



Scaling video encoding performance

with Synamedia Vivid Compression and AMD EPYC™ CPUs

by Synamedia

Overview

Media content consumers are increasingly demanding crystal-clear video and are getting used to higher screen resolutions, frame rates, and dynamic ranges. When it comes to live streaming, viewers want stellar, real-time experiences that make them feel like part of the event. This is particularly true for sports fans: they desire immersive experiences to bring them as close as virtually possible to the playing field.

Massively parallel software processing and encoding of huge amounts of pixel data are at the heart of industry efforts to improve video experiences. But this requires high-core count CPUs, which enable high-density transcoding (i.e., a large number of channels per server), to deliver high efficiency and lower power consumption per channel.

Synamedia's Vivid Compression engine, powered by AMD EPYC processors, offers just that. Combining excellence in compression and performance, Vivid is breaking ground in live sports streaming and driving the industry forward in high-quality, high-density encoding.

Overcoming the Scaling Challenge

Increasing software efficiency and CPU advancements contribute to increased video quality and more cost-effective solutions. However, introducing new CPUs and increasing the number of cores alone does not guarantee success and scaled-up performance: it can lead to memory, saturation, and other bottlenecks.

But the potential benefits are great. Scaling performance with cores can not only improve quality, but also enables a range of new and immersive applications while bringing down power consumption per channel. Synamedia's vDCM platform with Vivid Compression, powered by AMD EPYC processors, has proven this is possible.

Synamedia vDCM and Vivid Compression

Synamedia is always looking to raise the bar. That's why the company has significantly expanded its video encoding investment, leading to the development of a set of in-house, high-quality pure-software encoders under the umbrella of

Vivid Compression. These highly robust encoders adjust dynamically to varying workloads and server densities, as well as handling high resolutions while lowering costs.

As part of its commitment to software-based encoding and compression solutions, Synamedia developed Synamedia vDCM with Vivid Compression. The Digital Content Manager virtualises the entire video headend, enabling providers to optimise video processing functions, from live encoding and transcoding to multiple bit rates and formats, across myriad devices. As a result, Synamedia vDCM with Vivid Compression improves video quality, increases the number of channels per server, and lowers latency.

The cloud-native solution also enables providers to seamlessly personalise video content, providing an outstanding subscriber experience with automated, repeatable workflows that drive 24/7 efficiency.

Leveraging AMD EPYC CPUs

AMD EPYC 9004 Series CPUs features the world's highest-performing of x86 server processor 1. AMD EPYC processors have a history of delivering world record performance and winning enterprise efficiency, while helping optimise IT budgets and advancing energy efficiency - with up to 96 cores per processor, 5nm technology, and 50% more memory channels than current generation x86 CPUs to help maximise application performance.

Synamedia has teamed up with AMD to improve processing capabilities and increase channel density in parallel with the number of cores. Parallelisation within Synamedia vDCM

encoders benefits from a higher number of cores and is underscored by its ability to support 8K encoding on a single AMD EPYC CPU. In addition, given that high-resolution encoders process an enormous amount of data in memory, AMD EPYC CPU memory architecture benefits the solution's high-throughput compression applications.

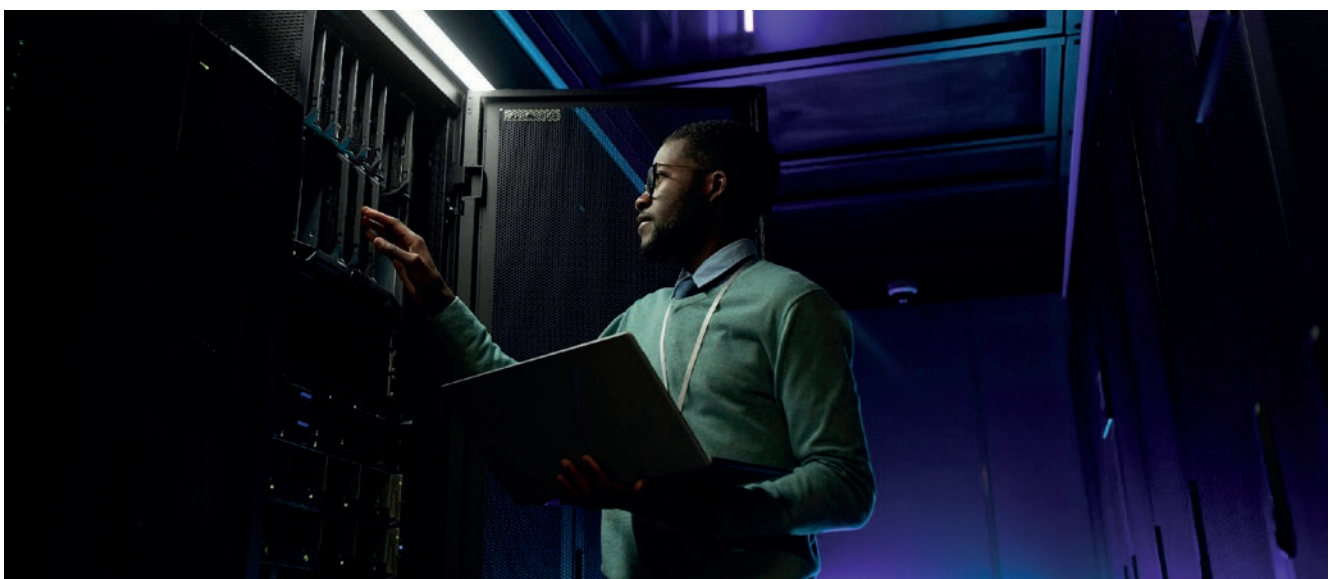
Enabling new applications: 8K for Live Sports Streaming

Demonstrating the strengths of the vDCM, BT Sport and Synamedia, leveraging AMD EPYC CPUs, carried out live 8K streaming of the 2022 Premiership Rugby final, an industry first for a live sporting event. The solution transported 8K video at a bitrate of 40-80Mbps, which is supported by common TV sets. This made end-to-end 8K delivery feasible to commercial TV sets while using only off-the-shelf components and servers.

The proper processing solution for delivering high-quality video requires high-level, real-time 8K encoding with no technology trade-offs. That means not splitting the 8K signal into 4K quadrants. It also means eliminating the need for dedicated GPUs or other hardware accelerators to avoid memory communication and/or throughput issues, as well as local video quality variations.

The event also highlighted other strengths of the vDCM platform, including live ingest at 48 Gbps, and 8K+4K adaptive bitrate ladder encoding and packaging on a single AMD-powered server.

Synamedia demonstrated the power of live 8K encoding at both NAB and IBC 2022.



Configuration	CPU type	# of sockets	CPU cores	Total cores	Base Clock frequency
1	3rd generation AMD EPYC 7713p	1	64	64	2.0GHz
2	3rd generation AMD EPYC 7763	1	64	64	2.45GHz
3	3rd generation AMD EPYC 7763	2	64	128	2.45GHz
4	4th generation AMD EPYC 9654	2	96	192	2.40GHz

Taking encoder performance to the next level

For every new generation of CPUs, Synamedia performs extensive benchmarking tests, to measure how video encoding performance takes advantage of new CPU and memory architectures. To determine how Vivid Compression performance scales with the addition of cores, encoding tests were performed with different AMD EPYC CPU-powered systems with the following server configurations (see above).

Tests were run by transcoding video streams at various resolutions (SD, HD, FHD, UHD), bitrates, and formats (MPEG-2, AVC, and HEVC). For each test case, as many streams as possible were processed in parallel on a single server. The resulting maximum number is referred to as the

“server density” for that use case. Configuration 1 was used as the reference point for the benchmark tests.

When averaged over more than 25 test cases, Figure 1 illustrates that the performance of Vivid Compression on AMD EPYC CPUs scales more than linearly with the number of CPU cores. By combining two AMD EPYC 7763 CPUs (configuration 3), a performance increase of just over 2x is measured compared to a single AMD EPYC 7763 CPU (configuration 2).

Remarkably, by introducing 4th generation AMD EPYC CPUs and increasing the number of cores from 128 to 192, a more than 70% increase in channel density was measured. This can be seen by comparing the results for configurations 3 (213%) and 4 (370%).

SCALING VIDEO ENCODER PERFORMANCE: FROM 3RD TO 4TH GENERATION AMD EPYC CPU

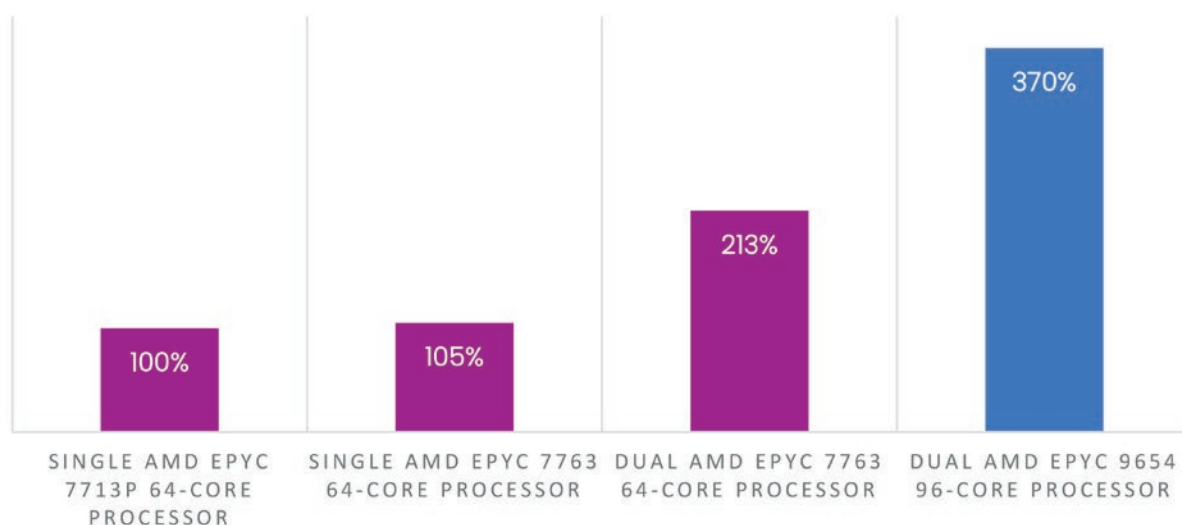


Figure 1: Average benchmarking results for single-socket 7713p and 7763 CPUs, and dual-socket 7763 and 9654 CPUs.



“The 4th generation AMD EPYC™ CPUs enable us to process 70% more video channels on a single server.”

**Jan De Cock, Director
Codec Development**

SCALING VIDEO ENCODER PERFORMANCE: FROM 3RD TO 4TH GENERATION AMD EPYC CPU

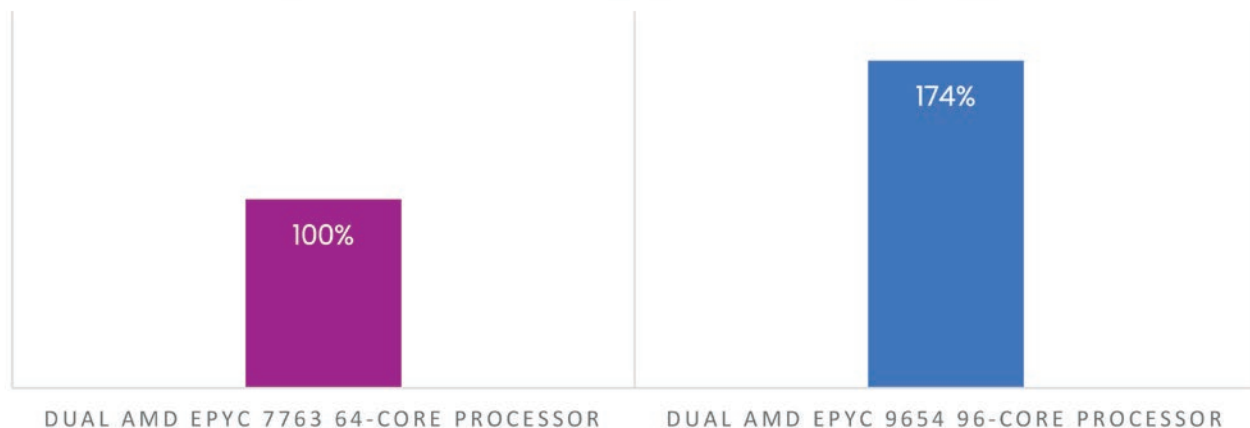


Figure 2: Average benchmarking results comparing the highest core-count CPUs for 3rd generation (2x 64-core 7763) and 4th generation (2x 96-core 9654) AMD EPYC™ CPU.

When zooming in on the generational gain for the highest core-count CPUs, going from 3rd to 4th generation AMD EPYC™ CPUs, we obtain the following results (see above).

Performance and Cost Benefits

Running Vivid Compression on AMD EPYC CPU demonstrates that transcoding performance improves more than linearly when transitioning to 4th generation AMD EPYC CPUs. This enables higher-density encoding servers optimally suited for live streaming of premium-quality video. It also opens the door towards even more demanding applications such as video at higher resolutions (8K and beyond), higher frame rates (>100 fps), 360-degree video, and virtual reality applications with crisp quality for every viewpoint.

Decreasing dependency on expensive hardware, pure-software encoding on AMD EPYC CPU also offers operators with significant capital and operational expense (CAPEX and OPEX) savings due to a lower footprint and reduced power consumption per encoded stream.



For more information, see www.synamedia.com