

# ETIA 2015: THE FUTURE OF ELECTRONIC ENTERTAINMENT OVER THE INTERNET

## SMPTE hosted the third ETIA conference showcasing state of the art technologies for providing entertainment over digital infrastructure By David Cardinal

Once again, Entertainment Technology in the Internet Age (ETIA) returned to the Stanford Campus. As in previous years, it featured a packed line-up of speakers for two full days, plus an evening event. The special event this year focused on one of the most important new issues in the entertainment and tech industries— security. Other new topics included an engineered replacement for legacy gamma encoding, optimizing bandwidth, a debate on whether physical media and ownership are dead, and how many screens are enough. Familiar topics included monetization, net neutrality, audio, live event broadcasting, challenges in VR/AR (virtual and augmented reality), and improving image quality over the Internet.

### Opening Remarks: More, Faster, Better Pixels

SMPTE Education Vice President Pat Griffis, of Dolby Laboratories, set the stage for the conference with opening remarks on improving the quality of content distributed over the Internet through more, faster, and better pixels. Setting the bar high at 8K video, Griffis recapped how the combination of high-resolution and higher frame rates (HFR) add up to very high bandwidth needs. He pointed out that 8K video requires about 33 megapixels per frame. While 8K is nominally at least enough for the human visual system, Griffis reiterated that the quality of the pixels is equally important—especially the range of brightness and color.

Griffis explained the need for new standards. Conventional standards are based on old technologies—cathode ray tubes (CRTs) and analog film—meaning there is a need for good ways to measure luminance accurately in modern entertainment scenarios.

As part of the effort to develop new standards that fit today's more rigorous requirements, Scott Miller of Dolby Laboratories, followed-up with a detailed discussion of how a replacement for gamma is being engineered. Miller demonstrated how luminance is measured and showed how viewer preferences, for reproducing those scenes, should be measured. The process of matching those preferences to a quality metric has created performance quality (PQ) – an improved alternative to a simple gamma encoding.

Lars Borg of Adobe, showed instances in which the derived PQ could be used in a color workflow. For the capture step, serial digital interface (SDI) packaging doesn't have a flag for PQ, while high efficiency video encoding (HEVC) does. He explained that this can be applied in high dynamic range (HDR) grading, but it is a work in progress. The ensuing panel discussion focused on where intent resides in the workflow, and who should implement the final rendering of a scene onto the viewers' display. All agreed that more automation would be desirable, but difficult, as the director's artistic intent in many instances cannot be determined from simply analyzing the scene.

### Compression Panel: If Bits are Bucks, What's the Best Bang for the Bit

A well-rounded panel that included representatives from Netflix, Warner Bros., Sony, Ericsson, Harmonic, and Ateame provided a range of perspectives on the tradeoff between quality, quantity, and cost in distributing entertainment content. The panel pointed out that narrowcasting has actually become an increasingly popular option because of improved compression and great broadband availability—despite the move to higher-resolution formats. Narrowcasting works best with constant bi-

trate compression, which requires using all the techniques from variable bitrate compression, adapted to the unique characteristics of a fixed, but limited, bandwidth.

The panel agreed that UHD (4K) TV is already experiencing customer success, and growing market acceptance, avoiding the disappointment of 3DTV. To support the case that UHD wasn't everything, Ericsson cited the results of its double-blind studies comparing the increased resolution of UHD with true HDR with 1080p HD. All their test subjects preferred the HDR with HD—at every viewing distance—to UHD with standard dynamic range. In addition, they found that if you don't move closer or purchase a larger TV, UHD is not a visible improvement over HD (at its proper viewing distance). Ericsson pointed out that while HD is typically best viewed at three times the height of the display, 4K UHD is best seen at 1.5 times. So moving to UHD ideally means doubling the size of the display, or viewing it twice as close—which is not likely to happen in the typical living room. To get the full benefit of a 60-in. UHD display, for example, you'd need to sit about 5 ft away.

### Keynote: Netflix Wrestles with the Future of Streaming

The first afternoon's featured speaker was Neil Hunt of Netflix, who discussed the challenges Netflix has faced in delivering ever-better content through limited bandwidth. Hunt said he believes we need to free ourselves from the "tyranny of the grid" (pre-planned TV schedule). Instead of a limited number of fixed choices, Netflix starts out at the opposite end of the spectrum, with tens of thousands of options available on-demand. So its challenge has been to filter many options down to a reasonable-sized set that a user can choose between.

## BIGGER, BRIGHTER, AND BETTER

On the topic of bigger, brighter, and better TVs, Hunt believes that the Internet will become the leader in standards, delivering them before broadcast, cable, and theaters. As an example, he pointed to the Netflix's 1 million active 4K members. While rolling the capability out, they found that HEVC was not nearly as efficient as was expected, so 4K video is taking about 16 Mb/s to transmit (it will be 20 Mb/s if it is also HDR).

A related challenge has been whether to certify 30p devices for 4K, committing Netflix to long-term support of both 30p and 60p, or only work with 60p-capable devices. As far as implementing HDR, Hunt said Netflix is essentially HDR-ready. In terms of challenges for viewing, the company struggles with the factory settings of TVs, as only a fraction of people change the settings to make the viewing more appropriate for movies. Netflix is hoping at some point there will be a closed-loop calibration system that guarantees predictable viewing conditions.

## SMALLER, FASTER, AND CHEAPER

At the other end of the spectrum, there are now many more phones and tablets than TVs—sometimes connected over a mobile broadband account—although usually over Wi-Fi. Unlike big screen viewing, most small screen viewing is solo. Netflix is hoping it can achieve 480p quality images at less than 250 Kbps for use on those occasions when the viewer is on a mobile data plan, although Hunt does not see HEVC assisting with the solution. He said he hopes that Google's VP9 compression will be useful. In addition to bandwidth, changing viewing conditions are also a challenge.

## CLOUD ENCODING

As Netflix expands to new markets, encoding has become a massive processing task that needs to be done quickly. Netflix uses the cloud to do the heavy lifting. In fact, Hunt explained that the company's media workflow is entirely virtual—living in the cloud. On virtual reality (VR), Hunt opined that Oculus-like devices will only be a niche market when it comes to passive viewing, with immersive big-screen technologies dominating. Conversely, for interactive entertainment, he sees VR as being much more compelling.

## Monetization Panel: Show Me the Money, Sonny!

Discussing other available options for streaming, Allan McLennan of The PADEM Group, chaired a panel focused on how content can be monetized effectively. The panel featured Hunt, along with Todd Collart of Deluxe OnDemand and Phil McKinney of CableLabs. Collart stated that the environment for delivering content is changing so quickly that individual providers must adopt a solid and flexible platform for storage and delivery. Deluxe OnDemand delivers such a framework, spanning creation to distribution across various types of networks and devices. McKinney amplified the need for flexibility by citing the variability of distribution networks, using the large average speed differences between countries as an example. In most cases content only has to move a few feet over a connection to get to the customers' Internet provider. McKinney said another way to get high-quality content broadly distributed is using emerging "home hub" devices. They can download premium content in high-resolution, and then transcode it and serve it to individual viewing devices.

## Turning Viewers into Dollars: A Web Perspective on Monetization

Turning viewers into dollars is an equally crucial topic for many content providers. Charlie Jablonski, a SMPTE past president and most recently with OnLive, led a panel on how web content viewing and delivery affect the way viewers ("eyeballs") are monetized. Simon Jones of Conviva led off with an overview of measurement technology currently available on the web. He en-

visioned a world in which all content could be consumed on a subscriber's choice of devices, citing HBO Now as an example. The result is an environment in which content providers gain intelligence of what each viewer is watching, on what device, and how it relates to its subscription sign-ups and subsequent viewing. In that world, network operators become a device-independent distribution channel for the content providers. Advertisers, likewise, gain much more accurate targeting. Of course, the consumer also benefits, since they can watch what they want, when they want, on the device they want.

Scott Brown of Nielsen provided a somewhat contrarian point of view about the potential demise of traditional cable-channel-based viewing. He pointed out that 91% of potential viewers still watch some live TV on a daily basis, with 80%-90% of the TV watched, purchased as part of a traditional monthly plan. He explained that growth in subscription viewing on demand (SVOD) more than offsets the small drop in live TV viewing, and Nielsen can also monitor SVOD by using the audio signal as a "fingerprint" to identify the source program. Brown anticipates that young people, who rely on mobile devices today, will purchase fixed-location TVs and subscribe to cable plans as they get older. However, he explained that Nielsen is watching the growth in digital media and has extended its architecture to allow clients to measure their performance on digital media. That effort includes partnerships with companies such as Facebook and Adobe for accurate analytics.



Panelists: *If Bits Are Bucks...* (L-R) Anne Aaron, Netflix; SMPTE Past President Wendy Aylsworth, Warner Bros; Bill Baggelaar, Sony Pictures Entertainment; Pierre Larbier, Ateme; Paul Haskell, Harmonic; and SMPTE Executive Vice President Matthew Goldman, Ericsson.

## Advances and Challenges in AR/VR Entertainment

Following on from last year's Holodeck exploration, a panel updated the conference on the state of Virtual and Augmented Reality (VR and AR) entertainment. In contrast to Hunt's perspective, members of the panel predicted that more than half of the usage of VR will be for entertainment, and not gaming—especially when it comes to movies and music. Challenges, however, include the display hardware and software, as well as the effective capture and creation of interactive content, along with user interfaces that allow the viewer to control the experience. Arthur van Hoff of Jaunt VR, calls the resulting user experience “cinematic VR.”

Chris Ullrich of Immersion Corp., and Sunil Bharitkar of Dolby Laboratories' spoke about their respective innovations in the use of haptics to extend the authenticity of VR experiences. In particular, they have learned that providing tactile feedback for even a small part of the body, such as a hand, greatly increases the realism of the overall experience. Stefano Baldassi and Soren Harner of Meta, laid out their company's vision for making Hollywood's version of AR into a reality. Tish Shute of THRED, addressed the question of using AR and VR platforms to enable new experiences. Her company's solution allows content creators to string together images and other media to tell a story.

### Special Event: Not So Safe—Entertainment Over the Web

Until recently, security for the entertainment industry was almost entirely about piracy prevention. However, given recent

events, enterprise-wide cyber security has also become a topic of great importance. The conference's evening event featured a panel of speakers representing a wide variety of perspectives from the MPAA, MaxPlay, Prime Focus, Independent Security Evaluators, Amazon, Aspera, and OnLive. First, the panel made it clear that cyber security has become a business issue—it is no longer strictly the province of the information technology (IT) department, and instead needs to be actively addressed at the corporate level. Systems that rely on people to behave perfectly are doomed to failure; employees often do things they shouldn't do so a much more mindful approach is required.

The discussion began with the acknowledgment of every organization's need to create a model of the likely threats to its assets. Depending on the size of a given company, that can include disgruntled former employees, competitors, pirates, malicious hackers, or even governments. Ted Harrington of Independent Security Evaluators, demonstrated the ways that wireless routers are insecure and prone to both local and remote attacks. Francisco Artes of MaxPlay, dissected many of the recent infamous corporate hacks. He presented a compelling demonstration of how easy it is to see the name of every Wi-Fi network most of the mobile phones in use at the conference had ever been connected to. This is a well-known issue, but his use of the data to backtrack people's likely places of work and residence was definitely spooky to the audience members.

Wendy Frank of the Motion Picture Association of America (MPAA) provided ideas on how best to secure enterprises, begin-

ning with the MPAA's new best practice guidelines that are available on its website. The primary focus of the guidelines is to assist in protecting digitally stored films from theft; following them will also aid in keeping other corporate assets secure.

### Panel on Multi-screen Content Delivery: How Many Screens Before I Say No More?

Colin Dixon of nScreen Media provided background statistics to set the stage for a panel discussion of second screen and non-TV screen connectivity. He demonstrated that iOS and Android are splitting the mobile video market almost evenly. However, despite the rapid growth in mobile video, connected TVs used for streaming are as large a market as Android and iOS combined. The ratio varies greatly throughout the day: Mornings see the most use of mobile devices, while evening viewing moves more connected TVs.

Will Law of Akamai kicked off the panel describing the difficulty of caching and distributing the many streaming and compression formats, and recapped some recent progress in reducing the complexity through projects like common encryption and consolidation around MPEG-DASH, instead of many of the older streaming formats. Needing to transcode, or even repackage, a stream on delivery is a major consumption of processing power for Akamai, so they are also working on methods to do this in advance.

Mark Adams of Accedo, addressed the complexity of developing an application for the wide variety of connected TVs. Each new platform is designed to provide additional capabilities, and ideally simplify



Lars Borg



Neil Hunt



Charles Jablonski

future development. Since all the old platforms still need to be supported, the result is more complexity, rather than less. Development frameworks can make this a little easier, but he explained that there is no easy answer. Many developers and content providers are being more selective about which devices they support as a result. HTML5 holds out the promise of a unified environment, while only addressing about 60% of the development and testing effort required to roll out an application.

Jim Monroe of Net2TV, cataloged the advantages of the new platforms, especially the ability of broadcasters to see what viewers are doing on various platforms—allowing them to customize the experience they provide. Those experiences can include both an interactive version for small screens, and a lean-back version for large-screen viewing. Realtime user data also makes it possible to personalize channels, filling them with programs that match a viewer's particular interests.

Chrisopher Cukor of LG Silicon Valley Lab said they see WebOS as a way to attract developer support even though LG is an emerging platform, because of native HTML5 support. LG has gone one step further with its Connect software development kit (SDK), allowing it to easily play content designed for a wide variety of platforms, including Google's Chromecast.

The panel agreed that the bandwidth required by UHD will be a challenge going forward, as well as getting user data back from the device maker to the advertisers. Platform fragmentation was also reiterated as an issue that is only getting worse.

### **Expert Panel Disagrees on the Future of Consumer Ownership of Content**

Danny Kaye of 20th Century Fox Home Entertainment, kicked off this discussion by providing data that more than 80 million U.S. consumers are still buying physical digital content, about the same as the 87 million that subscribe to a streaming service, and slightly less than the 105 million who spend money on pure digital content. Even though there is overlap, more than 30 million of the consumers are exclusively purchasers of physical media such as DVDs and Blu-Ray discs. A core group of about 30 million consumers purchase physical, digital, as well as streaming. The particular

channel of choice depends on the content. Due to the higher price point, physical product sales still represents a major portion of revenue, more than \$5 billion annually, down from several times that amount a decade. Over time Kaye predicts much of the physical purchase business transitioning to digital purchase of HD content, but still sees a demand for ownership.

Albert Koval of DECE/Ultraviolet, explained how Ultraviolet is a big part of making the transition from physical to digital ownership possible. With more than 23 million accounts and 130 million movies owned, Ultraviolet continues to gain traction with consumers, echoed by high consumer satisfaction ratings. Even among those purchasers, many prefer to stream rather than download.

Dixon returned to the stage to provide a contrarian point of view, that ownership is not just on the decline (16-21% year to year), but also on its way out. His data demonstrates that rentals are declining almost as fast, and he predicts that subscription revenue (growing 25% year to year) will eclipse both of them by 2018. Dixon sees universal device connectivity as driving this trend—but the bigger cause is change in lifestyle, especially among millennials—to one where large collections of physical media are uncommon. He views release windows as one of the few remaining motivations for acquiring content, and points out that with services like HBO Now, even its importance is eroding.

The rest of the panel questioned whether the trends that Dixon projects will last, blaming the current decline in purchase on the reluctance of the movie industry to embrace digital purchase, which is now changing. There was no consensus on the issue, other than a suggestion that attendees should return next year to observe which way the trends are headed.

### **An Update on Net Neutrality**

Legal expert James Burger of Thompson and Coburn, provided his current perspective on the state of net neutrality, building on the excellent discussions from last year's event. In particular, he walked delegates through some of the Federal Communications Commission's (FCC's) recent decisions, explaining that the FCC has stipulated that owners of networks should not control lawful consumer access, and

not discriminate against content providers with restricted access to their network. The FCC's current position grows out of a set of principles first articulated in 2005, and then turned into the more concrete Open Internet Order in 2010—after the 2008 Comcast case regarding BitTorrent. Its initial rules were successfully challenged in court, so the FCC went back to the drawing board and reclassified its treatment of the Internet from Title I to a subset of Title II, allowing it additional ability to regulate it. That is now being tested in court, and may become the subject of future legislation.

### **Audio Panel: What's New in Sounding Good over the Web**

While most of the audio panel focused on the creation and transmission pieces of audio entertainment, Phil Hilmes of Amazon Lab126, provided perspective on how audio is played for the consumer—on devices ranging from headphones to laptops. Issues include synchronization with video due to lag, poor interoperability of devices, and actual acoustic issues caused by the listening environment or poor playback devices. Wireless, in particular, is making sync problems worse, and is worst on the increasingly popular Bluetooth—with latencies as high 400 ms, and varying with time.

Hilmes sees room for improvement in device design, which could work in tandem with cloud processing to pre-process audio for the particular situation. Embedded metadata could also allow for more intelligent processing where the local device will determine the best settings possible for the specific content and environment. Local sensors—especially microphones—can also be helpful in characterizing the listening environment intelligently, ensuring optimal audio playback.

Once again, ETIA packed a tremendous variety of information, ideas, issues, and possible solutions into a two-day event. The key themes included the need to drive standards for higher-quality video and audio, the tension between OTT and cable, as well as streaming versus purchase, were familiar from last year. Other topics like emerging threats to corporate security, were new. Overall, attendees benefited both from the formal program and for the ample time allowed for networking between sessions.