

Advanced File-Based Quality Control

Understanding New Developments and Market Requirements for Content Suppliers and Video Service Providers

White Paper

Contents

Introduction	3	A QC Solution Suite Fully Attuned to New Market	
New Developments Impacting Content Suppliers' QC		Requirements	9
Requirements	4	Aurora QC.....	9
The New Multi-Device and On-Demand		Accelerating and Sustaining QC Test Speeds	9
Viewing Paradigm	4	Scalability and Efficiency.....	10
The Explosion in Quality Benchmarks that Must		QC for 4K and ABR.....	10
Be Met by Content Suppliers	5	Cerify and Third-Party Workflow Compatibility	10
The Proliferation of Requirements from		The Hydra Player	11
Distribution Outlets	5	Speed and Versatility	11
The Expansion in Testing Tasks	6	4K and ABR Payout.....	12
The Impact of Advertising.....	6	The Industry-Leading Cost-Benefit Equation	12
QC Challenges Posed by ABR	6		
The Need to Prepare for 4K UHD and HDR.....	7	Conclusion.....	13

Introduction

Major advances in file-based quality control (QC) technology have arrived just in time to provide suppliers of TV programming and motion pictures much-needed assurance that they can keep pace with demand in the fast-moving multiscreen services market.

The challenges to managing QC are mounting rapidly as ever more OTT outlets join the traditional VOD and TV syndication supply chains, each adding a unique set of quality benchmarks for incoming video files. Greatly complicating matters, suppliers must satisfy those QC requirements across a growing matrix of metadata categories, multilingual subtitling and closed captioning feeds, TV display resolutions, color gamuts, contrast ranges and advertising support mechanisms.

While many content suppliers' post-production workflows already support an earlier generation of automated file-based QC solutions, the requirements have progressed to where a new level of flexibility and efficiency in file-based QC is needed. In a nutshell, a state-of-the-art QC system must support:

- Faster speeds in automated testing and analysis;
- Scalability to higher volumes of concurrent processing without slowing testing on individual assets;
- Automatic access to supplemental processing capacity to avoid system overloads;
- Greater frame accuracy, speed and display diversity in the playout of content, metadata, closed captions and subtitles for manual review;
- Rigorous scrutiny of performance across all Adaptive Bitrate (ABR) streaming modes;
- Application of file-based QC to 4K UHD content;
- Flexible integration with cloud-based resources and workflows.

Tektronix, the market leader in file-based QC, has fully addressed these requirements for all broadcast, cable VOD and OTT syndication environments with introduction of the next-generation Aurora QC platform. As the backward-compatible successor to Cerify, the industry's first file-based QC platform, Aurora QC delivers unmatched mission-critical performance in scalability, speed, ABR validation and QC analytics with support for 4K QC and integration into cloud-based workflows.

Further augmenting QC operations, Tektronix has streamlined the manual review process with introduction of a new multi-protocol playback tool, the Hydra player. When used as an integrated component with Aurora, Hydra accelerates the QC process at up to eight times normal speeds with unprecedented frame-accurate visualization of video, audio, metadata and other elements played back in multiple distribution modes, including ABR. Hydra, which can be used with other QC platforms as well, also supports real-time playback of the Interoperable Master Format (IMF) composition playlists (CPLs) that are widely used to facilitate 4K QC.

For existing Cerify customers, Aurora QC enables a planned migration to vastly improved file-based QC capabilities without an upgrade charge and without disrupting existing workflows. For new customers, the new Tektronix QC platform offers a lower cost point of entry into file-based QC at unprecedented levels of performance, ensuring they will be able to meet evolving QC requirements for years to come. For existing and new customers alike, Hydra represents a breakthrough not only in player performance, but in cost effectiveness as well.

In the discussion that follows we look at the market developments that are mandating more advanced approaches to file-based QC. We then examine in greater detail the capabilities Tektronix has brought into play with Aurora QC and the Hydra player.

New Developments Impacting Content Suppliers' QC Requirements

Consumers' growing reliance on smartphones, tablets and computers to access premium long-form video in combination with an expanding ecosystem of distributors seeking to capitalize on this trend has presented TV programming networks, motion picture studios and post-production houses new opportunities to sustain returns on their content investments amid declining viewership on traditional TV outlets.

The New Multi-Device and On-Demand Viewing Paradigm

Looking at data gathered from hundreds of millions of online users worldwide, digital video publisher Ooyala recently reported video consumption on tablets and smartphones doubled between Q4 2013 and Q4 2014 and now accounts for 34 percent of all online video plays.

As shown in Figure 1, a global study conducted by Accenture in 24 countries provides a breakdown of device preferences for viewing long-form content by age group, highlighting the dominance of preferences for viewing TV Shows, movies and sports on devices other than the TV set among the 14-34 age groups worldwide. As can also be seen in Figure 1, much of this viewing is on-demand whether through access to pure-play OTT outlets and TV Everywhere apps from MVPDs (multichannel video programming distributors) or via traditional VOD outlets.

Viewing Trends Long-Form Video				
Preferred Viewing Device for Long-Form Video				
Age	14-17	18-34	35-54	55+
TV Shows/Movies				
Computer	44%	47%	34%	23%
Smartphone	16%	11%	5%	1%
Tablet	16%	9%	7%	3%
TV	29%	46%	58%	64%
Sports				
Computer	31%	26%	22%	15%
Smartphone	18%	11%	6%	1%
Tablet	14%	7%	5%	2%
TV	26%	38%	47%	54%
Source: Accenture				
Percentage of Consumers Sourcing Video Entertainment				
Age	18-34	35+		
From Free Video Streaming Services	72%	40%		
From Subscription VOD	60%	40%		
From Pay TV	46%	58%		
Source: TiVo ³				

Figure 1.

¹ Ooyala, Q4 2014 Global Video Index, March 2015

² Accenture, Digital Video and the Connected Consumer, April 2015

³ TiVo, 2013 Millennial Video Entertainment Survey, February 2014

The biggest force driving consumption of long-form video online is subscription VOD offered by Netflix, Hulu, Amazon and a growing list of other global and regional players. According to Digital TV Research, SVOD subscriptions will increase from 117 million at year's end 2015 to 249 million by 2020.⁴ OTT SVOD revenues are projected to hit \$21.6 billion in 2020, up from \$7.6 billion in 2014. In the U.S., according to Parks Associates, 57 percent of U.S. broadband households now subscribe to an OTT video service.⁵

The need to capitalize on these opportunities is obvious for premium video content suppliers who want to compensate for a loss of momentum in traditional linear TV viewing. Researcher ABI predicts just a 3.7 percent CAGR (compound annual growth rate) for pay TV revenue in the U.S. through 2020 compared to a predicted 24 percent CAGR for OTT subscription revenues through 2019.⁶

The slow growth in pay TV revenue reflects the impact of higher subscription fees against a downward trend in raw subscription numbers. According to the Diffusion Group, the percentage of adult broadband users who do not subscribe to a legacy pay TV service reached 14 percent in Q3 2014 compared to 12.4 percent a year earlier and just 8.6 percent in 2011.⁷ Researcher SNL Kagan predicts that U.S. multichannel TV household penetration will drop from 85.1 percent in 2014 to 76.7 percent in 2024 with the number of cable subscribers declining from 53.5 million to 46.9 million.⁸

The Explosion in Quality Benchmarks that Must Be Met by Content Suppliers

The Proliferation of Requirements from Distribution Outlets

The expansion in the number of distribution outlets for premium video content poses major challenges for suppliers of TV programs and movies, who must apply QC processes that will guarantee their content meets every distributor's expectations. Otherwise, as the number of distribution outlets multiplies, most with different sets of acceptance standards, the costs of content rejection will skyrocket, not only consuming time to rectify problems but also delaying the start of revenue collection on those assets.

At the same time, along with meeting the expanding range of diverse, non-standardized requirements set by distribution outlets, content suppliers must also ensure their files meet the requirements of distributors who have embraced the AS-11 international file format for HD files developed by the stateside Advanced Media Workflow Association and the U.K.'s Digital Production Partnership. To expedite validation of files sent to these distributors QC processes should be equipped with specific test packages that comply with AS-11 testing requirements.

⁴ Digital TV Research, Global OTT TV & Video Forecast, June 2015

⁵ Parks Associates, press release, January 2015

⁶ Rapid TV News, "Pay TV to Inch Upwards while OTT Rockets," April 2015

⁷ The Diffusion Group, Pay TV Refugees, October 2014

⁸ ScreenPlays, "Mid-Market MSOs Pay TV Angst Triggers Plans for Radical Action," December 2014

The Expansion in Testing Tasks

In all cases, the range of asset components that must be subjected to the QC process has greatly expanded, complicating such traditional basics as ensuring the quality and synchronization of video and audio, closed captioning and language sub-titling and dubbing and greatly adding to the range of metadata information that must be validated.

The quality and synchronization of video and audio payloads must be validated across multiple codecs and screen resolutions to deliver each file to each customer in the formats they use for mezzanine storage prior to transcoding. Suppliers must be able to verify an unprecedented range of container wrappers used in delivering their content to distributors. Confirming the accuracy of the metadata used in conveying the syntaxes of all these elements and a growing list of other elements has added to the QC workload as well.

Moreover, the amount of information carried by metadata has exploded. Distributors need to reach more diverse audiences, which has expanded the number of closed captioning, sub-titling and dubbing streams that must be associated with each content asset. QC processes must also be able to validate richer compilations of metadata essential to enabling advanced search and recommendations applications and to the use of trailers, poster art and other graphics elements in navigation systems.

The Impact of Advertising

Another development adding to the QC checklist is the role of on-demand content in driving advertising revenues. Program suppliers and distributors need to be able to capitalize on ad tracking by Nielsen during three- and seven-day windows of exposure following broadcast airing, which has fueled increases in the volume of content TV networks are licensing to MVPDs' free VOD offerings.

Dynamic ad insertion, often targeted to specific audience segments, after the C3 window expires, has also gained momentum. As a result of these new advertising strategies, content suppliers must be able to verify ad insertion tables and proper alignment of IDR (Instantaneous Decoder Refresh) and EBP (Encoder Boundary Point) markers.⁹

QC Challenges Posed by ABR

ABR streaming, too, has imposed new requirements on QC systems. In transferring video files for dissemination through OTT outlets, MVPDs and programmers' in-house digital operations that rely on ABR streaming technology, content suppliers must be sure their video, audio, metadata and other asset components are properly aligned when subjected to the ABR packaging process. This means that along with applying QC to ensure each programming file as a whole is fully compliant with quality requirements they must be able to quickly confirm each file will be properly rendered across all the major ABR streaming modes, including HLS, Smooth, HDS and MPEG DASH.

⁹ Bloomberg, "TV Networks Offering More On Demand to Reduce Ad-Skipping," September 2014

The Need to Prepare for 4K UHD and HDR

The emergence of 4K UHD and HDR technologies brings into play another dimension in content suppliers' efforts to feed the distribution ecosystem. While often paired in industry discussions, preparation of content for 4K UHD and HDR involves separate sets of new parameters that must be subjected to QC processes along with all the other elements outlined above.

4K UHD has become a growing presence in the services offered by distributors, especially those in the pure-play OTT camp, amid expectations that 4K TV set penetration will continue to soar, reaching 10 percent of households in the U.S. by 2020, according to Strategy Analytics.¹⁰ The researcher says that, worldwide, 4K set shipments increased by 633 percent in 2014 to reach 12.1 million units and predicts increases to 27.5 million units shipped in 2015 and to over 100 million in 2018.

As of mid-2015 Netflix subscribers paying a premium subscription price of \$11.99 per month had access to 4K versions of the provider's original programming and a growing package of 4K-formatted movies. Amazon Prime, too, had launched 4K with a relatively large portfolio of movies along with its own original series and other TV shows, offered at no extra cost to Prime Instant Video subscribers, who pay \$99 for full-year Prime service. Other online providers in the early stages of offering UHD content include M-Go, Vimeo and YouTube.

MVPDs are making early moves into the market as well. In the U.S. Comcast is expanding initial "Xfinity in UHD" offerings targeted to Samsung TVs with the addition of more titles and introduction of a new X-1 4K-capable set-top box.¹¹ In Europe, Liberty Global, BT and Sky are in various stages of introducing new 4K-capable set-tops as well.¹²

Ensuring 4K UHD content meets distributors' requirements requires QC processes that can determine that files meet customer specifications, whether they were originally shot in 4K UHD or converted from other formats such as 35 mm film, the cinematic version of 4K or 1080p HD. It's also important to note that content suppliers will need to be able to use advanced 4K-capable QC to gauge the effectiveness of the 4K up-conversion processes available to them, such as upscaling, various types of scanning, film grain filtering, artifact removal and color re-grading.

In this new environment, specifications may vary according to how a distributor wants to position 4K content, where the threshold for quality might be lower for up-converted HD content versus content originated in film or 4K. Such variations might come into play, for example, with implementations of different tiers of service tied to variations in release windows.

¹⁰ Multichannel News, "4K TV Market Set to Explode," March 2015.

¹¹ ScreenPlays, "Holding Back on UHD Services not a Good Option for MVPDs," February 2015

¹² Broadband TV News, "4K Sky Box within Weeks," June 2015

Additionally, quality variations may depend on the bitrate thresholds set by distributors, which presently range anywhere from 15 Mbps to 25 Mbps for transmitting HEVC-encoded 4K content. Suppliers must be able to verify that quality requirements have been met at the customer's chosen bitrate threshold in accord with whichever HEVC profile the customer prefers – Main, which supports 8-bit color with a sampling depth of 256 levels, or Main 10, which is designed for 10-bit color processing with 1,024 sampling levels. Variables tied to these HEVC profiles also include chroma subsampling levels at 4:2:0, 4:2:2 or 4:4:4. And, of course, questions of whether ancillary content elements, such as UI graphics, text and ads, conform to the 4K quality parameters must be addressed by the QC process as well.

Another level of complexity in quality parameters that must be addressed in QC processes is introduced with HDR, which goes beyond the spatial resolution benefits of 4K by breaking with the long-standing Standard Dynamic Range (SDR or ITU REC 709) specifications that have defined how TV content is presented since the dawn of the HD era over 20 years ago. The various HDR modes now vying for market acceptance all have in common support for a much wider color gamut and much greater contrast dynamics with deeper levels of black in the darker pictorial elements and far greater luminance in the brightest white and color elements

The competing approaches to HDR are characterized by variations in contrast ranging from 2,048:1 to multiple factors above that and by variations in color gamut ranging from 757 million to 69 billion colors. Some HDR systems rely on use of 10-bit encoding while others require 12-bit encoding. The latter typically entail sending two payloads, one a baseline picture conforming to REC 709 to accommodate viewing on non-HDR sets and the other a metadata overlay conveying enhancements to be executed by display systems that can support REC 2020.

Efforts to sort all this out into a set of industry standards have made significant headway, but there are many initiatives underway that will have to be brought together if there's to be true standardization. Meanwhile, program suppliers will have to be prepared to apply QC processes to a variety of HDR modes, depending on which ones their customers choose to support.

These requirements have entered the near-term horizon. Amazon became the first wide-scale disseminator of HDR-formatted content in Q3 2015, while Netflix was publicly committed to begin delivering HDR before the end of 2015.¹³ Similar plans were taking shape among other OTT outlets as well as MVPDs with expectations initial forays into HDR would be widely underway in 2016.

¹³ CNET, "Amazon Beats Netflix to Deliver HDR Video," June 2015.

A QC Solution Suite Fully Attuned to New Market Requirements

Clearly, the requirements that now must be met through rigorous application of file-based QC processes call for advances that go well beyond the capabilities achieved with the first generation of automated QC systems. With far more elements to address in the QC workflow, content suppliers must be able to expand automated testing at accelerated speeds with the ability to perform manual review much faster and more comprehensively than ever before.

In response to these needs, Tektronix has developed the high-speed, highly automated Aurora QC platform. Aurora allows customers currently utilizing the Tektronix Certify QC platform as well as new customers to address all the requirements enumerated above at unprecedented speeds. Equally important, Tektronix has introduced the advanced frame-accurate Hydra player, a breakthrough in QC support that enables content suppliers to greatly accelerate and expand the range of manual review procedures in the QC workflow with playback on PCs and TV monitors from an unprecedented range of source files, containers and codecs.

Aurora QC

Accelerating and Sustaining QC Test Speeds

Aurora overcomes the drawbacks that have inhibited the acceleration and expansion of QC processes on other file-based QC platforms (Figure 2). Through configurable allocations of CPU and GPU resources in high-density virtual and blade environments, Aurora's Guaranteed QC Capacity architecture supports concurrent analysis of more file types at much faster rates than has been possible until now.

For example, the flagship Aurora Professional QC platform enables utilization of up to eight CPU and two GPU cores per VU to perform analysis of HD files at up to 4.5 times real-time throughput, regardless of how many tests are activated. All

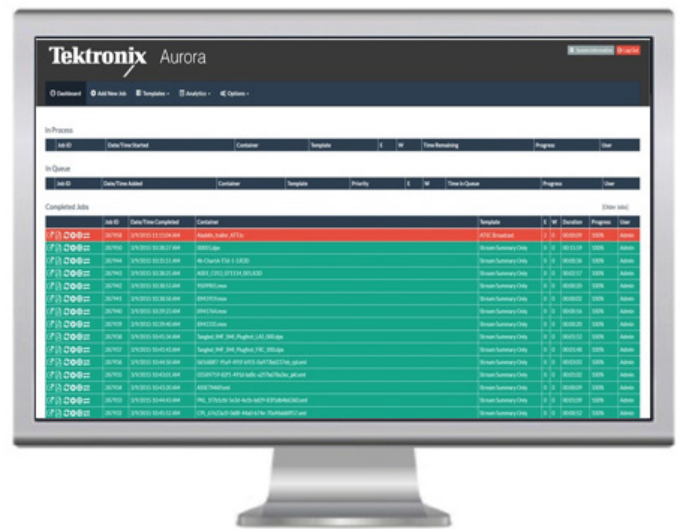


Figure 2. Aurora greatly expands the range, speed and scalability of QC applications with comprehensive report analytics.

the testing required for 4K files can be performed at up to two times real-time speed.

Tektronix also offers a premium version of Aurora that can dedicate up to 16 CPU cores and high numbers of GPU cores per VU to achieve even higher speeds. At the other end of the portfolio spectrum, the entry level Aurora QC system can tap up to four CPU cores to deliver QC throughput on HD files twice as fast as real time.

In contrast to other systems, where the addition of more QC tasks slows processing speeds and can risk system overload, Aurora allows customers to add ever more concurrent tasks to these hardware resources with little noticeable reduction in processing speeds as the workload increases. As a result, customers can expand workloads on each Aurora Verification Unit (VU) with assurance they will not overload the system, thereby avoiding the need to repeatedly analyze how additional tests will impact the system.

Scalability and Efficiency

Aurora supports unmatched levels of scalability in the implementation of new QC tasks and VUs. Through the QC task queue, the Aurora Controller can allocate each QC task across all or any subset of VUs. The controller can add VUs to the system as needed, enabling scalability with increased file-testing throughput to a nearly unlimited number of VUs. In addition, customers can deploy multiple Aurora Controllers to manage groups of differently configured VUs in conjunction with setting multiple QC analysis speeds to prioritize processing of different categories of files.

Aurora also achieves higher efficiency in the testing processes by employing techniques that eliminate false positives and that maintain a high degree of correlation to human perception, thereby ensuring that only the significant issues are highlighted in test reports. Such capabilities will become increasingly important as tests are applied to all the nuances associated with QC over 4K UHD and HDR-enhanced content.

Aurora supports the full range of video, audio and metadata tests that are essential to maintaining QC on all asset files from SD to 4K. Utilizing its Smart Test Plans function, customers can configure automated workflows to apply different sets of tests to specific files, including configurations of the tests specific to DPP AS-11 with options for testing one file or four files at a time.

QC for 4K and ABR

Where 4K is concerned, Aurora supports IMF-based QC analysis. When pointed at the asset map or any of the CPL assets, the system automatically parses and tests the CPLs and provides the results in a QC Test Report.

Aurora can execute 4K tests in real time or faster across all codecs and containers, including JPEG 2000, HEVC and DPX as well as the various AVC permutations of H.264. For example, utilizing GPU acceleration, Aurora with the Advanced Codec Pack can perform 4K essence tests on JPEG 2000 files at speeds of 24 frames per second in real time.

Aurora, for the first time in an automated QC process, also allows content suppliers to verify that their assets will be conveyed as expected over ABR streaming platforms. Such testing, performed at the same rates used with other tests in the QC workflow, is now possible owing to the much higher processing speeds that can be achieved with Aurora.

The Aurora ABR QC process employs all the fragmentation and manifest parameters used by the leading ABR systems, including HLS, Smooth, HDS and MPEG DASH as well as configurations specified by Netflix, CableLabs and other entities. All the asset components in each file are paired with each manifest platform to enable verification that those components will play out as intended in the ABR stream.

Cerify and Third-Party Workflow Compatibility

Critically, Aurora is fully compatible with the Tektronix Cerify QC platform, the first and most widely deployed file-based QC solution. Customers can automatically integrate Aurora into their Cerify workflows, enabling much faster performance on all the tests used with Cerify, as well as new tests. Aurora provides Cerify customers a direct link into Hydra and allows them to sustain connectivity via CeriTalk APIs or Cerify XML into third-party applications.

Augmenting customers' flexible use of cloud resources, Aurora will expand on the QCloud capabilities of Cerify by allowing customers to flexibly use public and private cloud resources for Aurora QC processes, including operations in fully virtualized hybrid environments. Along with supporting Aurora QC with Amazon Web Services, Aurora is also capable of running on providers such as Azure Media Services and SDVI. Such resources can be used on a perpetual basis or on a per-use basis when extra burst capacity is needed.

Flexible use of Aurora also extends to integration with third-party workflows. Benefitting from work with Cerify, Aurora can be readily integrated into Telestream, SeaChange, Harmonic, Snell, Dalet and other environments, in some cases allowing customers to begin running Aurora QC within the first day of installation. Aurora's WSDL based SOAP API ensures that most new integrations can be designed and built in a very short period of time.

The Hydra Player

Speed and Versatility

Complementing the advanced processing capabilities of Aurora QC, the Hydra player was built from the ground up to achieve an unprecedented level of frame accuracy, speed and versatility in the playback of asset components for manual review in response to QC reports generated by Aurora. Hydra can also deliver a much higher level of playback versatility in the manual review process with other file-based QC solutions.

Hydra reduces manual review time to a fraction of the time it takes with other playback systems. When used with Aurora, the player allows customers to select any issue from an Aurora QC Report for playback through Hydra. Or they can access the full list of QC issues detected for a given file as displayed in the Hydra Review Bar and toggle from one to the next with no time wasted looking for the right start frame in the reviewed segment. During the review process customers can add annotations and make QC decisions for each issue as they view the playback, all of which are saved back to the Aurora XMLQC Report.

Hydra supports this rapid visualization process with no chunking or delays, replicating a linear viewing experience across all asset categories, including video, audio, captions, subtitles, text and metadata. The player can display these visualizations from multiple file formats on PCs or video monitors via SDI payout. (See Figure 3 for the list of file formats supported by Hydra.)

No other QC player offers this range of file versatility or the ability to perform QC review on video monitors. Moreover, Hydra uniquely supports direct access to content wherever it's located, including origin servers or archives without requiring

File Formats Supported by Hydra	
Video Codecs	H.264 (AVC/AVC-Intra), MPEG-2 (including XDCAM, IMX and D-10), ProRes, JPEG 2000, DNxHD (VC-3), Cineform (VC-2), VC-1 (and WMV), DV/DVCP, Flash VP-6/7, RAW (Huffman, YUV, RGB, Blackmagic), RED, EXR, DPX, Canopus, HEVC
Audio Codecs	PCM Audio (WAV/AES/BWF), Dolby Digital (AC-3), DD+ (EAC-3), Dolby TrueHD (MLP), Dolby E, AAC, HE-AAC, WMA Standard/Pro, MPEG-2 (L1,2,3), MPEG-1
Container Wrappers	MXF (All OP, including AMWA defined AS, RDD-9, P2, SxS), Transport Stream, Elementary Stream, Program Stream/VOB, AVI, WMV/ASF, QuickTime/MOV, GXF, MP4, 3GPP, LXF, R3D, DPX, DXW, HLS, DASH, Smooth Streaming, IMF, DCP (unencrypted), HDS
Captions/Subtitles/Text	Line 21, CEA-608, CEA-708, Timed Text / DFXP, EBU Subtitles (including STL), SRT, SCC, WebVTT

Figure 3.

rerouting to dedicated in-house servers. This also applies to playback of native camera files in instances where QC testing is performed as video is ingested into the production workflow from the field.

Adding to the versatility, Hydra can be easily implemented in third-party workflows utilizing purpose-built APIs to facilitate integration of all relevant workflow applications into the Hydra system. This enables customers to replace existing QC players with Hydra with assurance all the Hydra playback functions will be available to them, even if they choose to engage with Hydra through their own workflow UIs. Notably, Hydra's support for multiple hardware controllers (Video Display Controllers, USB Shuttle Wheel, BUF boxes, etc.) can be itemized on those UIs.

4K and ABR Playback

All of these capabilities apply to manual reviews of 4K UHD files on PC and SDI monitors in instances where Aurora customers take advantage of the HEVC-compatible Advanced Codec Pack. As previously mentioned, Aurora supports QC analysis utilizing IMF with 4K. In Hydra, users can scrub back and forth among CPLs, select one and click on any reported QC issue respecting any specific profile in the Aurora Test Report to view in 4K the exact frame(s) of the reported issue.

As is the case with Aurora QC, the Hydra player architecture is designed to enable users to make use of GPU as well as CPU resources. As a result, Hydra can play out higher resolution files and process more complex wrappers than is possible with other players, which is especially important in the 4K QC review process. This includes handling IMF CPLs for 4K playback in real time.

Hydra, when integrated with Aurora QC, for the first time brings playout of HLS, HDS, Smooth, DASH and other ABR file sets into the manual review process. Hydra accesses results of tests specific to identifying the causes of ABR streaming problems and jumps to the exact frames to enable review wherever issues occur.

The Industry-Leading Cost-Benefit Equation

Tektronix recognizes cost containment is a major issue for content suppliers as they adjust their QC capabilities to keep pace with today's fast-moving distribution market. Customers will find the capabilities and application breadth of the Tektronix suite of file-based QC solutions set new benchmarks in cost effectiveness as well as performance.

For existing Cerify customers, Tektronix has positioned Aurora QC as an upgrade option which they can integrate into the existing platform at no additional cost. For new customers, the cost of entry and additional capabilities they may want to add in the future are well below typical market costs.

Hydra is offered at a great cost advantage as well. Customers will find Hydra costs are as much as 75 percent below solutions that fall far short of its capabilities.

Conclusion

The expansion of distribution outlets for premium content represents both a major opportunity and a challenge for content suppliers. As margins tighten in the traditional pay TV and broadcast syndication markets, surging consumer demand for anywhere, anytime access to content has spawned a rapid increase in OTT outlets, where cost-effective approaches to satisfying this demand are essential to sustaining strong returns on content suppliers' assets.

The proliferation of OTT distributors has greatly expanded the range of requirements that must be met in supplying content suited to each distributor's needs. Along with variations in basic A/V quality benchmarks, the OTT market's reliance on ABR streaming together with ever richer fields of metadata tied to navigation, advertising and audience diversity has made it virtually impossible to keep pace with file-based QC requirements using old approaches. The complexities will only increase as distributors introduce UHD 4K services and capitalize on the richer viewing experience enabled by HDR technologies.

Tektronix has made it possible for content suppliers to keep pace with these QC needs with introduction of the Aurora file-based QC platform and the advanced Hydra player. Along with extending automation across all the new areas of QC validation, Aurora provides the means by which customers can attain and sustain unprecedented processing speeds as they add ever more tasks to the QC workload.

By virtue of its backward-compatibility with the Tektronix Cerify file-based QC platform, Aurora provides a painless, no-cost upgrade path to advanced QC capabilities for existing customers. And it offers a surprisingly low-cost point of entry for new customers.

Hydra, by setting new performance levels in QC player technology, provides content suppliers the speed and breadth of coverage in the manual review process they need to avoid bottlenecks in their efforts to keep pace with demand. Hydra delivers exceptional benefits when paired with Aurora QC and can be integrated into third-party workflows to bring exceptional playback capabilities to other QC environments as well. Either way, suppliers will find that cost as well as performance barriers fall with implementation of Hydra.

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