NETINT

SOLUTION BRIEF

Distribution Bandwidth Optimization

SUMMARY

Customer Profile

- Video producer with large monthly OPEX to distribute SVOD or OTT video through CDN to its consumers.
- CDN service provider looking to reduce networking OPEX to service its video streaming customers.

Opportunity

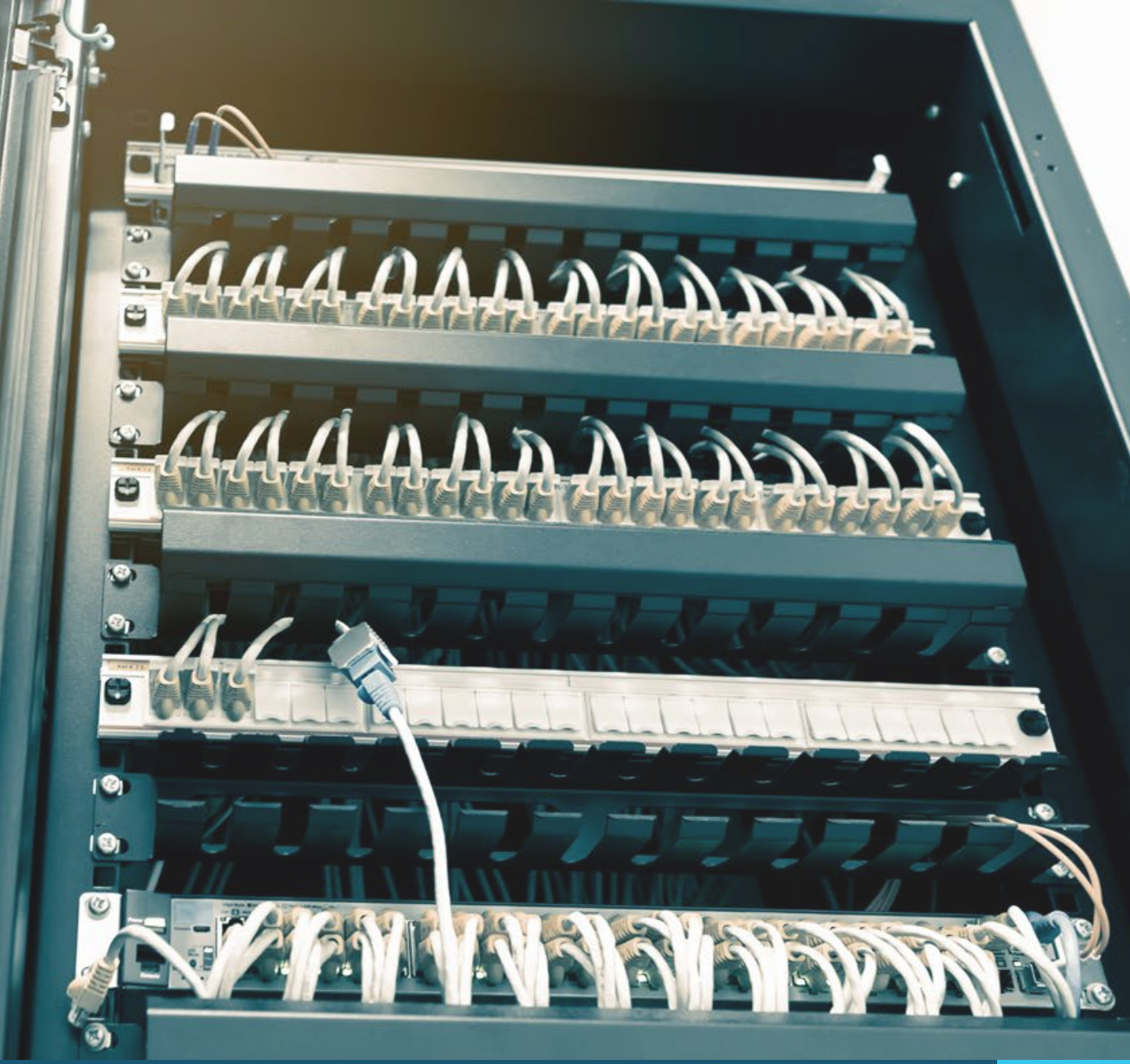
- SVOD and OTT market is growing.

Challenge

- Monthly video distribution OPEX expense is also growing.

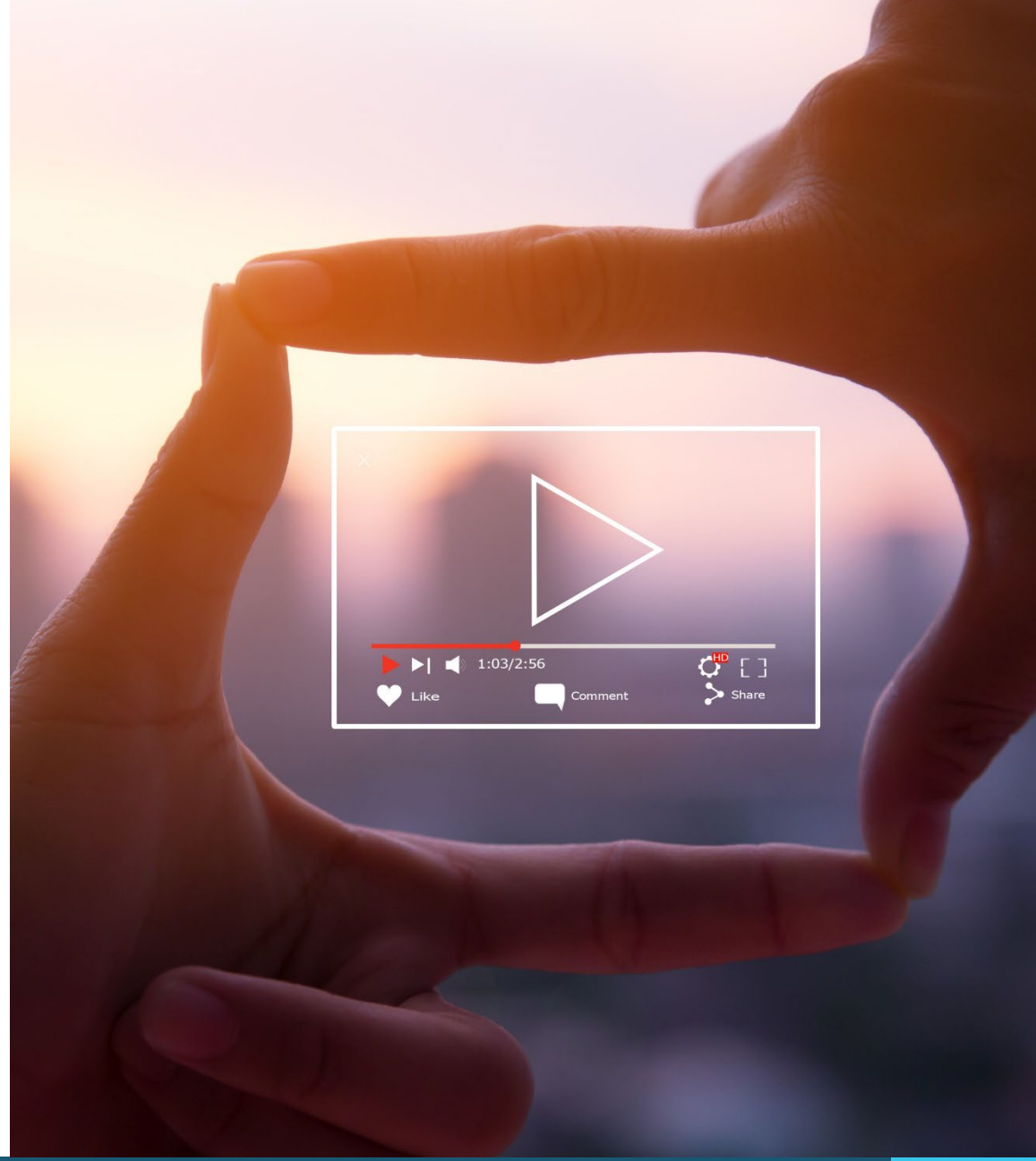
Solution Benefits

- Reduce monthly bandwidth, and associated OPEX, using high efficiency H.265 encoding for video bandwidth optimization.
- Investment in Codensity™ T408 bandwidth optimization solution can be paid back within months.



“Internet video content, including OTT and SVOD services, are growing at an explosive rate.”

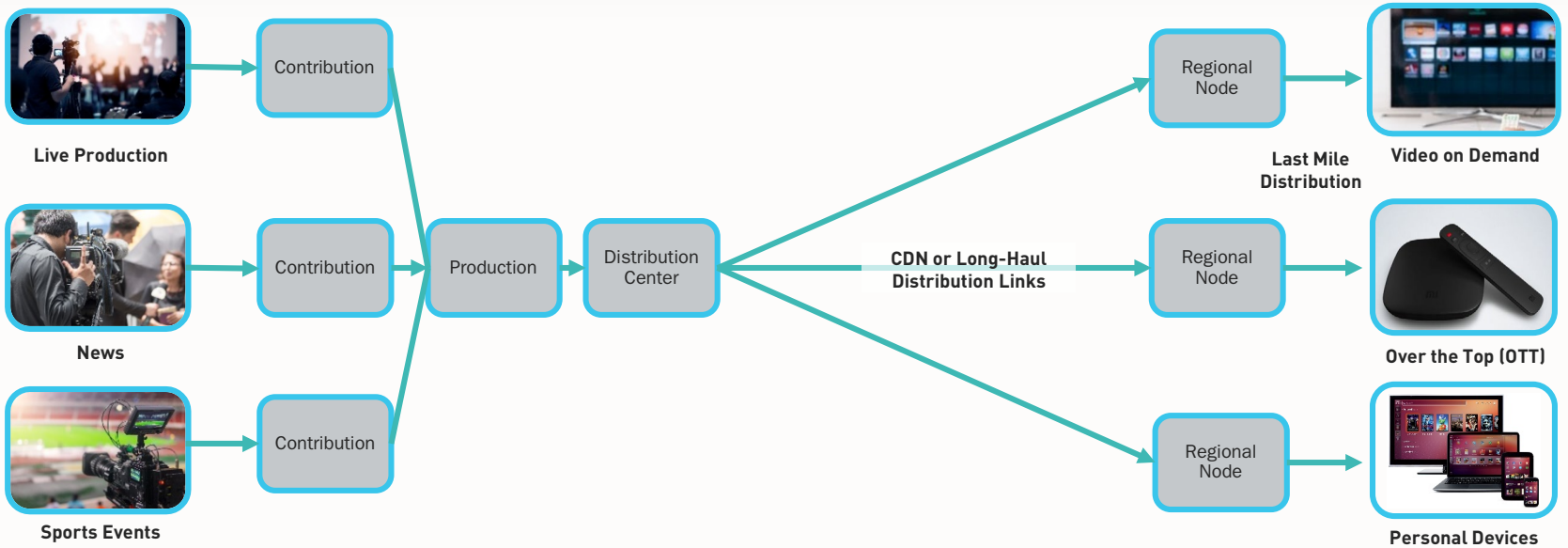
Industry sources estimate that by 2022, over 80% of internet traffic will be video content[1]. However, behind the business opportunities is an important economic factor regarding the distribution of large video files or live video streams. The monthly operating expense (OPEX) for transmitting video is large and significant, and with the explosive growth in video traffic, will also become a growing expense line item for any video business that buys or provides video distribution services. This solution brief outlines how the Codensity™ T408 video transcoder can be deployed to optimize and reduce video distribution bandwidth and costs.



1. Cisco Networks, Cisco Visual Networking Index (VNI) 2016– 2021

Overview of Content Creation Workflow

Content creation workflows vary widely, but typically include the following elements:



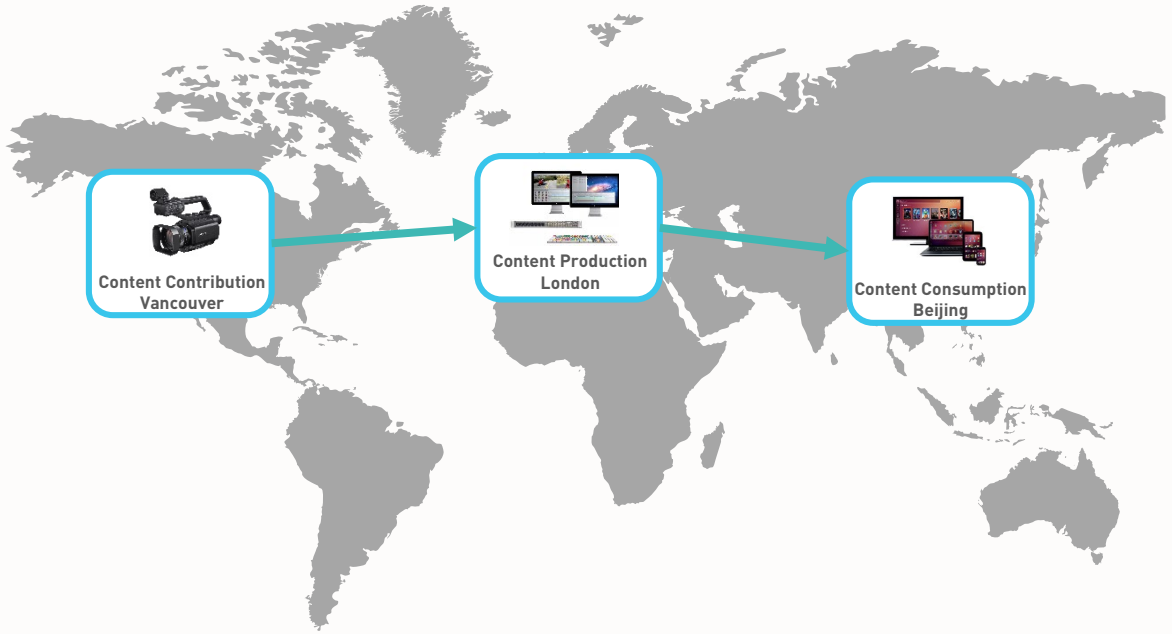
Contribution – This is the collection of media elements that would be used in the content creation process. For example, in a news production, this may include unedited news clips or in a sports production, an interview of a sports personality at a remote venue. Any video production typically uses content contributions from multiple remote locations, so this step includes the aggregation of original footage to a centralized production function.

Production – Individual contribution elements enter the production workflow and are processed and edited together to create the finished piece of content. Production is conceptually one function, but in practice might involve creative collaboration across many specialists or teams in different locations. The key deliverable is the final video content – ready for distribution to consumers.

Distribution – In this phase, the finished content is distributed to various devices or platforms, including SVOD and OTT. To accommodate the specific requirements of different viewing platforms, multiple versions of the content will have to be encoded in different formats and resolutions. Generating optimized encodings and encoding ladders requires significant processing resources in the cloud. Performing this function in real time for live production requires even more processing power.

Content Creation Workflow Challenges

This workflow, while highly integrated, may often be geographically distributed. For example, a documentary might acquire multiple videos of contributed content in Vancouver, then produced in London, for distribution in Beijing to regional SVOD and OTT consumers.



Distributed Content Creation Workflow

Transport links between the different elements of a content creation workflow typically utilize H.264 AVC due to its broad interoperability with existing technologies including acquisition, editing and encoding systems. In addition, H.264 is more broadly supported by end user devices commonly used for SVOD and OTT services such as smartphones, tablets and smartTVs. H.264 interoperability means content can more easily be exchanged without any additional processing or transcoding, simplifying the overall workflow.

H.264 AVC Content Creation and Consumption Elements

Unfortunately, utilizing H.264 for interoperability throughout the workflow may not efficiently utilize available bandwidth, leading to higher OPEX associated with moving video content through the workflow.

Instead, an H.265 HEVC transport solution would reduce bandwidth up to 50% while maintaining equivalent picture quality and screen resolution. An H.265 transport solution would reduce monthly OPEX, with typical payback within a few months. Any additional CAPEX costs associated with an H.265 transport solution would be offset over time by reduced OPEX costs[2] leading to a rapid margin improvement.

2. Edge Encoding for the Video Cloud

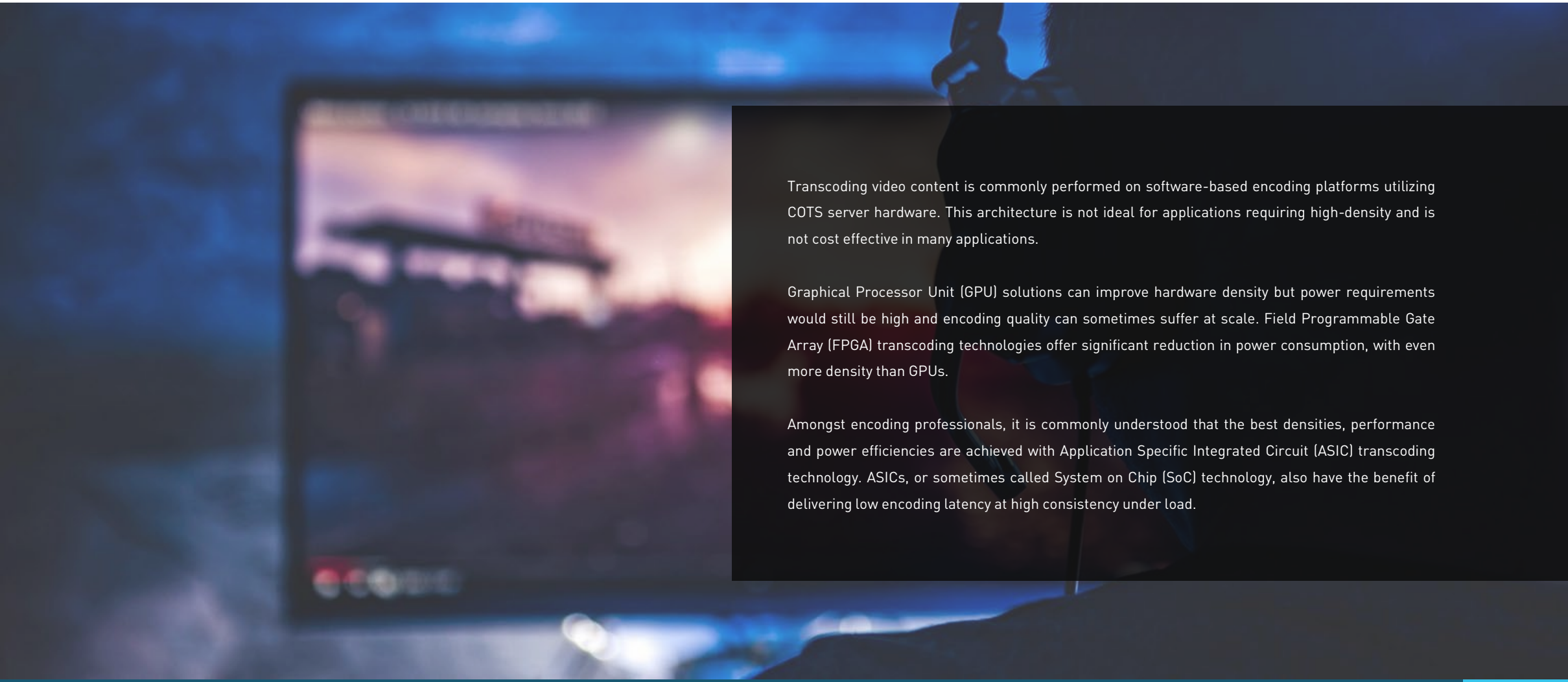
Implementing a Bandwidth Optimized Link

To implement a bandwidth optimized link, a high-performance low latency transcoder at the source would transcode the original H.264 AVC content into a lower bitrate H.265 HEVC stream for long-haul transmission to the destination. At the destination, a low latency transcoder would transcode the H.265 HEVC stream back into an H.264 AVC stream.

The goal of the solution is to transmit the original H.264 encoding to a destination H.264 output with minimal loss in data and picture quality, while balancing the need to minimize bandwidth requirements.

Compression artifacts that could be potentially introduced by the dual transcoding processes of this bandwidth optimized link are minimized by the use of the high efficiency H.265 codec. The transmission link can utilize a bitrate sufficient to maintain acceptable image quality, while still able to achieve dramatically lower bandwidth requirements compared to H.264 transmission.

Transcoding Technology Options for Bandwidth Optimization



Transcoding video content is commonly performed on software-based encoding platforms utilizing COTS server hardware. This architecture is not ideal for applications requiring high-density and is not cost effective in many applications.

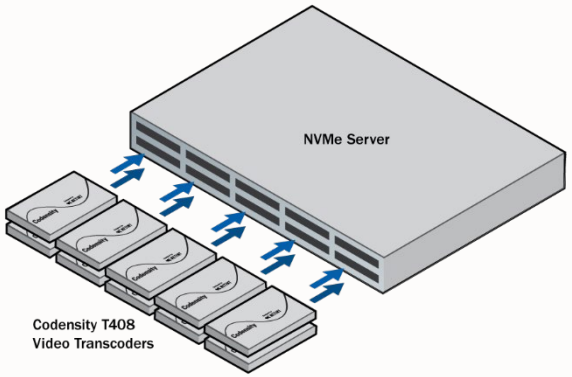
Graphical Processor Unit (GPU) solutions can improve hardware density but power requirements would still be high and encoding quality can sometimes suffer at scale. Field Programmable Gate Array (FPGA) transcoding technologies offer significant reduction in power consumption, with even more density than GPUs.

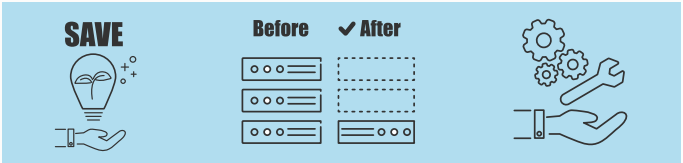
Amongst encoding professionals, it is commonly understood that the best densities, performance and power efficiencies are achieved with Application Specific Integrated Circuit (ASIC) transcoding technology. ASICs, or sometimes called System on Chip (SoC) technology, also have the benefit of delivering low encoding latency at high consistency under load.

Bandwidth Optimization with the Codensity T408 Video Transcoder

NETINT's Codensity T408 Video Transcoder is a compact plug-in module based on a unique ASIC-architecture delivering 4K UHD resolution up to 60 frames per second (fps) for high density, low latency transcoding even under full load.

To implement a bandwidth optimized link, a Codensity T408 module at the source location would transcode, for example, up to 8x 1080p30 H.264 AVC streams into lower bitrate H.265 HEVC streams for transport to achieve bandwidth savings of up to 50%. At the receiving destination location, an additional T408 module would transcode the incoming H.265 content back to H.264 format for interoperability with the existing workflow and associated systems. A bandwidth optimized workflow preserves interoperability with H.264 based systems and tools used in the workflow, while minimizing transport link bandwidth, delivering a balance between performance, low latency, bandwidth conservation and OPEX savings.





Also contributing to OPEX savings is low power consumption. A single T408 U.2 module consumes only ~7 Watts of power (typical) at full load, making a T408 solution very economical to operate.

For higher capacities, up to 10x Codensity T408 Video Transcoders can be deployed in a 1RU NVMe server to scale up the solution in rack-constrained environments to deliver benefits across hundreds of streams or workflows.

Application of Bandwidth Optimization

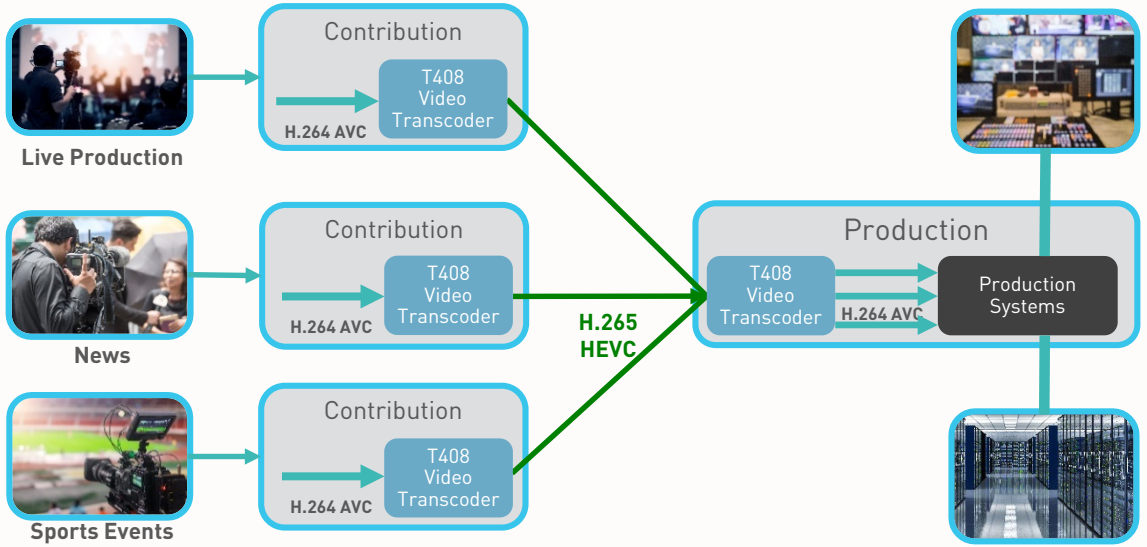
The application of bandwidth optimization is applicable to any operations using CDN services or operating long-haul video broadband distribution links associated with the various steps in a content creation workflow. In this section, we will explore two different scenarios.

Application of Bandwidth Optimization

Scenario 1: Content Contribution

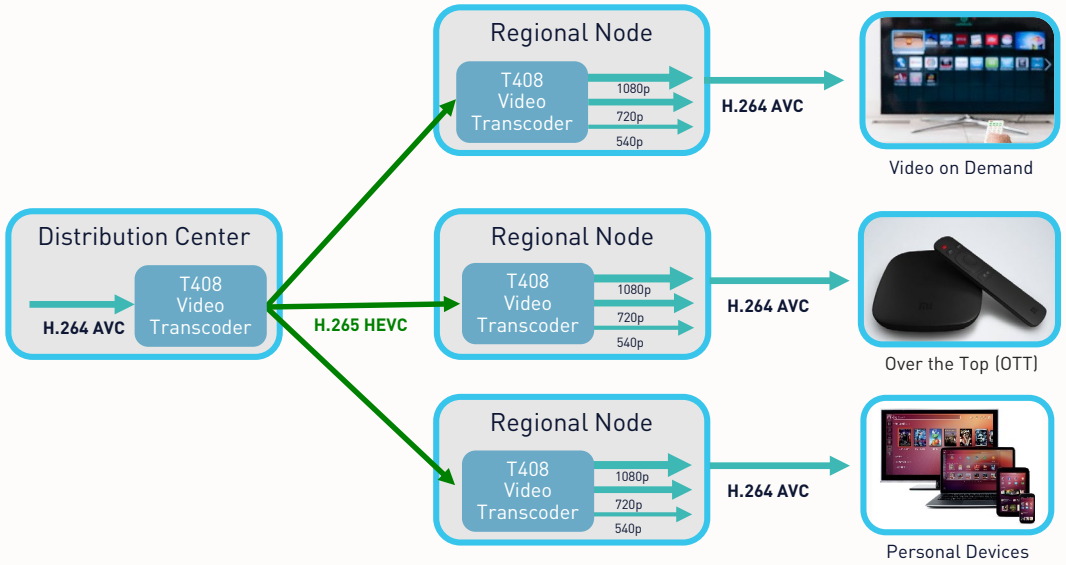
At the start of a workflow, various contributed video elements could be generated and produced in different locations that then need to be transported, sometimes using expensive CDN services or long-haul links, to the master production studio for QA and editing. Contribution content typically utilizes formats including AVC H.264 due to its interoperability with production systems and tools.

To save bandwidth and content aggregation OPEX costs, a Codensity T408 video transcoder at each source capture location could transcode the video to bandwidth-efficient H.265 HEVC format for transport. At the receiving master production location, a T408 module would transcode the video back to H.264 AVC format, maintaining interoperability with existing investments in H.264-based infrastructure.



Application of Bandwidth Optimization

Scenario 2: Content Distribution



When the content producer completes their final video, it is handed off to the content distributor, which utilizes CDN services or long-haul links to send the content to regional nodes for last mile distribution to the viewer. Existing transport link architectures utilize H.264 AVC in order to maintain interoperability at the expense of higher bandwidth and OPEX costs.

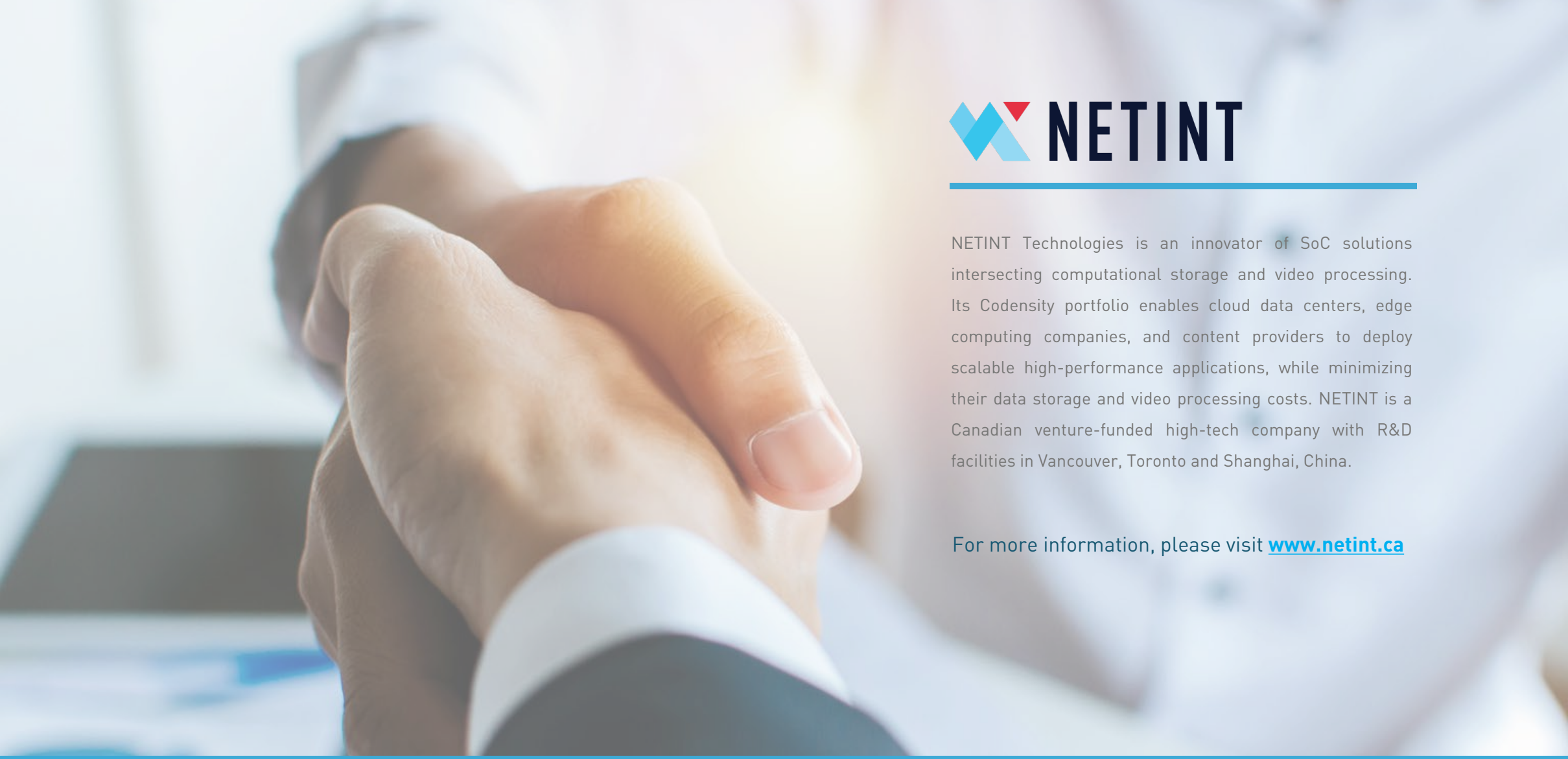
Utilizing H.265 for the long-haul distribution links will potentially lower bandwidth up to 50% with an associated reduction in monthly CDN or OPEX costs.

In addition, content transported to the regional nodes might also be distributed to different platforms including SVOD and OTT, which dictates the need to prepare the video content for different consumer devices with varying screen resolutions, and different bitrates suitable for different connectivity conditions, from broadband, to WiFi, to LTE mobile. To deliver quality video across this spectrum of requirements, as the H.265 HEVC content is decoded at the regional distribution nodes back to H.264 AVC, the Codensity T408 Video Transcoders could also generate encoding ladders with multiple output formats for Adaptive Bit Rate (ABR) streaming and distribution to different platforms. Transcoding at the edge of the distribution network also minimizes overall bandwidth since multiple versions of content are not transcoded and sent from the distribution center.

Other considerations for transcoding equipment to implement bandwidth optimization include high-density and low power. Regional distribution nodes, and especially edge data center nodes, can be limited in both rack space and power; hence the Codensity T408 is ideal for edge applications.

Conclusions

Bandwidth optimization associated with content creation workflows will be an ongoing challenge. Advanced encoding solutions such as the Codensity T408 Video Transcoder as outlined in this solution brief will utilize high efficiency H.265 on long-haul links to reduce bandwidth and OPEX costs, while maintaining H.264 AVC interoperability with the large installed base of end user devices. An investment in a bandwidth optimization solution using the Codensity T408 Video transcoder can be paid back within months, delivering positive margin improvements to your business.



NETINT

NETINT Technologies is an innovator of SoC solutions intersecting computational storage and video processing. Its Codensity portfolio enables cloud data centers, edge computing companies, and content providers to deploy scalable high-performance applications, while minimizing their data storage and video processing costs. NETINT is a Canadian venture-funded high-tech company with R&D facilities in Vancouver, Toronto and Shanghai, China.

For more information, please visit **www.netint.ca**

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