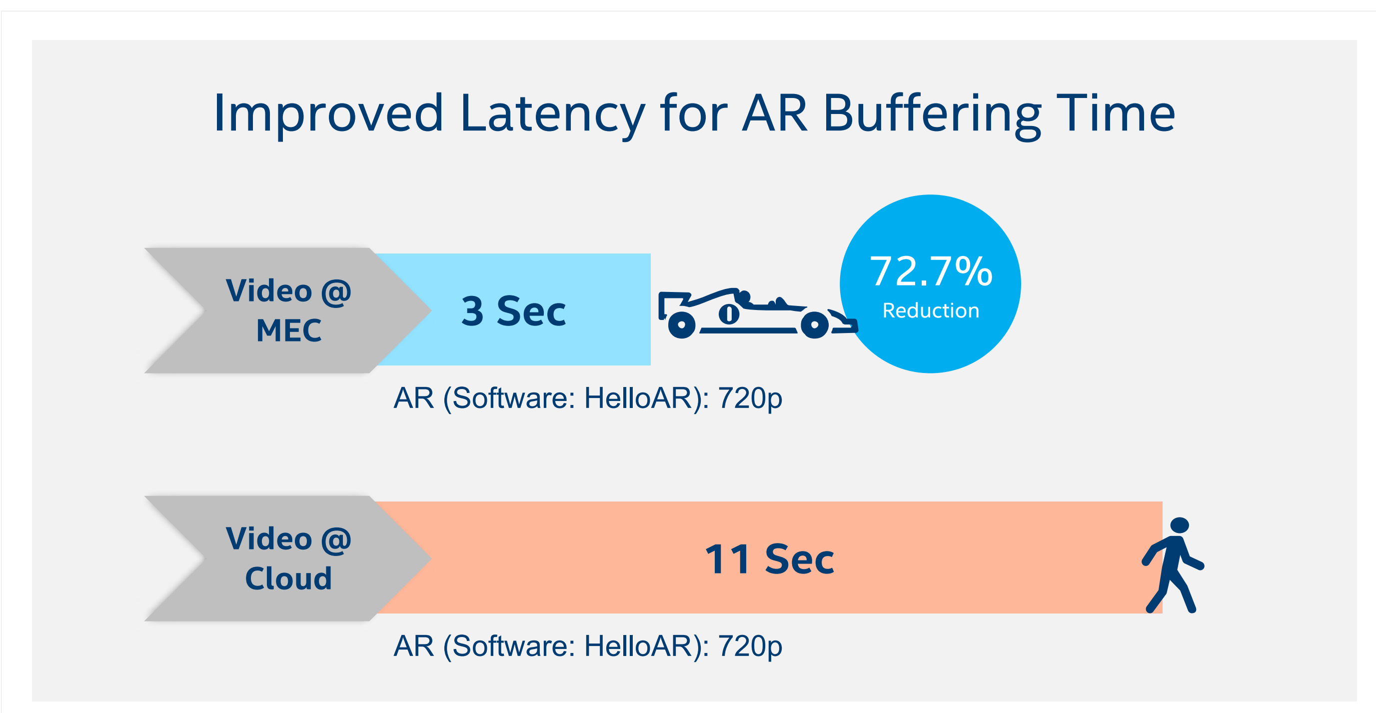

Figure 8. Buffering time test results.[6]

Conclusion

The test results provide evidence of the benefits of MEC architecture in video streaming and AR applications to improve user experience and serviceability. A high-performance MEC server such as the Lanner NCA-6210 can be the foundational platform for CommSP video content delivery networks to help keep up with increasing video traffic and quality expectations.

About Lanner

Lanner Electronics Inc (TAIEX 6245) is a world leading provider of design, engineering, and manufacturing services for advanced network appliances and rugged applied computing platforms for system integrator, service providers, and application developers. More information is at http://www.lannerinc.com.

About Intel® Network Builders

Intel Network Builders is an ecosystem of infrastructure, software, and technology vendors coming together with communications service providers and end users to accelerate the adoption of solutions based on network functions virtualization (NFV) and software defined networking (SDN) in telecommunications and data center networks. The program offers technical support, matchmaking, and co-marketing opportunities to help facilitate joint collaboration through to the trial and deployment of NFV and SDN solutions. Learn more at http://networkbuilders.intel.com.

[1] Tests conducted by Lanner on May 29, 2019. Configurations of Lanner NCA-6210: 2.10 GHz Intel® Xeon® Silver 4116 (microcode: 0x2000030) CPUs with 16 GB of DDR4 2666MHz REG DIMM DRAM and a 1 TB Seagate Enterprise hard drive. Network connectivity was provided by a four-port Intel i350 Gigabit Ethernet controller and a four-port Intel X710 10Gbe controller. AMI BIOS and Ubuntu 16.04 were used in the tests. Turbo, Hyperthreading were utilized; P- and C-state configuration, Intel® Virtualization Technology for Directed I/O (Intel® VT-d) and "performance mode" were not engaged. Google Cloud Platform configurations: Machine type: n1-standard-4 (4 vCPU, 15 GB); CPU: Intel Xeon E5 v3; Server region: us-east1-b; Enable Display Device: not utilized. N1-standard-4 configuration details can be found at https://cloud.google.com/compute/docs/machine-types#n1_machine_types.

[2] https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white-paper-c11-738429.html#_Toc953325.

[3] Figures provided courtesy of Lanner. See end note 1 for configuration details.

[4] https://www.openairinterface.org/?page_id=864

[5] https://helloar.io/index.html

[6] See end note 1 for configuration details.