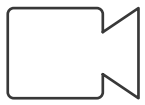




A Guide to Choosing the Right Video Compression Vendor for your Business



Introduction

In today's multimedia-oriented world, visual data is one of the most prominent ways of communication. Emerging from the seeds of photography in the 19th century, visual data transmission solutions have seen many significant milestones over the years. But perhaps the biggest transformation occurred with the transition from analogue to digital more than 30 years ago.

Now that it is possible to re-use and distribute high-quality visual content, the digitization of media has led to ever-growing market demand.

Today, the trend continues with the constant evolution of technology that offers increasing screen resolutions, frame rates and dynamic ranges - not only on televisions but also on mobile devices - as well as various modalities such as virtual reality, multi-view, 3D and 360 TV.

Such is the ubiquity of video that by 2022, it will comprise over 80% of Internet traffic¹.

From the perspective of content distributors, whether aggregators or direct-to-consumer (DTC), that can only be good for business.

But surely, there must be a catch. And indeed, there is...



¹ https://www.cisco.com/c/dam/m/en_us/network-intelligence/service-provider/digital-transformation/knowledge-network-webinars/pdfs/1213-business-services-ckn.pdf



The great balancing act

The ever-increasing video resolutions and consumer demand for immersive viewing experiences are loading heavier computational complexity on all the key components of video processing. And that, in turn, brings a significant challenge to our industry:

How do we efficiently deliver high-quality video at scale, while maintaining a high-quality user experience?

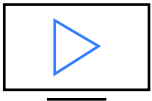
At the heart of scalable video delivery lies compression. The principle is simple: the more you compress, the more you can store and transmit.

But there are multiple caveats. Compression is about striking a balance between quality, bandwidth, latency and density. There is *always* an interplay between these elements.

How then, can your streaming video business cost-effectively maintain the highest quality at the lowest bitrate and latency?

To answer that question, it is worth recalling the history of digital video compression while looking at the current climate. This guide does just that, before going on to describe the attributes you should seek when choosing the right compression engine vendor for your video business.

Compression is a balance between quality, bandwidth, latency and density.



The evolution of digital video compression

The principles of digital video compression date back to 1990, when ITU-T built the H.261 standard. This pioneering work introduced the principles of motion estimation and prediction, which still lie at the heart of video compression algorithms today. Shortly after, in 1992, ISO/IEC JTC 1 released the MPEG-1 standard that was able to compress not only video, but also audio.

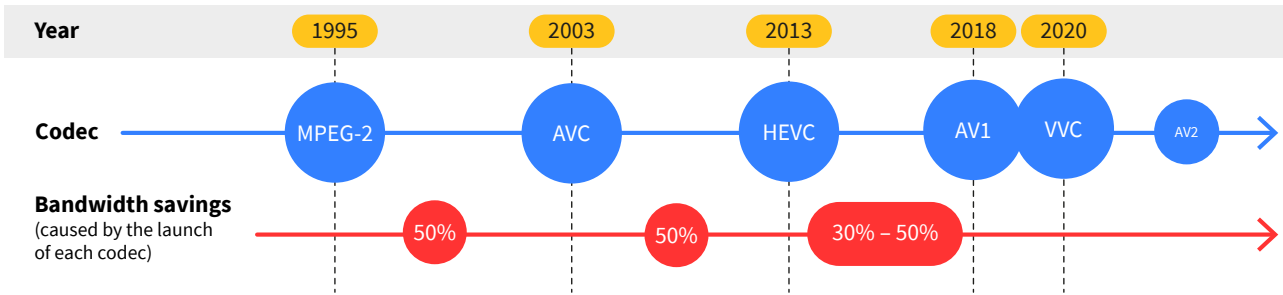
MPEG-2 emerged three years later thanks to the collaboration between these two independent standardization bodies. Together, they would go on to jointly produce the most widely used compression standards.

MPEG-2 governed the video market for almost 10 years, until ever-increasing consumer demand for higher quality video, at higher resolutions, called for a more bandwidth efficient solution.

The resultant H.264/AVC standard delivered significant bandwidth gains over MPEG-2. But it came at the cost of more computational complexity. Today, with advances in both software optimization and hardware, H.264/AVC encoding density is on a par with MPEG-2.

The trend continued a decade later with H.265/HEVC, offering 50% more bandwidth savings². Around the time it was developed and standardized, the encoders were expected to be several times more complex than H.264/AVC encoders³. Reducing encoder complexity and encoding time, particularly at high resolutions, are still challenging research topics that drive the design of more efficient codecs.

Which brings us to today...



² Tan, Thio Keng, et al. "Video quality evaluation methodology and verification testing of HEVC compression performance." IEEE Transactions on Circuits and Systems for Video Technology 26.1 (2015): 76-90.

³ Bossen, Frank, et al. "HEVC complexity and implementation analysis." IEEE Transactions on Circuits and Systems for Video Technology 22.12 (2012): 1685-1696.



The current market landscape

In addressing the popularity of 4K, and soon 8K, the upcoming H.266/VVC standard again promises a 30%-50% improvement in bandwidth savings over its predecessor. But it also brings seven times more encoder complexity when reference software implementations are compared, and around 1.5 times more decoder complexity^{4,5}.

Researchers and video technology companies continue to find elaborate ways to strike the right balance between quality, bandwidth, latency and density.

On the one hand, they remain aware of Moore's Law, which states that the processing power of computers doubles every two years. While many would claim that this law has reached its capacity, CPU manufacturers continually find new ways to keep it relevant.

On the other hand, new smart software encoding solutions have emerged that can reduce computational complexity without negative impacts on perceived image quality. This transition from hardware to software encoding now brings top-quality, real-time multiscreen content, with first-screen latency, to the industry.

Another important challenge for those engaging in video encoding has been financial considerations; in particular, royalties associated with most of the aforementioned codecs. With the development of new standards, the cost of licences has increased significantly. For HEVC, multiple patent pools brought additional uncertainty concerning licensing conditions⁶. Consequently, this has hindered its widespread market adoption.

This was a catalyst for Google's efforts on VP8 and VP9 codecs that paved the way to the establishment of the Alliance for Open Media (AOMedia), which develops open and royalty-free encoding solutions and resulted in the launch of the first standard, AV1, in 2018.

Optimized primarily for streaming media over the internet, AV1 can deliver around 30% bandwidth savings over H.265/HEVC. In the meantime, its compression efficiency is continuously improving with the development of open source encoders and decoders such as SVT-AV1.

⁴Topiwala, Pankaj, Madhu Krishnan, and Wei Dai. "Performance comparison of VVC, AV1 and EVC." Applications of Digital Image Processing XLIII. Vol. 11137. International Society for Optics and Photonics, 2019.

⁵Pakdaman, Farhat et al. "Complexity analysis of next-generation VVC encoding and decoding" Proceedings of International Conference on Image Processing (ICIP), p. 3134-3138, 2020.

⁶Ozer, J., 2019. A Video Codec Licensing Update. [online] Streaming Media Magazine. Available at: <<https://www.streamingmedia.com/Articles/ReadArticle.aspx?ArticleID=129386>> [Accessed 10 October 2020].



Are there too many industry standards?

Clearly there are plenty of standards out there. Which begs the question: Wouldn't it be easier to just adopt one standard and stick to it?

Theoretically it would be easier. But practically, that's not how today's market works.

It is true that in a nutshell, content and service providers want it all: high-quality video, low bit-rate, scalability and low latency. At the same time, they naturally want a cost-effective way to strike this balance.

What's more, different types of content demand unique combinations of trade-offs between resolution, available bandwidth, latency limitations and cost optimization. These distinct trade-offs leave us with a variety of encoding scenarios, each one aimed at providing an optimal viewing experience for a specific type of content.

Adopting multiple encoding standards helps to achieve a cost-effective balance for each specific use case, while individual encoder improvements fine-tune the quality of experience.

As if that is not complex enough, add to that the fact that cable, broadcast, satellite television and OTT streaming all have their own unique needs and therefore require distinct configurations.

If, for example, you are delivering **live OTT streams**, you need to deploy low latency encoding to recreate the same experience as linear live TV.

If, on the other hand, you are looking to deliver a high Quality of Experience (QoE) for **multiscreen delivery**, you need to employ efficient video encoding algorithms that support multiple formats and resolutions.

And if you need **copyright protection**, then you will also want an encoder with watermarking capability.

While doing your utmost to accommodate these specific demands, new displays continually come to market offering even higher picture quality and further raising the bar with respect to expectations of the 'user experience'.

With all these factors to consider, finding the right compression engine vendor is no easy task. In the remainder of this guide, we'll look at the questions you should be asking when considering the right vendor for your video business.

The diversity of customer needs requires different encoder configurations that reflect the trade-offs between type of content, resolution, available bandwidth, latency and cost of ownership.



What to look for when choosing a video compression engine vendor

When considering all the factors that contribute towards a great viewing experience, you must, above all, ensure that your compression engine vendor possesses the essential attributes to deliver high-quality video effectively.

The ideal candidate would have studied market demands and compression challenges thoroughly, come up with innovative solutions to overcome them, and contributed to the development of more advanced solutions. It's evident that such a profile demands solid industry experience with a customer-focused, creative mindset.

Let's take a deeper look into those attributes that will ensure the best Quality of Experience.

Delivers the best picture quality

Any vendor's codec development strategy should be built on creating value for their customers. But what does that really mean?

Viewers like sharp pictures with less blur. However, they prefer the natural look over the artificial feeling that may result from sharpening video processing techniques. Content providers therefore need to consider texture fidelity and preservation of character so they can offer their viewers immersive, yet realistic experiences.

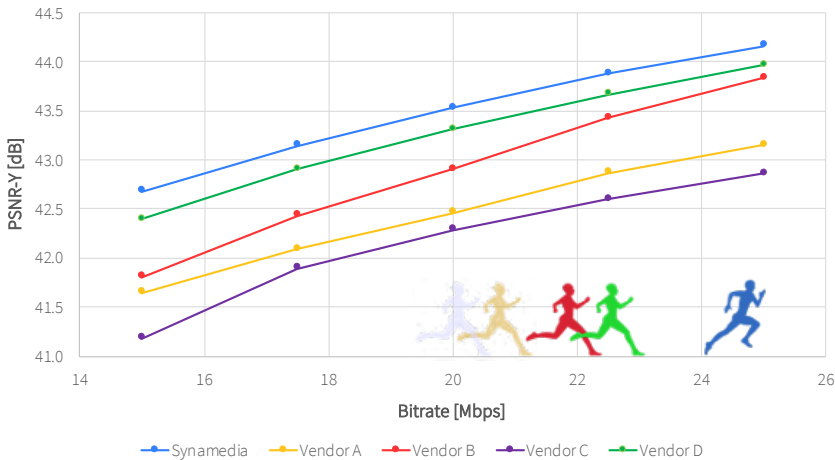
When looking to optimize picture quality for the content you offer, your vendor should be taking into account those elements that make up the best quality of experience for your target audience.

By asking you these questions and establishing answers, your vendor can deliver superior objective and perceptual quality compared to

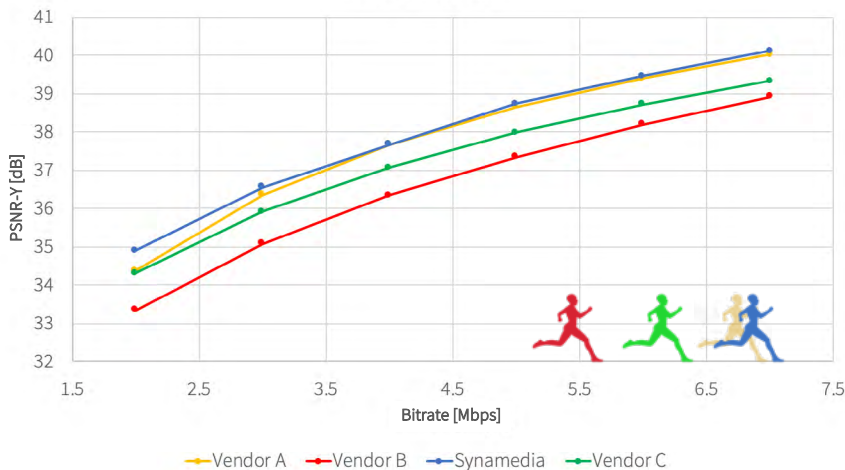
common open-source alternatives and other vendors in the market.

Using VIVID Compression technology, Synamedia's AVC encoder brings around 23% bandwidth efficiency over the open source x264 encoder, *at the same perceptual quality*. Our HEVC encoder also offers a substantial performance advantage over both x265 and encoders of other vendors in the market. By continuously improving the perceptual quality of our encoders, we are pushing the limits of AVC and HEVC encoding to higher frame rates, higher resolutions and richer color spaces.

HEVC @ 2160p



AVC @ 1080i25



Key perceptual quality improvements

- ✓ Less blurring
- ✓ Sharper details
- ✓ Texture fidelity
- ✓ Natural look
- ✓ Less chroma dragging
- ✓ Noise reduction
- ✓ Text preservation
- ✓ Logo enhancement

An industry influencer

The compression vendor you choose should be an active player in the industry. By taking a proactive role within well-known standardization bodies, your vendor can collaborate with fellow leading internet and media technology companies to advance open standards for media compression and delivery. And you will be safe in knowing that you are ‘backing the right horse’.

An active member of AOMedia, Synamedia maintains a vision to create future-proof solutions. Integrating next-generation codecs is a part of our roadmap for upcoming releases, and we take an active role in the development of AV1 encoders and the future AV2 format. By applying cutting-edge technology and extensive training, our proof-of-concept solutions are continuously improving. We also strongly advocate innovation through machine intelligence and are learning around the clock to expand our horizons.

Offers flexible deployment options

OTT services are everywhere. And they bring with them the need for high availability, increased scalability and maximized performance. That’s why, in addition to being deployable on-prem, your encoders should also be able to operate on private and public clouds. By deploying in the cloud, you can reduce operational costs, particularly when it comes to live sports events.

Synamedia’s partnership with AWS and Google Cloud brings our customers easy access to cloud-based video workflows with a flexible, ‘pay-as-you-use’ OPEX model.



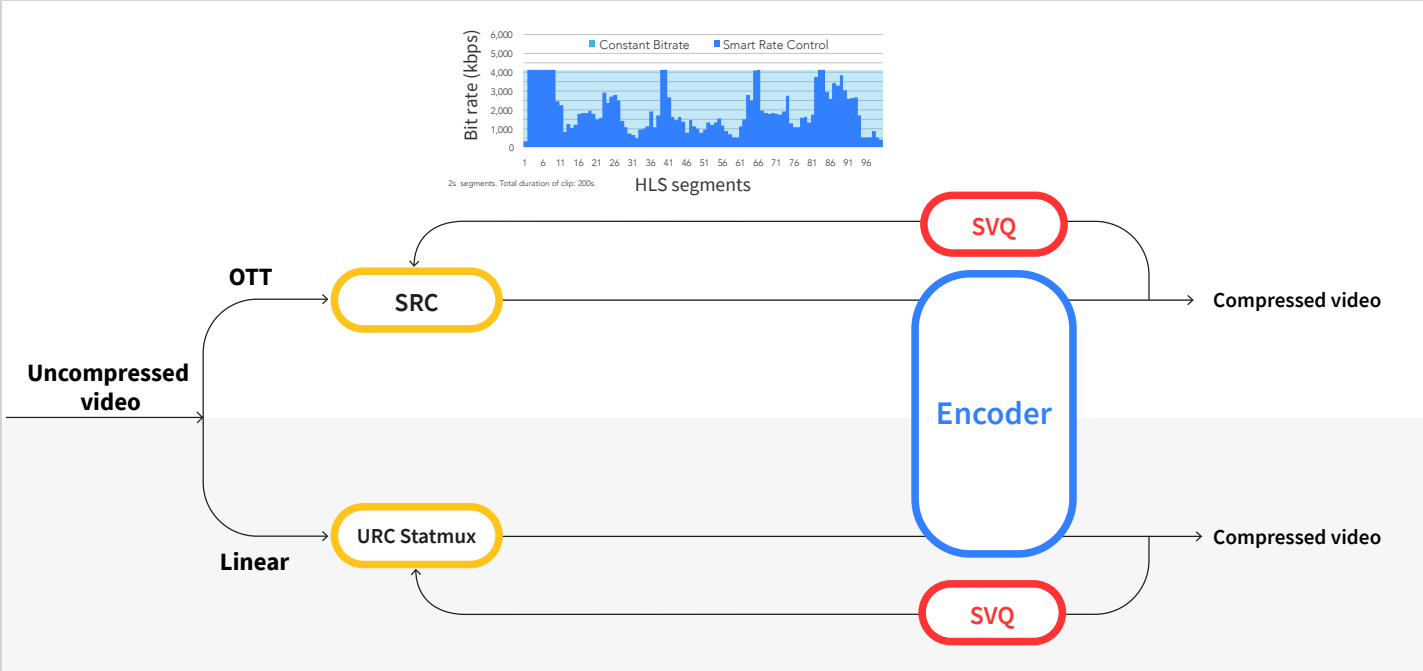
Utilizes rate control to achieve consistent perceptual quality

Any big leap in encoder performance should be built on a software-based codec strategy that seeks *perceptually optimized quality*. To attain such video quality, you first need to be able to measure it. Historically, one of the most interesting and challenging problems in research has been to find a mathematical method that measures video quality *the way consumers perceive it*.

Synamedia has a patented metric, SVQ, that continuously steers toward a *consistent perceptual quality* for the encoded profiles. Its lightweight and no-reference nature makes it an ideal candidate for delivering continuous feedback for linear and OTT delivery. The high correlation with perceptual quality provides accurate guidance, while low computational complexity prevents declines in performance in terms of latency and density.

Synamedia employs SVQ to optimize its rate control mechanisms for multiscreen solutions. Our award-winning Smart Rate Control (SRC) technology offers 36% bandwidth savings, averaged over different types of content for ABR delivery. SRC is a real-time solution for achieving consistent perceptual quality outputs that are ideal for live ABR streaming. On the broadcasting end, Synamedia's Universal Rate Control (URC) Statmux brings powerful pre-analysis functionality to optimize channel rates, while live encoder feedback steers towards consistent video quality for individual channels.

We call upon our density profiling tool to maximize the usage of servers and optimize total cost of ownership. Our server offering is periodically updated to offer the latest CPU generations, while we improve end-to-end encoding pipeline efficiency with each release.





An innovation pioneer

Your compression vendor should be eager to adopt exciting technology into its products, while following recent advances closely, particularly concerning quality assessment and compression.

Take artificial intelligence for example. Using AI-based models, it's possible to enhance compression engines and optimize bandwidth savings based on content while reducing computational complexity. Machine learning facilitates decisions both at the rate control algorithm level (URC and SRC) and encoder level, thereby saving you bandwidth and speeding up processing at the same time.

There are also ways to engineer content-aware encoding, where bits are allocated optimally according to various characteristics of the visual data. This allows you to reduce bandwidth to the lowest possible level without compromising on quality.

Enable great customer experiences,
reduce complexity and save costs

Leverages industry experience

With such vast demands and limitations in the encoding market, the key to advance is to *continue being creative and innovative*. An experienced vendor with a rich pool of talent can develop compression engines in-house and call upon combined encoding experience within global R&D centres.

At Synamedia, we are developing high-quality compression engines that not only enhance picture quality, but also continuously increase

density and decrease latency. Our software-based VIVID Compression is comprised of a single application on one converged platform where you can choose among multiple models to drive business agility without large capital investment, and deliver the best quality in the market *at all* bitrates. All this, while offering maximum savings on bandwidth and hence the most cost-effective solution.



About Synamedia VIVID Compression

At Synamedia we are leveraging our 30+ years of experience in the compression market to serve you best. Our VIVID Compression delivers the highest video quality, at the minimum bandwidth, to millions of viewers around the world, every day.

By making our customers' requirements a top priority, we remain attentive to market trends and technological advances. It ensures that we maintain an innovative mindset for creating and delivering the highest quality of experience anytime, anywhere.

If you are looking for a high-quality, efficient, flexible and trusted compression platform, Synamedia can propose an ideal VIVID Compression solution tailored to suit your needs best.

To learn more about Synamedia's video compression solutions, either [book a demo](#) or [contact us](#).

Our Video Network Portfolio

Synamedia's Video Network portfolio offers end-to-end video solutions for the distribution, processing and delivery of both first screen and OTT content, across the entire video workflow, from content providers to service providers to consumers. Our solution portfolio matches, and even exceeds, the latest consumer demands with features including time-shift TV, common copy cloud DVR, low latency and multicast ABR.

While delivering true live video without compromising on quality, we leverage our world-renowned digital ad-insertion solution and secure the entire video network chain. Our workflows easily integrate with Synamedia and leading third-party content protection solutions. Whether on-prem, virtualized or on cloud, all our solutions offer you easy scalability, 24/7 reliability and 100% satisfaction.



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