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How to deliver differentiated video services

Haivision, running on Intel® technology, enables CSPs to provide live video platform as-a-service for a compelling TCO

This solution brief describes how to solve business challenges through investment in innovative technologies.

If you are responsible for...

- **Business strategy:**
  You will better understand how live video platform-as-a-service will enable you to successfully meet your business outcomes.

- **Technology decisions:**
  You will learn how a live video platform-as-a-service solution works to deliver IT and business value.

Executive Summary

Cloud Service Providers (CSPs) must provide differentiated services to retain and grow market share. As more organizations rely on live broadcasts to efficiently communicate to a large, globally-dispersed audience, CSPs see the revenue potential in offering live video services, but face technical challenges.

Video streams are large and must be transcoded end-to-end in real-time for delivery on every device, in any location. Margins can quickly slip away as CSPs struggle to meet these technical requirements. The key is being able to deliver high-quality live video streams in a cost-effective manner.

Haivision, running on Intel® technology, provides CSPs with a one-stop, highly-scalable solution, enabling them to deliver differentiated live video platform as-a-service (PaaS) for an agreeable total cost of ownership (TCO). CSPs no longer need to spend time and resource integrating specialist technologies from different vendors, since Haivision supports the full live video workflow from on-premise encoding through to high-performance cloud processing, and a reliable end-to-end transport technology.

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Figure 1. Enterprises are turning to live broadcasts as an effective way to communicate with large audiences

Solution Benefits

- Efficient on-premise encoding. Single bitrate encoding produces streams of just 6 Mbps as opposed to up to 30 Mbps, reducing the required contribution bandwidth by as much as 80 percent[1]

- Accelerated cloud processing. Hardware-assisted media and graphics processing increases the number of live video streams per server and allows for delivery of increased video resolution

- Reliable transport technology. Secure Reliable Transport (SRT) protects the stream from packet loss, helping it get through firewalls and applying encryption

Business Challenge: Lowering the TCO of live video services

CSPs operate in a fiercely competitive market segment, with hundreds of providers offering largely similar infrastructure services. To compound matters, niche players with specialist offerings are entering the sector at a rapid pace, threatening to snatch revenue from more established players with a broad service portfolio. To retain and grow their share of the market, CSPs must be able to offer differentiated services that meet customer needs and expectations.

Enterprise video is one such service. A study in 2015 estimated that the global enterprise video market segment would grow from USD 16.98bn to USD 36.84bn by 2020[2]. Video services alone are expected to account for an increasing proportion of this market. Technavio's analysts forecast that the global video services sector will grow at a CAGR of 24.34 percent during the period 2016-2020[3].

As more organizations turn to live broadcasts as an effective way to communicate with large audiences, live video PaaS stands out as a promising potential revenue generator for CSPs. However, live video PaaS also presents huge technical challenges.

Audiences are used to watching high-quality video across a range of devices and therefore expect the same user experience with live enterprise video. CSPs must be able to deliver live streams with more pixels and more frames per second than ever before, to an ever-growing number of devices and codecs. What's more, live video broadcast streams must be encoded, transcoded and transported in real time with minimal latency on the network.

Meeting these technical challenges, however, is not enough. The key to success is being able to fulfil these requirements in a cost-effective manner.
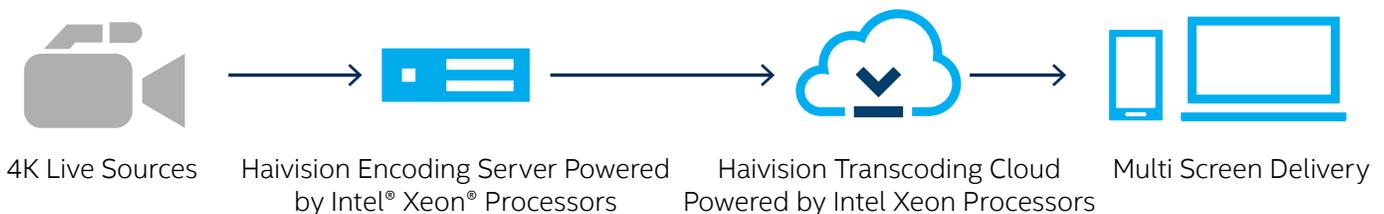
Live end-to-end video workflow

The CEO of a Fortune 500 company wants to record and stream live the keynote she will deliver at a top industry event. She has a product announcement to make and wants the news to reach as many people as possible in one hit. The global audience will be watching on a range of devices from TV monitors and desktops, through to tablets and smartphones.

The CSP providing live video PaaS to the Fortune 500 company must assure the end-to-end workflow from the broadcast location all the way through to the device. What's more, this workflow must be completed in real-time and with minimal network latency to ensure a quality viewing experience for the audience. Each stage of the workflow presents a challenge for the CSP, with two in particular standing out.

- **On-premise source encoding.** Traditionally, on-premise encoding generates multiple, high-bandwidth adaptive bitrate (ABR) streams which must be sent from the broadcast location to the cloud. Often this requires bandwidth exceeding 30 Mbps. In many instances, however, the broadcast location relies on the public Internet. Currently the average speed of the internet globally is just 7Mbps[4]. To circumvent this, CSPs must either sign up to a contract with a specialist multi-protocol label switching (MPLS) provider who can offer speeds higher than 30 Mbps or pay the public internet service provider for increased bandwidth. Each of these measures requires effort and planning and incurs extra expense.

- **Cloud transcoding.** Once in the cloud, high-density live video streams must be transcoded in real-time for distribution through a content delivery network (CDN) to a range of devices with differing standards and requirements. As well as ensuring high-performance processing, CSPs must be able to deliver enough concurrent streams per server to make infrastructure costs manageable, and services profitable.

To underpin live video PaaS, CSPs require a technology solution that assures a quality end-user experience, while minimizing operational costs. Traditionally CSPs rely on specialist technology solutions, often from different vendors, for each element of the end-to-end workflow. With this approach CSPs must spend time and resource integrating disparate technologies to ensure they run smoothly together. It is both inefficient and costly. A much better approach is to source one end-to-end hybrid (on premise and cloud) solution from one technology partner.

4K Live Sources   Haivision Encoding Server Powered by Intel® Xeon® Processors   Haivision Transcoding Cloud Powered by Intel Xeon Processors   Multi Screen Delivery

Figure 2. The end-to-end workflow from broadcast location to end device

Solution Value:
Compelling user experience for great TCO

Haivision combines efficient on-premise encoding with high-performance cloud processing and end-to-end transport technology. It provides CSPs with a one-stop, highly scalable solution, enabling them to deliver live video PaaS for an agreeable TCO.

The Haivision encoder facilitates high-performance, on-premise H.265/ High Efficiency Video Coding (HEVC) encoding of video up to 2160p (4K/ Ultra-High Definition (UHD) for distribution as a cascade of adaptive bitrate RTMP/HLS/MPEG-DASH streams across a content delivery network (CDN). It offers great advantages when bandwidth at the broadcast location is limited. Single bitrate encoding produces streams of just 6 Mbps as opposed to up to 30 Mbps, reducing the required contribution bandwidth by as much as 80 percent[5]. CSPs can send video to the cloud for transcoding from a much wider range of locations, without having to pay MPLS or internet service providers for additional bandwidth.

Haivision's transport technology, known as Secure Reliable Transport (SRT), protects the stream from packet loss, helps get it through firewalls, and applies encryption. The reliance on Quality of Service (QoS)-oriented networks diminishes, as ad hoc contribution is now possible from any location.

The Haivision cloud offers scalable, high-performance, and real-time processing of live video streams. Transcoding can take place using CPU processing power only or CPU with GPU assistance which can further improve performance.

CSPs can run more live video streams per server which leads to better resource utilization, improved data center efficiency, and lower power consumption. Since Haivision supports the full end-to-end live video workflow, CSPs no longer need to spend time and resource integrating specialist technologies from different vendors. This helps CSPs lower the TCO for delivery of live video streams to every user across a range of devices and locations.

Solution Architecture:
Haivision, running on Intel® technology

Havision collaborates with Intel to help optimize video processing on Intel CPU and GPU architectures.

The Haivision on-premise encoders run Dell hardware powered by the Intel® Xeon® processor E3 family and the 6th Generation Intel® Core™ i7 processor. These processors are built to support a range of cloud-based graphics demands like real-time live video encoding and transcoding.
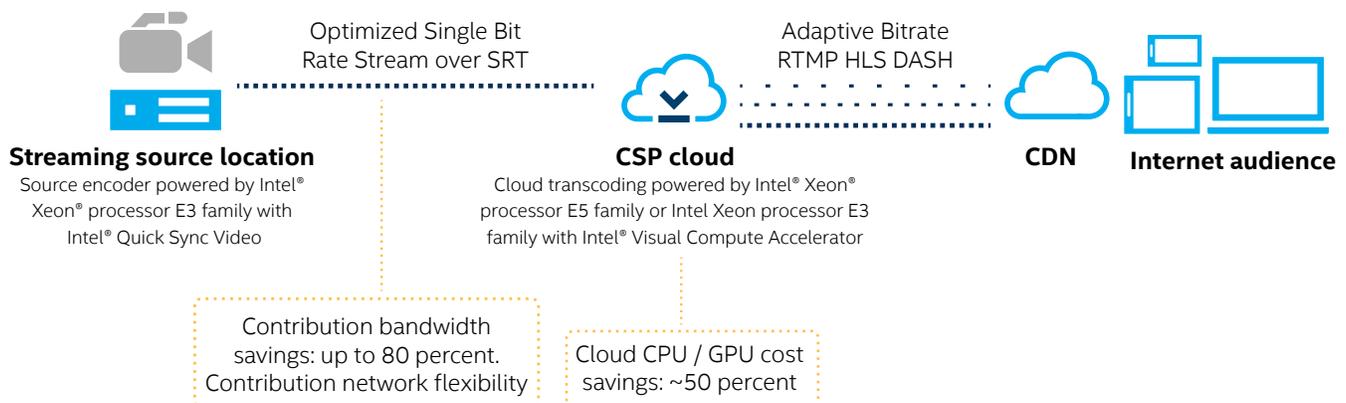
The Intel Xeon processor E3-1200 v5 product family integrates Iris® Pro graphics P580, Intel's most powerful data center graphics, and delivers up to 1.4x more performance for video transcoding and up to 1.8x more 3D graphics performance compared to the previous generation[6]. It also features Intel® Quick Sync Video for hardware-accelerated transcoding performance, delivering up to 4,300 simultaneous High Definition (HD) video streams per server rack to provide high-quality live video content to more users[7].

Whether on-premise or in the cloud, the Intel® Visual Compute Accelerator (Intel® VCA) brings additional 4K UHD media processing capabilities to Intel Xeon processor E5 platforms. The Intel VCA card integrates three Intel Xeon processor E3 family with Iris Pro graphics into a PCIe* card form factor that fits into Intel Xeon processor E5-based servers. Intel® Media Server Studio is also used to unlock the full graphics capabilities of Intel® Quick Sync Video and achieve fast, dense video transcoding.

Specifically designed for HD and 4K UHD media processing with HEVC and high-density Advanced Video Coding (AVC) transcoding solutions this card gives CSPs a customizable solution that can:

- Offer fast transcoding for video into multiple formats and bit rates helping reduce the amount of time needed to process the video inputs

- Help reduce the amount of storage needed for those multiple formats through high compression processing

- Help allow for real time transcoding into multiple formats from the stored format, reducing the need to store all possible media formats

- Help reduce the amount of network bandwidth needed (low bit rates) at good video quality by compressing the video prior to transmission

Peter Maag, chief marketing officer at Haivision, says: "Working from the core and expanding to the ends of the workflow, we believe that the Intel VCA will improve our cloud processing capabilities. This could help us in a number of ways, from

Optimized Single Bit Rate Stream over SRT

Adaptive Bitrate RTMP HLS DASH

Streaming source location
Source encoder powered by Intel® Xeon® processor E3 family with Intel® Quick Sync Video

CSP cloud
Cloud transcoding powered by Intel® Xeon® processor E5 family or Intel Xeon processor E3 family with Intel® Visual Compute Accelerator

CDN   **Internet audience**

Contribution bandwidth savings: up to 80 percent. Contribution network flexibility

Cloud CPU / GPU cost savings: ~50 percent

Figure 2. Haivision, running on Intel® technology, helps increase the efficiency of live video PaaS end-to-end workflow

improving resolution through to increasing the number of streams per server. Intel VCA is a key differentiator for anyone encoding and transcoding in the cloud."

"It is an active partner community and leading edge developments by companies like Haivision enable Intel technologies to shine," adds Jim Blakley, General Manager of Intel's Visual Cloud division. "Customer solutions can only be successful with technology collaboration, and the best solutions often rely on deep collaboration between some of the leading vendors."

Conclusion

By combining efficient on-premise source encoding at bit rates well below 6Mbps, unique contribution transport technology, and high-performance cloud transcoding, the Haivision/Intel solution allows CSPs to deliver live video PaaS for an attractive TCO.

What's more, Haivision's end-to-end technology enables CSPs to differentiate their live video PaaS offering in a number of ways:

- Customer broadcasts can take place from a much wider range of locations, even those that have average internet connections

- Transmission costs are lower, since single streams can run over readily available internet connections and it's no longer necessary to buy additional bandwidth

- Cloud-based transcoding allows low-cost delivery of live video streams to every user on every device, in every location.

Solution Provided By:

Find out how you could deliver differentiated video services.

Find the solution that is right for your organization. Contact your Intel representative or visit **www.haivision.com/Intel**

Solutions Proven By Your Peers

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- intel.com/content/www/us/en/servers/data-center-graphics.html
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- intel.com/content/www/us/en/products/processors/core.html
- intel.com/content/www/us/en/products/processors/xeon.html
- intel.com/content/www/us/en/architecture-and-technology/visual-technology/graphics-overview.html
- intel.com/content/www/us/en/servers/media-and-graphics/visual-compute-accelerator.html
- software.intel.com/intel-media-server-studio

1 http://www3.haivision.com/Datasheet_KB

2 http://www.marketsandmarkets.com/Market-Reports/enterprise-video-market-1182.html

3 http://www.prnewswire.com/news-releases/global-video-services-market-2016-2020-300343990.html

4 https://www.akamai.com/us/en/multimedia/documents/state-of-the-internet/q4-2016-state-of-the-internet-connectivity-report.pdf

5 http://www3.haivision.com/Datasheet_KB

6 Up to 1.4x transcoding performance with Intel® Xeon® E3-1285L v4 when compared with Intel® Xeon E3 v3 on Intel Media Server Studio 2015 R3 Essentials Edition. Number of real time threads transcoded simultaneously: 10 on E301286L v3, 14 on E3- 1285L, using 1080p30 20Mbps streams. Baseline configuration: Intel Rainbow Pass SR1200V3RP Platform with Intel® Xeon® E3- 1286Lv3 (65W, 4C, 3.4Ghz, Intel® Iris Pro Graphics P6300) or Intel® Xeon® Processor E3-1286L V3 (65W, 4C, 3.2Ghz, Intel® HD Graphics p4700), 32 GB (4x8GB DDR3-1600MHz UDIMM), 160GB 7200 SATA HDD, Turbo Boost Enabled, HT Enabled, Windows Server 2012 R2, Intel Media Server Studio 2015 R3 Essentials Edition, Multi Transcoding Sample Version 6.0.0.36, Intel graphics driver pGFX 10.18.14.4172, BIOS S1200RP.86B.03.01.002. Source: Intel internal measurements as of May 2015 6 Up to 1.8x better performance on 3DMark11*. Baseline configuration: Intel® Hermosa Beach 2 CRB platform with Intel® Xeon® E3-1286v3, 32GB memory (4x 8GB DDR3-1333 UDIMM), 64GB SATA SSD, Turbo Boost Enabled, HT Enabled, Red Hat Enterprise Linux 6.3, Oracle Java Hotspot Java 1.7.0_17. 3DMark Score 1524, Source: Internal Intel® measurements as of April 2014. Intel® Xeon® workstation platform (Intel S1200RP Board) with one Intel Xeon processor E3-1285 v4 (quad-core, 3.5GHz, 6M cache) BIOS S1200RP. 86B.03.01.0002.041520151123, Intel HT Technology best configuration, 32GB memory (4x8GB DDR3- 1600 ECC UDIMM), Intel Iris Pro Graphics P6300 with driver 10.18.10.3980, Intel SSDSC2BB300G4, Microsoft Windows 8.1*. 3DMark Score 2881, Source: Intel internal testing as of June 2015

7 Up to 4300 streams per rack, or 1.4x vs previous generation. Rack density based on the Supermicro* SuperServer 5038MLH24TRF 3U chassis with 12 sleds. Each sled containing 2 Intel® Xeon® E3-1200 v3 or v4 processors for a total of 24 E3-1200 v3 or v4 processors per 3U chassis. Assuming 2U for top of rack switches, 13 3U chassis could fit in each rack, giving 24*13=312 sockets in a 42u rack. E3-1286L v3 streams=312*10=3120; E3-1286L v4 streams=312*14=4368

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