Solution Brief

3rd Gen Intel® Xeon® Scalable Processor
Visual Cloud

Advancing Video Compression Performance

MediaKind demonstrates up to a 30 percent performance improvement with the 3rd generation Intel® Xeon® processor, enabling video service providers to scale up services while reducing infrastructure.[1]

The consumer appetite for higher-resolution video content continues to grow, and meeting that demand reliably and cost-effectively is a key challenge faced by today's broadcast and streaming video service providers. The drive to deliver higher numbers of high-definition (HD) and ultra-high-definition (UHD) streams requires providers to rack more compute power than ever before, in a massive, ongoing investment that also includes the addition of distribution bandwidth.

Increasing the density of streams that can be transcoded per server allows the total number of servers required to be reduced, decreasing both CapEx and OpEx. For all of these service providers, it is more cost effective to reduce the bitrate of their video streams than to expand distribution bandwidth capacity. According to MediaKind, with new generations of video codecs, it's possible to reduce video service bitrates by between 50 to 75 percent over previous video codecs, allowing for more video streams across the available bandwidth.[2] To achieve the compression performance improvements from the new codecs requires additional computational power.

MediaKind's testing of its compression headend running on the 3rd generation Intel® Xeon® Scalable processor shows dramatic improvement in performance, up to 30 percent for HD and up to 22 percent for UHD.[1]

Transcoder performance provided by tuned hardware and software stacks is the key to balancing the needs of service provider budgets with subscriber expectations for an outstanding user experience. Reducing the bitrate of video streams creates an undesirable hit on the quality of the video delivered to end customers, and continuing to add bandwidth is ultimately cost-prohibitive. Running on the 3rd generation Intel® Xeon® Scalable processor, the MediaKind Aquila compression headend delivers the high performance needed to maintain that balance.

MediaKind Aquila Solution

MediaKind's Aquila compression headend is based on the company's cloud native software encoder for both linear broadcast and streaming applications. The software enables broadcasters and streaming video service providers to efficiently and reliably transmit live video content to viewers. It is designed for service providers that are either launching UHD services or migrating to all IP workflows. A representative converged broadcast and streaming video workflow is shown in Figure 1.

With support for the latest IP standards such as SMPTE ST 2110, the MediaKind headend allows a true migration path to all-IP workflows, which ultimately means a broadcaster or service provider can leverage the agility and flexibility of either private or public cloud deployment models. Based on MediaKind's decades of experience, the Aquila video compression headend offers market-leading video compression performance across codecs (HEVC, MPEG-4 AVC, MPEG-2), enabling video service providers to offer the same video quality with less bandwidth. Key advantages of the solution include the following:

- The minimum bitrate required while maintaining picture quality whether using MPEG-2, MPEG-4 AVC, or HEVC
- SD, HD, 1080p, or UHD services, including support for High Dynamic Range
- Wide audio codec support
- Subtitles management, including ingest of DVB subtitles, teletext, and closed captioning, plus translations for each format
- Wide content protection support

MediaKind Stream Processing processes transport stream video flows providing multiplexing, SI/PSI generation and manipulation, and content protection. Supported scrambling standards include BISS, Digital Video Broadcasting Common Scrambling Algorithm (DVB-CSA) V1, V2 and Advanced Encryption Standard (AES)-128 scrambling. Stream processing can also work in conjunction with MediaKind PRISMA for linear TV Advertising insertion.

MediaKind Packaging provides just-in-time packaging into mainstream adaptive bitrate formats, encryption, and content origin publishing to leading CDNs. Packaging can also work in conjunction with MediaKind PRISMA for Dynamic Advertising Insertion.

The combined solution can be deployed on Intel® architecture-based reference hardware, on-premises private data centers, and public cloud.

MediaKind G8 Server

The MediaKind appliance used in the performance testing is the MediaKind G8 Server, part of a family of high-density hardware servers for on-premises deployment. The G8 1000 Series is a compact 1RU chassis that offers flexible configuration options. The MediaKind G8 2000 solution comes in a 2RU-high form factor and is designed for IP-based video headend applications, offering a compact solution to maximize rack space.

Both systems support 1 GbE, 10 GbE, and 25 GbE connectivity with support for 3G-serial digital interface (3G-SDI) and HD-SDI input support. The MediaKind G8 family also features 16 HD-SDI interfaces and dual IP input/output management interfaces, IPMI remote management support, and redundant hot-swappable power supplies.

The testing by MediaKind reported on in this brief demonstrates potential increases in both raw performance and density of streams per server from future updates to the MediaKind G8 family based on the 3rd generation Intel Xeon Scalable processor.

Next-Generation Server Processors for High Transcoding Performance

Significant increases in performance per core help accelerate performance of MediaKind software. In addition, the processor is available in a flexible range of SKUs, with a wide range of core counts, frequencies, features, and power levels.

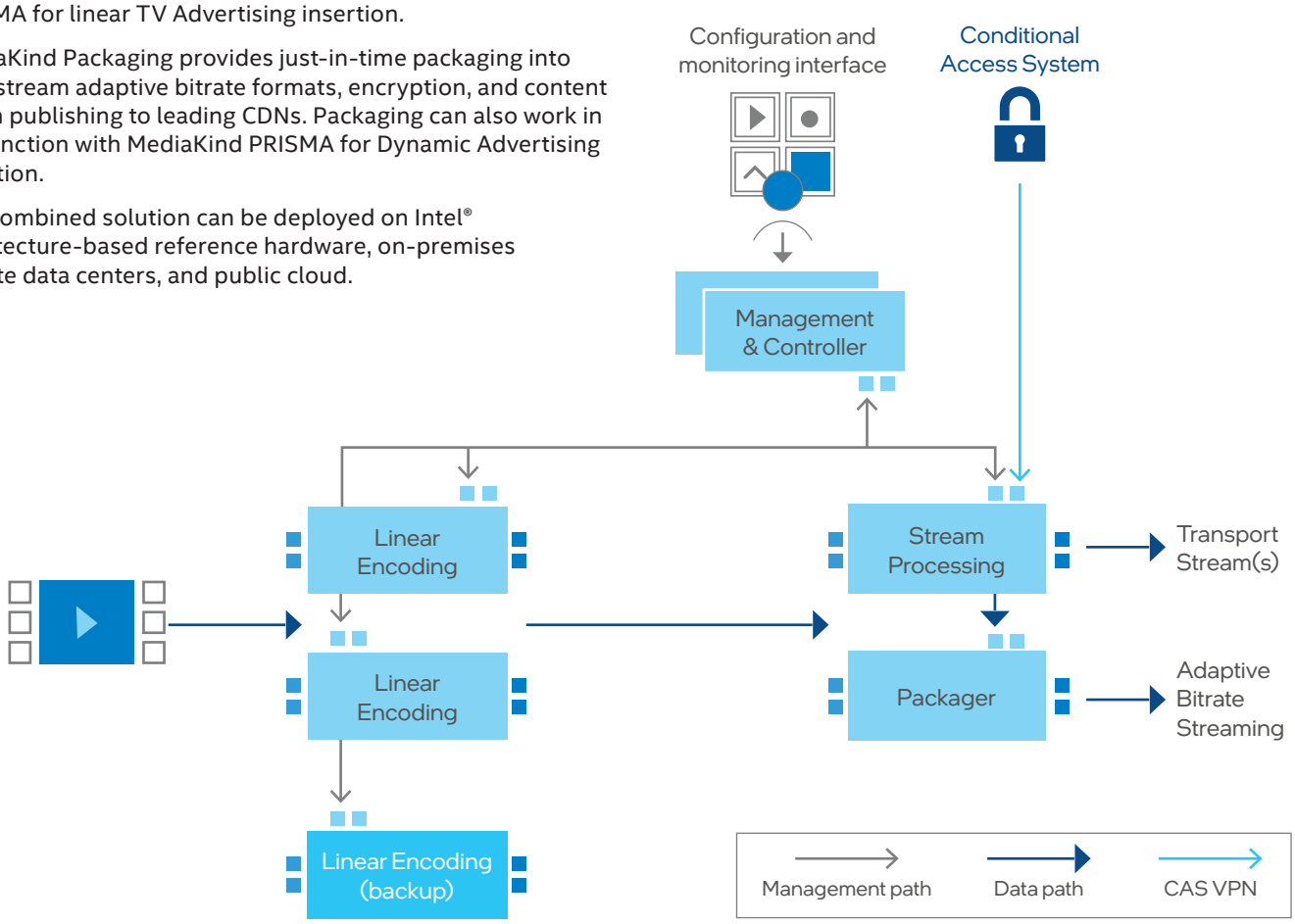

Figure 1. Video workflow through the Aquila solution.

The solution provides the performance headroom needed to deploy transcoding workloads with a high density of streams per server, enabling video service providers to reduce their server footprints and costs while securing the competitive advantages that come with delivering high video quality and great subscriber experience.

In addition to increased execution resources compared to its predecessors, the 3rd generation Intel Xeon processor also features up to a 48 KB L1 cache (50 percent bigger than the previous generation) as well as bigger L2 and L3 caches, helping keep more hot data close to the processing cores. The solution also includes advances in the memory subsystem, with increased memory bandwidth and capacity of up to 4 TB per processor socket, as well as support for PCIe Gen4, which operates at twice the bandwidth of PCIe Gen3.

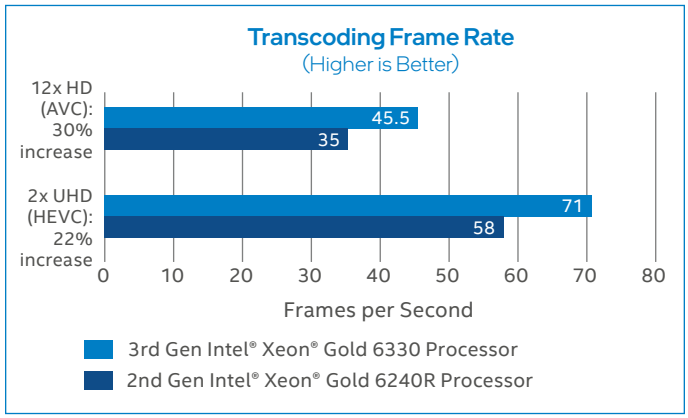

Figure 2. Increased video transcoding performance.[1]

3rd Generation Intel Xeon Scalable Processors

- **Flexibility from the edge to the cloud**, bringing AI everywhere with a balanced architecture, built-in acceleration, and hardware-based security.
- **Part of a complete set of network technology from Intel**, including accelerators, Ethernet adapters, Intel® Optane™ persistent memory, FlexRAN, OpenNESS, Open Visual Cloud, and Intel® Smart Edge.
- **Engineered for modern network workloads**, targeting low latency, high throughput, deterministic performance, and high performance per watt.
- **Enhanced built-in crypto-acceleration** to reduce the performance impact of full data encryption and increase the performance of encryption-intensive workloads.
- **Hardware-based security** using Intel® Software Guard Extensions (Intel® SGX),[3] enhanced crypto processing acceleration,[3] and Intel® Total Memory Encryption.[3]

MediaKind optimizes its software for the 3rd generation Intel Xeon Scalable processor in part by integrating Intel software development products into its development pipeline. The Intel® compilers help developers take advantage of hardware features and capabilities, while the Intel® VTune™ Profiler helps them understand runtime behavior, bottlenecks, and performance-tuning opportunities.

Test Setup

Testing was conducted by MediaKind using a benchmark designed to measure video encoder performance, which is the most compute-critical software function in the Aquila video compression headend solution. Two different tests were designed: the first encodes two UHD files in parallel, one on each NUMA (non-uniform memory access) node, and the second encodes 12 full HD files in parallel on all cores. The performance metric used was the average encoding speed in frames per second (fps) of the parallel encodings. The tests were run on dual-processor servers using NUMA. An MPEG-4 AVC encoder was used to encode the full HD streams and an HEVC encoder was used to encode the UHD streams. The devices under test (DUTs) were as follows:

- **DUT-1 (2nd generation Intel Xeon Scalable processor)**: MediaKind G8 appliance based on the Intel Xeon Gold 6240R processor
- **DUT-2 (3rd generation Intel Xeon Scalable processor)**: Server based on the Intel Xeon Gold 6330 processor

Performance Outcomes: Better Throughput

In the full HD test, 12 MPEG-4 AVC encoder instances were used to encode in parallel 1080p video files. The tests used all of the cores on both processors. The results show that DUT-1 sustained an average of 35 fps per encoder and DUT-2 sustained 45.5 fps per encoder, a 30 percent improvement.

The UHD test utilized two instances of an HEVC encoder to encode in parallel 4K files. In this test, DUT-1 had performance of 58 fps, compared to 71 fps for DUT-2. The 22 percent increase in performance of DUT-2 to 71 fps demonstrates that DUT-2 easily supports two UHD channel encodings per server.

Conclusion

Using the latest processors to improve the performance of encoders is important for video providers that want to support more content. The testing reported on in this brief shows compute-centric encoding workloads benefiting from the enhanced performance and memory bandwidth of 3rd generation Intel Xeon Scalable processors. The added performance of this solution positions video service providers to provide expanded content offerings including UHD at high quality, using a cost-effective approach.

Learn More

- MediaKind
- Aquila Consumer Delivery Solutions
- Intel® Network Builders
- 3rd generation Intel® Xeon® Scalable processors
- Intel® Visual Cloud

Notices & Disclaimers

[1] Testing performed March 31, 2021, by MediaKind.

DUT-1 (2ND GENERATION INTEL XEON SCALABLE PROCESSOR): MediaKind G8 appliance – one node based on 2x Intel Xeon Gold 6240R processors (24 cores, 48 threads per socket); 192 GB RAM total (12 modules @ 16 GB each, 2933 MHz); Intel® Hyper-Threading Technology enabled; Intel® Turbo Boost Technology enabled; microcode 0x5003003; BIOS version SE5C 620.86B.02.01.0012.070720200218; CentOS 7.9; Kernel 3.10.0-1160; MediaKind Encoding Live version 12.14.0.27; Intel C++ Compiler.

DUT-2 (3RD GENERATION INTEL XEON SCALABLE PROCESSOR): One node based on 2x Intel Xeon Gold 6330 processors (28 cores, 56 threads per socket); 256 GB RAM total (16 modules @ 16 GB each, 2933 MHz); Intel® Hyper-Threading Technology enabled; Intel® Turbo Boost Technology enabled; microcode x270; BIOS version SE5C6200.86B.3021.D40.2103160200; CentOS 7.9; Kernel 3.10.0-1160; MediaKind Encoding Live version 12.14.0.27; Intel C++ Compiler.

[2] Data provided by MediaKind as of April 2021.

[3] This technology is not supported when using Intel Optane persistent memory.

Notices & Disclaimers

Performance varies by use, configuration and other factors. Learn more at https://www.intel.com/PerformanceIndex.

Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See backup for configuration details. No product or component can be absolutely secure.

Your costs and results may vary.

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