



**VŪBIQŪITY™**  
PREMIUM **CONTENT** SERVICES

**EFFECTIVELY MANAGING  
THE CONTENT DELIVERY EVOLUTION  
THROUGH BANDWIDTH OPTIMIZATION**



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# INTRODUCTION

The head of the Technology department stared down at his plant's capacity utilization reports and then glanced over at the new emails on his laptop monitor. The news in his inbox was becoming increasingly predictable – a request to expand the asset library and the demand to support new devices in order to keep pace with behemoth and over-the-top competitors. He glanced back at the reports and sighed as he thought, "more planning and prioritization, new procurements, more headaches." He jotted a quick sticky note and stuck it on his wallet. It read; "Buy more Advil!"

The proliferation of content, devices and formats seems to abide by a Moore's Law type growth rate these days. Digital TV Research forecasts that the worldwide annual revenue for movie and TV shows from online platforms will grow from \$3.98 billion back in 2010 to \$35 billion in 2018. People are hungry for the stories that content providers deliver. Stories give us the means to create connection, to make sense of our surroundings and to shape our own identities. The in-person and face-to-face storytelling of the past has morphed into movies, TV shows, and short film content distributed for multiplatform use. This expanding delivery medium has yet to find its full expression as disruptive technologies continue to enable new ways of viewing, sharing, and interacting with content that facilitates greater accessibility, flexibility and usage.



## A NEW AGE FOR CONTENT DELIVERY

It's rather funny to think that a new "E-Generation" is coming of age that has no idea of what "appointment viewing" means, what it's like not to be able to pause live TV, and not to have access to their favorite content across a variety of screens. Young people are being raised with untethered devices, ubiquitous access and social applications that enable increasing amounts of content to be consumed. For example, a recent study commissioned by VUBIQUITY<sup>1</sup> found that three-quarters of people under age 35 use a computer for viewing video at least weekly; 64 percent of 13-17 year olds watch video on a smartphone at least weekly, and 37 percent on a daily basis. The emerging E-Generation has an insatiable appetite for content that entertains, educates, and interests them. It doesn't take a corporate shaman to see that the market is changing and that legacy systems and processes will have difficulty handling the increasing demand. Today's service providers need a clear path to next generation technology platforms while maximizing the return on investment of their legacy gear.

**No operator wants to be limited by the size or amount of content**

It used to be that in-house content processing operations and independent data centers could keep pace with one-size-fits-all programming. However, the confluence of the Internet, the expansion of bandwidth capacity, and the exponential growth of processor power has mounted a formidable challenge to traditional over-the-air and cable delivery TV service. TV is still the dominant means to watch content, but connected devices have joined in creating the anywhere, anytime viewing experience. There's an ever expanding array of channels that reach into untapped niche markets, and that precipitate the expansion of content portfolios. According to Nielsen's Advertising & Audiences Report, the average U.S. TV home now receives 189 TV channels - a record high and significant jump since 2008, when the average home received 129 channels. The report also indicates that an astounding 86 percent of U.S. smartphone owners say they use their devices as second-screens while watching TV, and that nearly half do it every single day. It becomes more and more clear that days of one-size-fits-all programming and delivery methods are gone forever. It also provides an opportunity for service providers who adapt, grow and prosper by staying one-step ahead of the ever evolving digital media delivery growth curve.

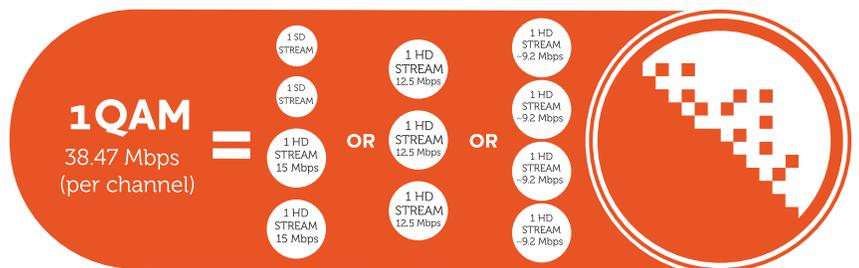
Content, devices and derivative bitrate encoding continue to multiply and increase in breadth and complexity. The evolution puts small-to-medium MVPDs at a disadvantage versus larger competitors and market entrants using new technologies. Their larger competitors can afford to build and grow internal support operations, while OTT providers can add hundreds of thousands of digital assets and have them shared by many consumers. The swath of competitive mergers in recent years doesn't make the outlook any brighter. The commonality shared by all - big and small, new and old - is that no operator wants to be limited by the size or amount of content they can deliver to their customers.

<sup>1</sup>The survey was commissioned by VUBIQUITY and conducted by Frank N. Magid Associates, October, 2013. An Executive Summary of the research that provides additional data is available for download from the VUBIQUITY website: <http://vubiquity.com/knowledge-center>.

## EMERGING BANDWIDTH OPTIMIZATION SOLUTIONS

One way to navigate the increasingly complex world of digital content management and delivery is through bandwidth optimization. One means of optimization is the use of reduced bitrate encoding – which is simply a more efficient way of compressing data streams. Cable operators have traditionally delivered TV streams encoded at a rate of 15Mbps, which allowed for 2 simultaneous HD streams and 1 SD stream to be transported over 1 Quadrature Amplitude Modulation (QAM). Encoding advances lowered that rate to 12.5Mbps in 2013, enabling 3 simultaneous HD streams to be transported over 1 QAM. Today, reduced bitrate technology has moved the mark down to 9.25Mbps, which allows for 4 simultaneous HD streams to be delivered over 1 QAM. Assuming a 1-hour show, the additional 1 HD stream equates to 8,760 more streams per year – and that’s a lot of extra Big Bang Theory, Dancing with the Stars and NCIS – not to mention potential incremental ad revenue.

How does video compression work? Generally speaking, the aim is to throw away as much information as possible with minimal effect on the quality of the audio/visual experience. To start with, the pixels in each frame of a video are examined and grouped together into large blocks (which explains why over-compression can result in blocky, blurry images). These macro-blocks are used to “describe” the image (i.e., to turn pixels on a display device off and on).



Imagine a man running across a field. In its uncompressed form, the video contains information for every pixel in every frame – the running man, the stationary field in the background, the sky, etc. Compression first throws out images and sounds that lie outside of the range of human perception. It then creates vectors off key frames of the video that describes the differences (the things that change) to the key frames. The post-compression video contains less information than the source video because similar pixels were grouped together and described in macro-blocks. By recognizing that some pixels contain differences and others not, the compressed video significantly reduces the descriptions, or size, of the file.

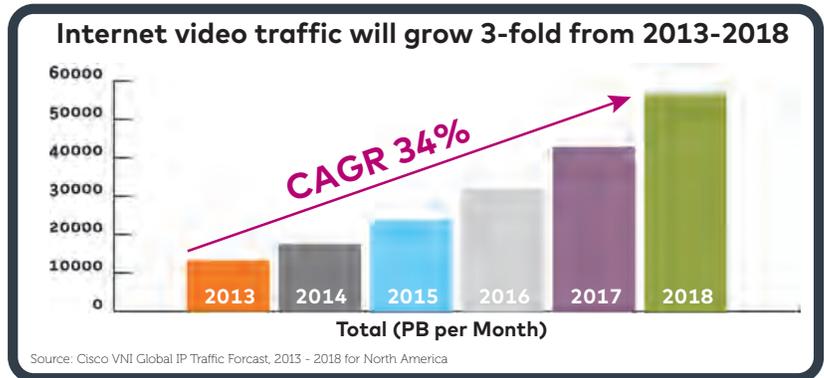
When considering if reduced bitrate files are a good fit for a service provider’s operations, it is important to measure the ratio between the file size and the loss of quality. Measuring standards include Peak Signal to Noise ratio (PSNR), Visual Quality Metrics (VQM), and Structural Similarity (SSIM) to quantify differences in quality. By using such measures, it has been determined that moving from 15Mbps to 9.25Mbps represents a 32 percent gain in storage with about under a 1 percent loss of quality. Most service providers conclude that this 32:1 ratio makes logical sense – especially when considering the need to minimize storage costs and to maximize library size.

## EMERGING BANDWIDTH OPTIMIZATION SOLUTIONS

Another factor to consider in moving to a small file size is delivery time. Smaller file sizes lead to a higher content refresh rate. Conversely, larger files consume precious bandwidth and diminish library refresh rates. Because 9.25Mbps files represent a 32% savings of storage over 15Mbps, 32 percent more titles that can be delivered over the same bandwidth and require 32% less storage space.

You've no doubt heard the term "garbage in, garbage out." This axiom rings particularly true in the world of video compression. A meticulous ingest and quality control process is required to produce a high-quality egress stream. An example of this is how VUBIQUITY starts its reduced bitrate encoding process with 30-50Mbps mezzanine source files and is constantly sourcing and expanding its "mezz" source library. The reason is that a good, clear

source file requires less transcode passes and results in less end-product artifacts. With a solid encode, an experienced quality control team "polishes" the final product by using best-of-breed automation tools such as Sencor and Baton as well as human spot checks and intervention – to catch minute issues like lip sync and closed captioning drift.



**Each month, 409 BILLION minutes of video content will cross the internet. That's 155,649 minutes EVERY SECOND.**

Source: Cisco VNI Global IP Traffic Forecast, 2013 - 2018 for North America

Reduced bitrate encoding optimizes the use of bandwidth. Advances in software encoding technology (underpinned by ever-increasing hardware processor speeds) continue to decrease file sizes and lead to greater efficiency and cost savings. Companies need to constantly re-certify and upgrade encoders and processes to stay at the forefront of encoding excellence. Keeping ahead of the curve allows for continued gains in extension of VOD storage for QAM as well as for CDN type IP delivery models. There have been advances in audio technology, also, such as Object Based Audio which helps to augment video bandwidth optimization while maintaining, or improving, the quality of sound. For

example, by employing Object Based Audio, 11.5 surround sound is now deliverable over the same amount of bandwidth that it once took to deliver 5.1 surround sound. And while the delivery of audio doesn't take much bandwidth, every little bit of optimization counts.

## EMERGING BANDWIDTH OPTIMIZATION SOLUTIONS

Service providers have a significant investment in their existing operations, and they also want to capitalize on emerging technologies that create more cost savings and efficiency. VUBIQUITY, for example, is actively moving to cloud based delivery with a 2-tier/3-tier architecture that provides a viable migration path to the future and helps its customers to avoid millions in extra CapEx. As electronic content delivery continues to move away from compression and toward storing and delivering more signal, new R&D time and money is being invested into:

- Testing technologies like ATIS C2 to extend VOD pump redirects to the CDN for content instead of to the VOD pump
- Trialing High Efficiency Video Coding (HEVC), or H.265 (which shines with new 4K/Ultra HD streaming) for an improved quality to compression ratio
- Working on developing MPEG-DASH
- Optimizing the reads of DRM keys that provide economies of scale that are passed on in terms of cost savings to customers
- Creating partnerships with companies like Akamai which is able optimize Last Mile delivery, offer efficient UDP profiles, and optimize output displays

Reduced bitrate encoding is just one tactic in a broader bandwidth optimization strategy to meet the needs of MVPDs in an evolving digital video marketplace. Bitrate reduction helps create more throughput and is an excellent interim solution as the industry moves toward IP and cloud-based platforms. One viable strategy for small to mid-tier service providers is to outsource the headaches and complexity of keeping up with constant change to an established digital media services company that can pass along efficiency and cost savings. Multiplatform service providers can support MVPD content operations and provide flexibility around ingest, storage and delivery of content where and when it is needed.

### ABOUT VUBIQUITY

VUBIQUITY is where technology and entertainment meet. As the leading global provider of Premium Content Services, more than 550 service providers and 470 content providers trust VUBIQUITY's expertise in content monetization. From licensing to delivery, VUBIQUITY offers a full scope of managed services globally for linear, on demand and OTT viewing that support rental, sell-through, ad-supported and subscription business models. From linear streaming to EST to 4K Licensing, VUBIQUITY is your one-stop-shop, delivering over 500,000 hours of content annually to more than 105 million households worldwide. By providing premium content and multiplatform capabilities that evolve with consumer technologies, VUBIQUITY is leading the way for the next generation of content services.

VUBIQUITY's Bandwidth Optimization solution has officially launched with several of their Content and Service Provider partners, enabling them to significantly increase shelf-space. VUBIQUITY is on schedule to offer virtually its entire library in the Cable Labs approved 9.25 Mbps standard by year end. As new avails come in, VUBIQUITY will continue to deliver 9.25Mbps files to customers that want it. Support for most existing set-top-boxes, DRMs and localizations has been built into flexible workflows and launch time for the reduced bitrate service is minimal, speeding up your time to market.

For more information on VUBIQUITY's Bandwidth Optimization solution or other Premium Content Services, contact John Smith at [jsmith@vubiquity.com](mailto:jsmith@vubiquity.com) or call 404.229.1697.

