Case Study:

Scalable software solution for live sports OTT delivery

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Live transcoder

The total transformation of the media industry from broadcast to multi-platform, on-demand delivery has called for a completely fresh approach to the underlying architectures. Consumers expect to be able to see the content they want – either on-demand from a vast archive or, in the case of sport, live with minimal latency – on the device that is convenient to them, wherever they are.

To keep their audiences, broadcasters have had to supplement their traditional platforms with multi-format OTT delivery. Because they are seen as supplementary to conventional broadcast – and largely funded by the same advertisers – the expectation is that the same quality standards will apply.

This is a rapidly evolving part of the industry, not least because of continuing evolution in delivery formats caused by interest in higher resolution and dynamic range origination and by new consumer devices. Fixed, hardware solutions to creating delivery streams lack agility. Only software-defined platforms can provide the flexibility to meet new technical requirements and added services.

Background: access to sports

This case study is based on a proven implementation at a major sports broadcaster. Active globally, it provides multiple television networks and a large number of online services, covering more than 130 different leagues and sports.

It has innovated in online delivery, offering package deals for specific sports which guarantee online access to every game in a league. The expectation is that both the production values and the delivery quality will at least match the HD broadcast standard. Increasingly, online services are allowing the broadcaster to experiment, for instance with 4K and HDR Ultra HD.

Given the expectation that the pay TV and OTT market will be close to $300 billion by 2022[1], addressing online demands is a commercial imperative.

The existing OTT platform was regarded as no longer fit for purpose. It was built on an architecture of hardware encoders which made changes to the service delivery impractical. The new encoding platform had to fit into an all-IP broadcast workflow. This included compatibility with JPEG2000, the broadcaster's preferred contribution codec.

On the output side, the encoding platform had to be capable of the high-density creation of a large number of streams in multiple formats including ABR.
The workflow needed to be largely automated, and capable of a single point of management for simplicity.

Finally, the design had to be highly resilient. Sports fans are intolerant of any disruption to the action, so the expectation is that OTT services, like broadcast services, should not be interrupted.

Technical definition

On the input side, the new platform is expected to support 100+ video streams. The contribution sources are very high quality 200 Mb/s JPEG2000 in a TR-01 wrapper.

[1] Digital TV Research, OTT and Pay TV Forecasts. Market to rise from $239 billion in 2016 to £$83 billion in 2022

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Each stream needs to generate eight different ABR H.264 outputs, which will then be packaged as HLS for onward distribution. Audio also needs to be included in the processing. Currently this requires transcoding from AES3 to AAC: in the future the broadcaster will probably move towards HE-AAC for its online services. The solution needs to be able to add this and other audio formats in future.

The architecture should be sufficiently agile to be able to support changes, new services and trial platforms virtually instantly. This is required to support new video and audio codecs and formats on the consumer side. It will also allow the broadcaster to trial and implement new formats such as Ultra HD in 8K resolution, high dynamic range and higher frame rates, and other new offerings.

Finally, while the current plan is to keep the new architecture under the direct technical control of the broadcaster, it does intend to look to virtualisation and cloud implementation in the future.

This list of requirements for quality, flexibility and future developments suggested a software-defined architecture.

Once the principle of a software-defined architecture is accepted, then a number of further benefits follow. Chief among these is improved density by using a single hardware device to provide a number of software-defined encoding and transcoding chains.

Higher density reduces hardware costs, and offers reduced operational costs in terms of rack space, cooling and power consumption. Incorporating multiple functions and software modules into fewer hardware devise also achieves lower latency.

It is important to note that, while these are reasonable theoretical expectations of a move to a software-defined architecture, today the software systems from most vendors cannot compete with hardware solutions in terms of density. The broadcaster was looking for a cutting-edge solution to deliver today the promise expected.

The final benefit of a software solution running on standard COTS (commercial-off-the-shelf) hardware is that it will take advantage of continuing improvements in price, performance and density over time. The IT industry makes massive investments in R&D, and media applications should take advantage of this.

Solution requirements:

JPEG2000 TR-01 compatibility.

H.264 ABR outputs.

High density per 1 RU.

All-IP software-only solution.

Low latency.

4K UltraHD and HDR support.

On-premise and cloud virtualization.

In particular, recent developments in unrelated areas, such as artificial intelligence or cryptocurrencies, have led to significant power boosts in GPUs, the multi-processor devices originally developed to drive high-quality displays. The internal architecture of the GPU allows for massively parallel processing.

The Comprimato versatile platform

Despite the challenging set of requirements, Comprimato was able to deliver a solution which realized all the benefits and more.

In particular, Comprimato is the world leader in the use of massively parallel processing on GPUs for complex computational tasks like JPEG2000 encoding and decoding. This allows it to build a practical transcode engine using the Comprimato unique UltraJ2K codec and GPU power for major JPEG2000 and H.264 processing. This leaves the CPU free for tasks including multiplexing and audio processing.

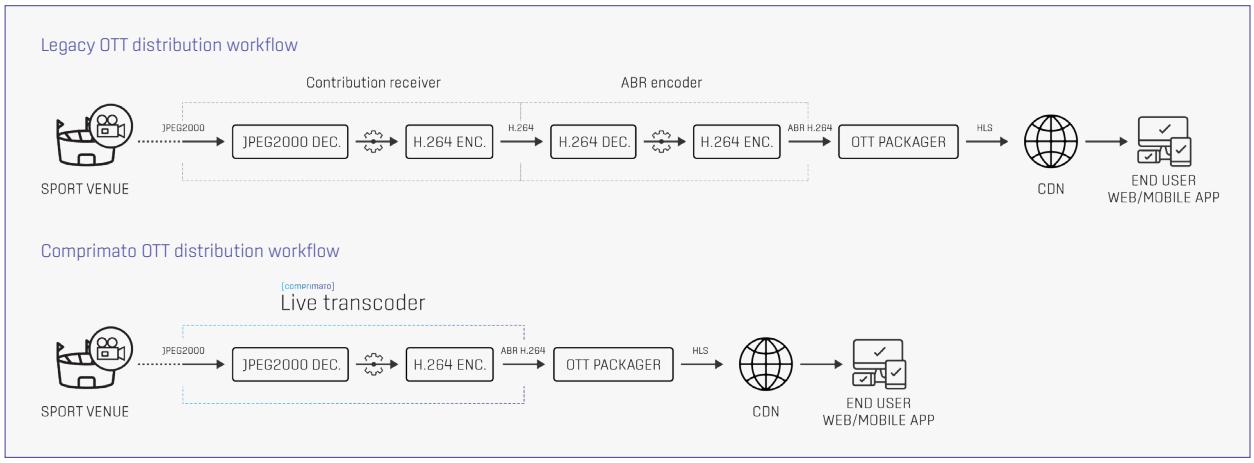
The software architecture is implemented as the Comprimato Live Transcoder, a powerful high-density solution running on COTS hardware. A single 1U server is capable of supporting 32 simultaneous one-to-one transcode streams or 16 one-to-eight ABR streams.

In this implementation, the inputs are eight maximum-quality tuned 1080p/60 full HD streams running on two professional GPUs. This setup provides 20 % buffer for load balancing and resilience while leaves enough space for immediate scaling by adding another GPU to the server. Software plug-ins to support 4K and HDR are already in place, and 8K and higher frame rates will be added as the requirement is defined.

Workflows through the system are defined through a simple web-based manager, using a RESTful API and SNMP monitoring. As new functionality is required it can be simply loaded into the device and implemented in a matter of moments.

The architecture also ensures low latency: less than one second end-to-end. The hardware platform it replaces had a latency of 5.5 seconds, so this 80% reduction in processing time is very significant.

Achieving workflow simplification: Legacy and Comprimato workflows comparison.



Benefits

The result is a powerful, flexible, readily extensible architecture which meets all the expectations of the broadcaster and is capable of extension to meet any likely future requirement. Additional COTS hardware can be added to the network if required to provide for expansion, without interruption to the existing outputs.

Through a simple GUI and reliance on standards including SNMP system management is simple. It also makes it easy to set up new streams in a matter of minutes. Workflows are simplified because every step is in integrated software.

It delivers cost savings, both in capital cost – being built on readily available COTS hardware including standard COTS servers and graphics cards – and in operational cost as it is compact, low power and software-upgradable.

The use of COTS processors reduces hardware dependencies, which means fewer technical issues and significantly greater resilience through standard IT redundancy techniques. Installation and maintenance requirements are also reduced because of the virtual elimination of interconnecting cables, with the devices sitting on the broadcaster's ethernet network.

Finally, minimising processing, and using Comprimato's unrivalled GPU video processing, it delivers better image quality than the existing hardware. This meets the expectations of subscribers and advertisers. It does this while providing a reduction in latency of more than 80%.

In short, the Comprimato software-defined solution delivers better quality to the growing number of subscribers and device types. It does this more quickly, more securely and more cost-effectively.

Comprimato solution benefits:

Flexible and agile software architecture scalable for future technologies.

4K UltraHD and HDR support.

80 % end-to-end latency reduction.

Density increase by 100 %.

Simplified workflow.

COTS hardware utilization.

All-IP software-only solution.

Simple centralized control.

Ready for testing?

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