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Biting the ABR Bullet

In an adaptive bitrate world, transcoding is essential but workflow is key

It's often said that change is disruptive, and that's certainly true for the most significant media distribution development in recent memory, which is the advent of new viewing devices—smartphones, tablets, connected TVs, DVD players, and game consoles—for content delivery. Viewers on these platforms expect consistently acceptable image and sound quality despite often uncertain and fluctuating bandwidth.

The introduction of adaptive bitrate (ABR) streaming has made that possible, but it has also vastly increased the challenges faced by high-volume content providers who service mobile markets. Because each ABR file—whether Apple HTTP Adaptive Streaming, Microsoft Smooth Streaming, or Adobe Dynamic Streaming—is actually a collection of parallel files of the same content at different bitrates, preparing ABR content typically involves a five- or six-fold increase in transcoding per supported format. Add to this the fact that ABR utilizes a different and far more complex file structure than fixed bitrate formats, and it becomes clear that ABR profoundly impacts both throughput and workflow, requiring a thorough rethinking of existing practices.

ABR's emergence coincides with the significant investment that content owners and distributors have made in recent years to extend media distribution beyond the confines of traditional broadcast and cable television. It would be a mistake to think
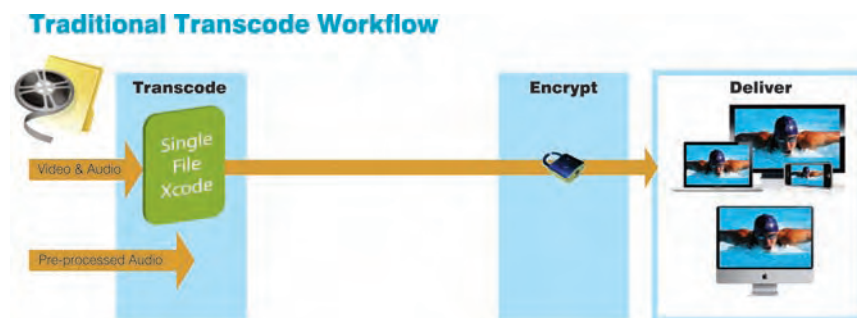

Figure 1. *The traditional workflow for transcode, encryption, and delivery of a single media file.*

of the content preparation side of that investment solely in terms of discrete devices for transcoding video into the correct format for various outlets. Instead, efficient high-volume content preparation demands a comprehensive workflow approach that addresses archiving, digital asset management, transcoding, and delivery in an intelligent workflow.

minimizing labor. Telestream's Vantage systems—which bring transcoding, media capture, metadata processing, and analysis together into a single managed process—are a prime example of this approach.

Inviting ABR to this processing party turns out to be a tricky proposition on several levels. To fully understand why, we first need to understand the core

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MAXIMIZING PRODUCTIVITY AND QUALITY

From this perspective, any task that can only be done manually, or that must be done more than once, is an obstacle to maximum productivity. The imperative for vendors to this market sector has been to design these inefficiencies out of the picture, maximizing quality, throughput, and control while

distinction between a standard media file (**Figure 1**) and an ABR file (**Figure 2**). An ABR file isn't actually an individual file at all, but rather a package of files. The package includes a manifest file, which holds the stream metadata, and a set of multiple "layers," each made up of the media data for a different target bitrate. To enable switching
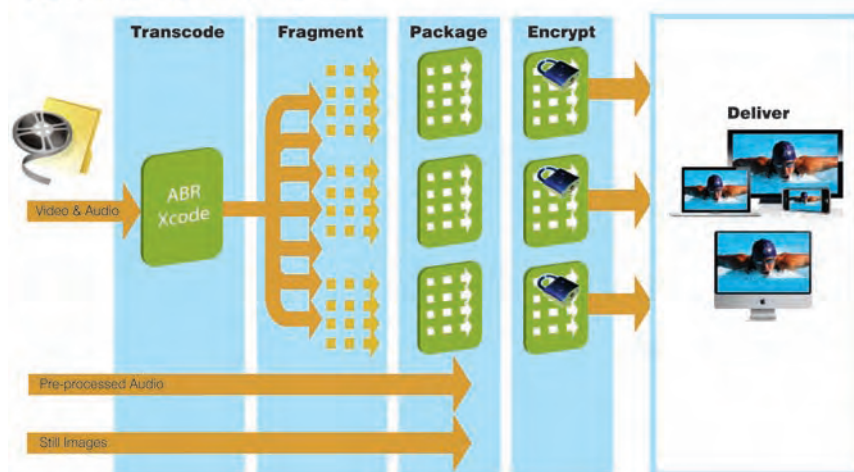
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Figure 2. *The workflow for transcode, fragmenting, packaging, encryption, and delivery of an ABR file.*

between layers as conditions change during streaming, the content for each layer is fragmented into files of only a few seconds in duration.

Needless to say, one aspect of preparing an ABR file is to prepare the half-dozen or so streams corresponding to each of the package's layers. If transcoded on existing hardware, each ABR job will take several times longer than the corresponding fixed-bitrate transcode. One approach to this problem would be to expand capacity six-fold, investing in new machines to run the transcode processes, expanding data storage capacity, and adding all of the associated ongoing costs in areas such as cooling, energy, and real estate. ABR provides content owners with access to a new, fast-growing market, but it does

not offer the multi-fold increase in revenues that would be needed to justify this massive expansion of capacity using existing models.

LIGHTSPEED VIDEO PROCESSING

Clearly this aspect of an effective ABR solution requires a new approach to the processing hardware itself. At Telestream we've done that by developing an exclusive new technology, called Lightspeed, that accelerates video processing and H.264 encoding on

parallel GPUs, including AMD and NVidia, and also on multicore CPUs, including AMD and Intel (**Figure 3**). The result is the highest possible image quality at the fastest possible speed. Solutions incorporating Lightspeed provide the boost in processing power required to address the ABR throughput dilemma, but they do so without a corresponding increase in hardware, operation, and maintenance costs.

So far, so good, but transcoding power alone doesn't address the full scope of ABR processing challenges. Once again, that's because the structure of an ABR file is dramatically different from that of a fixed-bitrate file, and those differences complicate every aspect of the overall file preparation workflow. Consider, for example, the task of handing off an ABR package to a content delivery network (CDN) that is designed to receive a single file for each item of media content. In a manual, step-by-step workflow, one could conceivably wrap the package's files into a .zip or .tar archive, FTP it to the CDN, and then rely on the CDN to properly extract the files and handle them such that they function as the intended ABR package. But when demand requires production and
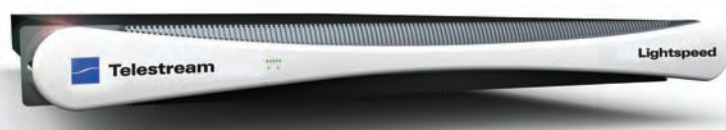

Figure 3. *Lightspeed accelerates video processing and H.264 encoding on parallel GPUs and also on multicore CPUs.*

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delivery of up to hundreds or thousands of files a week—the level at which effective process automation is a business necessity—the gross inefficiency of this approach becomes immediately obvious.

SINGLE ACCESS, MULTIPLE PROCESSES

This same issue plays out in many other aspects of media file preparation, where any step that is not automated becomes a severe bottleneck. The material for a given output clip is often drawn from multiple source clips (e.g. provider logo, main content, provider promo). The transcoded files must be QCed. The components, both transcoded and externally provided, that make up the deliverable must be assembled into format-compliant packages for delivery to target destinations, in some cases with DRM or other encryption applied. Industry experience has long since proven that handling these various tasks with discrete systems is far less efficient than handling them within a fully automated process that supports source-file playlists, tracks jobs, reports status, and handles the handoff of output materials to external systems.

Given that these capabilities are all already available in high-throughput systems for non-ABR content, it makes sense to consider whether these same solutions might be adapted to provide the needed services in the context of ABR processing. In fact, using the same systems for both ABR and non-ABR output isn't just a nice idea, but a crucial requirement for any enterprise that

intends to serve the ABR market without breaking the bank. One lesson learned as file formats have proliferated over the last few years is that the most efficient use of resources is to access source materials just once, transcoding simultaneously into all of the different required variants (progressive download, TV/VOD distribution, etc.) and then assembling the results into a compliant package for each destination. Thus the operation—not to mention development, testing, and deployment—of separate ABR/non-ABR workflows is inherently less efficient than utilizing a single, unified system.

So which unified system makes the best choice for consolidating ABR and non-ABR production? Once again, efficiency demands not simply a standalone system that handles transcoding, but a comprehensive solution that handles all aspects of the content preparation process. And the only currently available systems that do so are the industry's field-proven content preparation workhorses. Thus the solution for ABR is to adapt such systems to ABR requirements while maintaining all the advantages of full-featured video transcoding, workflow automation, and system management. That's precisely what Telestream has achieved with Vantage.

Vantage Multiscreen is optimized for ABR content preparation and workflows. Vantage Transcode is highly optimized for Web and VOD single-file production. Vantage combines both of these into a unified system that

streamlines the entire process of source file decoding, video processing, parallelized H.264 encoding, packaging, encryption, quality control, and delivery. Combining Telestream's industry-leading expertise in workflow automation and management with the power of Lightspeed technology, Vantage is the ultimate high-throughput solution to the challenge of content delivery for multiple screens.

ABOUT TELESTREAM

Telestream provides world-class live and on-demand digital video tools and workflow solutions that allow consumers and businesses to transform video on the desktop and across the enterprise. Many of the world's most demanding media and entertainment companies as well as a growing number of users in a broad range of business environments, rely on Telestream products to streamline operations, reach broader audiences and generate more revenue from their media. Telestream products span the entire digital media lifecycle, including video capture and ingest; live and on-demand encoding and transcoding; playout, delivery, and live streaming; as well as management and automation of the entire workflow. Telestream corporate headquarters are located in Nevada City, California. The company is privately held. For more information, visit www.telestream.net.