DIGITAL TV EUROPE

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MULTI-SCREEN & OTT

Social live streaming

The year of social streaming

Major moves by the top internet players have made 2016 a landmark year in the development of social live video streaming. Andy McDonald reports.

Live video streamed over the internet is not a new phenomenon, though with Facebook, Twitter, YouTube and YouNow all now jostling to take a lead in this market, the era of social streaming is truly upon us.

With smartphones now nearly ubiquitous, a focus on mobile has seen Facebook launch Facebook Live, YouTube add new streaming capabilities, Twitter gain strong traction with Periscope, and YouNow grow its market share – all in the space of a year.

While improved technology may be changing the very definition of entertainment – just ask any teenager more interested in their favourite vlogger than linear TV – it is the increasing eagerness of online and social platforms to vie for premium rights, sports content, and other professionally-produced content that signals the true power these platforms will hold in years to come.

Facebook goes Live

Facebook first started to test live video streaming with public figures in the US last summer. In December it rolled out the new feature to a small percentage of US iPhone users and in January it expanded live video sharing to all of its US iPhone users and announced plans to start rolling this out to the rest of the world.

By April, Facebook said it had been "surprised and delighted" with how people

Facebook started to test live video in the summer of 2015.

were using live video to connect and interact with each other all over the world. New features meant users were able to 'go live' in Facebook groups and events pages; live reactions made it easy for viewers to express their feelings during a live broadcast, while a new dedicated place on Facebook's mobile app meant users could discover live video from friends and creators, as well as content that the world is talking about.

The move into live is part of a broader push by Facebook into the video space. Speaking on the company's recent second quarter earnings call, company CEO Mark Zuckerberg stressed this commitment, describing a "move towards a world where video is at the heart of all our services".

"Right now, the big theme and strategy that we're executing is we're going to become video-first," he said, predicting that in roughly five years, online video will be what most people consume online. "That means that there needs to be a whole range of new production tools and consumption experiences for enabling that."

While Facebook Live is open to all of Facebook's 1.71 billion monthly active users, part of the social network's early strategy has revolved around attracting professional content producers to the service. A *Wall Street Journal* report from June claims that Facebook signed contracts with nearly 140 media companies and celebrities and paid out more than US$50 million (€44 million) to secure content for Facebook Live. Partners reportedly include media companies like CNN, the New York Times and Vox Media, and talent such as Olympic swimmer Michael Phelps, actor George Takei and YouTuber Ray William Johnson.

Bringing high-profile content to the service is a canny move to raise awareness of and increase exposure to Facebook Live, but it is yet to be seen whether it is this premium content will prove the most popular on this service.

During the recent US Republican and Democratic conventions, Facebook reported that 8,500 hours worth of video was broadcast on Facebook Live, with news outlets including ABC News, Al Jazeera's AJ+, Fox News and the BBC using the platform to cover the events. These videos were viewed some 120.3 million times.

However, even more impressive was the surprise viral hit dubbed 'Chewbacca Mom', which single-handedly surpassed more than 160 million views. The video, titled 'It's the simple joys in life', of American mother Candace Payne trying on a *Star Wars* Chewbacca mask and proceeding to laugh hysterically, demonstrated the user-generated potential of Facebook Live as a platform.

"What we're seeing is the kind of content that is proving popular on these platforms is evolving with the platforms," says Ovum analyst Matthew Bailey. "Take the Chewbacca mask example – I very much doubt that before that happened many advertisers would be keen to align their brands with that kind of content, because nobody probably saw that coming."

Discussing the 'sweet spot' of content for Facebook Live, Bailey says it is still uncertain what will work. "It will require quite a bit of experimentation on the part of the platform owners, but also content creators and broadcasters looking to expand into the digital-social space."

He identifies three distinct types of content that has the potential to really take off on platforms like Facebook Live: 'communicative content' – personal broadcasts between small audiences of friends and family members; 'democratised content' – personal, engaging broadcasts from general consumers, personalities and digital creators that are designed to reach a dedicated audience or fanbase; and 'professionalised content' – TV-like broadcasts from broadcasters and publishers that will typically be made with professional equipment.

"It says a lot that young people are spending their time on services like YouNow and not on MTV, VH1 or even Nickelodeon."

Adi Sideman, YouNow

Show me the money

"In order to attract advertisers and monetise the service, professionalised content will be important to the platform owners. But a mixture of all three, as far as platform owners are concerned, will probably be crucial in order to maximise monetisation and audience engagement," says Bailey.

Following its initial outlay, Facebook is clearly keen to make live content pay. Earlier this month it started a small test with a group of publishers, letting them insert short ad breaks into their live videos, effectively deploying a tried and tested advertising model from the traditional TV space. But is mid-roll advertising the best and most effective way to make money from live online video?

Phil Dyte, strategy director at digital performance marketing agency iProspect UK, says that mid-rolls could help meet the demand for smart advertising. However, he cautions that "nobody truly knows what live video will become" and says that Facebook's experiment in this area may or may not be the path it eventually goes down.

"Facebook unveiled its 10-year road map in April, confirming video as one of the key products to focus on in the immediate future. In recent months it has become clear that the urgency is real, as Zuckerberg's company rushes to secure a strong pole position on the emerging live space," says Dyte.

"In doing so, it skirmishes against the real-time advantages of rival services YouTube, Twitter and Snapchat by leveraging its platform and massive scale – and like these companies, it is searching hard for the commercial model that squares surging demand and smart advertising."

Branded or promoted content is an area that is already building a lot of traction on services like YouTube, where popular vloggers and influencers can command increasingly large sums to promote or simply talk about a given product or service. Facebook now also allows verified pages that have a blue checkmark to share branded content – as long as they follow its branded content and ads policy and use a branded content tool to tag marketers in their posts. However, Ovum's Bailey says that this 'self-disclosure' method may be more difficult to regulate and monitor in a live setting.

"With on-demand content, it could

potentially be reviewed and brought down before it gathers too much momentum. But if someone hasn't disclosed the fact that they are being sponsored to produce this content and it's going out live to potentially a substantial live audience, then that would have already been presented in a dishonest way, which obviously would be of major concern for regulators and also the platform owners."

Despite these concerns, Ampere Analysis principal analyst, Ed Border, says that branded content is a powerful area, with Facebook able to use the vast amount of user information that it has to tailor the stream to the person watching.

"If you start to compete with content that is on TV platforms, advertising's a necessary component, but I would say that the advantage of branding is that you can actually begin to layer in a lot of the information that Facebook has about you to actually make that advertising perhaps more relevant to the consumer."

Live webcast platform YouNow has a different approach to making money from live video. The five-year old company was a comparatively early player in the live streaming market, and has seen dramatic growth since its launch, funded by US$30 million of venture backing to date and a model that lets users send virtual gifts to one another.

YouNow lets users earn coins, a virtual currency that allows people to send stickers and likes to their favourite broadcasters. These can be earned by broadcasting; spending more time watching, voting, and chatting on the service; by inviting friends to use YouNow; and by logging in every day.

Separate to this, YouNow also offers a currency called bars, which users can buy from the YouNow mobile app through the iTunes or Google Play stores. Bars can be used to buy a range of different virtual gifts including: '50x thumbs-up', a gift that helps broadcasters to trend on YouNow; 'fan mail', a personalised note that stands out from regular chat; 'applause', a gift to show appreciation to the broadcaster's talent; and 'bars as tips', a way to directly support someone.

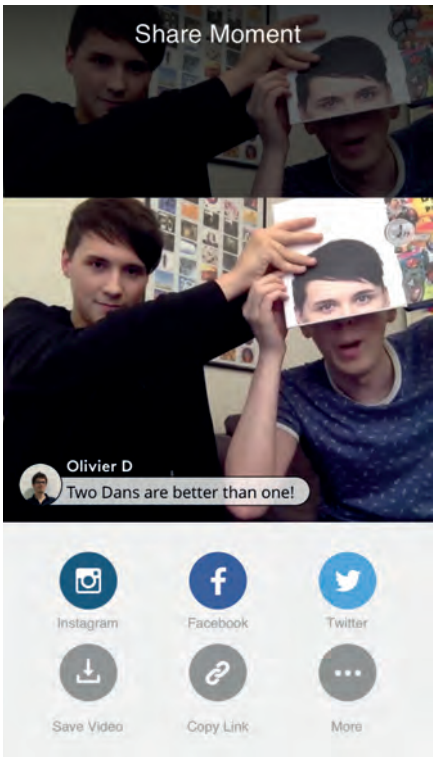
"We have a unique business model where broadcasters earn a revenue share of the virtual goods that are being spent during their broadcast," says YouNow founder and CEO Adi Sideman. "We are very proud of our unique participation experience. Users don't only chat, they also vote on which broadcasts should be trending, gift gifts and are able to jump into the broadcast and guest-broadcast along with the broadcaster in a split-screen situation, which is very popular."

YouNow offers a 60:40 revenue split in favour of its broadcasters, with many of the site's most popular users able to earn a decent salary from the money they make from the service.

The age of engagement

With more than 100 million user sessions per month and a user base that has roughly doubled every year to date, YouNow's approach appears to be working. Sideman says that 75% of YouNow's users are aged 13-24, meaning there is not a direct overlap with the demographic of other live social services like Facebook and Periscope. Some 70% of YouNow users also interact with the content that they are watching, while viewers watch an average of around 50 minutes per day.

"It says a lot that young people are spending their time on services like YouNow and not on MTV, VH1 or even Nickelodeon. I do think that we have seen a historical trend over the past 15 years towards participation," says Sideman, who describes a "passing the means of production" that is allowing more people to easily participate in a TV-like experience.



"It used to be that there were five reality shows 15 years ago. Today there are over 1,000 just on television and another hundreds of thousands if you count all of the digital channels like YouTube and YouNow."

Another trend that Sideman highlights is the move towards real-time interaction – with the evolution from text, to chat, to images, to real-time images, video and finally real-time broadcasts.

"There is a trend towards more immersive, more tactile, more sensory communications with immediate feedback, and that's what the users and the culture demands and that's what the technology can provide," says Sideman. "This generation was born with screens all around them, has the DNA of the network and are not intimidated and inhibited by participating in media. They don't want to just lean in, they want to jump in. YouNow, allows them to do just that."

YouNow's success has not been lost on other parts of the media. TV juggernaut *Amercia's Got Talent* has run auditions through the service, while YouNow has also been used by the likes of MTV, the Huffington Post and Refinery29, which recently closed a US$45 million funding round led by Turner. Crucially, Sideman says that this has happened organically and YouNow has not had to pay users to join its service.

Premium live content is an area that YouTube knows well and, like YouNow, its efforts in live streaming also date back five years. The Google-owned video giant started out by offering live options to selected partners that mainly revolved around tent-pole events such as Felix Baumgartner's record-breaking, Red Bull-sponsored, parachute-jump from a helium balloon 128,100 feet into space.

In 2013 YouTube opened up live streaming options to all verified channels in 'good standing' that adhere to the site's community guidelines and do not infringe copyright. However, it was just this year that YouTube made the important and competitively strategic step to enable live-streaming directly from the YouTube mobile app, allowing users to simply push a 'capture' button to broadcast in real-time.

"We enabled livestream way back in 2011 and the momentum behind it has just been getting stronger. In the last six months alone

YouNow was a relatively early entrant to the live-streaming business.

Q&A: Kent Steffen, CSG International

Kent Steffen, President of Digital Content Strategy, CSG International, talks about the challenges of launching new services quickly, the benefits of cloud technology and the impact of big data on the way service providers can shape their offerings.

Does it now make sense for service providers to launch new services quickly rather than plan and test them carefully?

We are seeing a lot of service providers follow the mantra 'Launch Fast, Learn Fast, Scale Fast'. But achieving that means conquering some challenges.

On the systems front, service providers need a digital service platform that provides flexibility to launch quickly and integrate offers in interesting ways. This usually requires new, adjunct systems to engage the customers across devices and collect insights about how the customers use the service.

Culturally, service providers need a new level of agility to get offers out to market quickly and provide a mechanism to listen to what customers like and don't like about the offers. Customers using the service are the most effective feedback loop, but culturally you have to be prepared to launch and then quickly evolve a service.

Have the risks involved in launching new services and testing them out in the market been reduced?

Stakes are high to deliver value to customers in a way that leverages the uniqueness of the service provider brand. Making busy consumers' lives easier should underpin new services. This means that a service provider needs to think holistically about product, market segmentation, care, price, and customer engagement. If you forget one of these elements, you can turn a great new service into a nightmare for customers. Plan on getting to market, gaining insights and making adjustments. The digital customer experience overall needs to be constantly evolving. The biggest risk is in standing still.

How can cloud technology enable operators to experiment with innovative services and revise their plans if things don't go as planned?

Cloud-based technologies open a new world of options to make faster or experimental changes to digital content services and reduce the time from concept to launch. In the past, it could take months to configure new services across multiple product catalogue, ordering, billing, rating systems and many others. Service providers often don't have the time or resources it would take to completely transform its BSS to exploit new market opportunities each time. A cloud-based, overlay approach allows new services that support digital service offerings to be deployed with minimum impact on incumbent platforms, digital services to be launched quickly, and new revenues to be realised fast – with an early positive impact on cash flow.

What additional tools do service providers now have at their disposal to combat churn and ensure subscriber loyalty?

Bundling has always been a great tool to uniquely leverage the existing products to bring value through new additional services. Creative merchandising, multiple payment models and methods, loyalty programmes or discounts on introductory products when a loyal customer is using the existing products are great ways to combat churn and drive subscriber loyalty. We are also seeing a shift from exclusively recurring products (although this is a great revenue source) to blending in on-demand and single-purchase types of upgrades. This constant consumption and upgrade model gives customers choice and can create additional revenue streams which are not always possible from a one-size-fits-all subscription-only product.

How much impact has big data had on enabling service providers to shape their commercial proposition in line with the habits and preferences of individual consumers?

Consumers like to see more of what they like. Big data analytics and customer insight models are an important toolset that service providers can leverage to better understand which up-sell, cross-sell, next-best offer and even promotional items may best encourage a consumer's loyalty to the brand. Many of the large internet brands drive everything from the data they collect around a consumer to create a personalised experience to make life easier for consumers. These companies have not just upped their game, but have changed the game when it comes to anticipating what a consumer will want, which can drive real long-term brand loyalty.

How much flexibility do service providers have to experiment with new commercial models such as loyalty programmes and vouchers, and what impact does this flexibility have on their performance?

A robust loyalty or merchandising strategy has evolved from a 'cool experience' to a 'must-have' for providers to create brand loyalty. In fact, it may well be among the best value propositions to convert one-time shoppers into repeat customers.

Blending free, sponsored and pay models together gives consumers choice to try before they buy and build an affinity to a new service and ultimately the brand. Having the programmes and tools in place to create offers, and target those offers at just the right time can turn a sale into a value-added service and long-term repeat business.

Visit CSG International at IBC (Hall 14, Booth n.26/n.28) and learn how we've helped the world's largest pay TV businesses, MSOs, telcos, mobile operators and other service providers launch new offerings, build greater customer loyalty, reduce churn and grow revenue from content and services. ***Book Your Meeting Now*** with one of our digital experts.

the amount of live streams on YouTube have tripled," said YouTube CEO, Susan Wojcicki, speaking at VidCon – the California-based video conference where YouTube announced the rollout of its mobile streaming functionality – in June.

Sharing the VidCon stage with Wojcicki, YouTube's product lead for immersive experiences, Kurt Wilms, claimed that YouTube's peerless infrastructure will make YouTube live streaming "faster and more reliable than anything else out there", and described how live broadcasts will be saved and made available like any other YouTube video once the broadcast ends.

"We've been doing live streaming since way before it was cool. Millions of people tuned in to watch The Royal Wedding in 2011, one sixth of the internet tuned in to watch Felix Baumgartner jump from space back to earth on YouTube in 2012, and just last month we live streamed the world's largest annual sporting event, the UEFA Champions League Final," said Wilms. "Over 21 million people tuned in to watch Coachella on YouTube this year. That's almost twice as many as that tuned in to watch the series finale of *American Idol*. Today I'm excited to announce a new chapter in bringing the power of live video to creators everywhere."

YouTube's move into live mobile streaming is certainly significant. As Wojcicki stated in her VidCon keynote: "Today more millennials tune into YouTube on mobile alone during primetime than any cable or broadcast TV network." She also claimed that 40% of millennial subscribers say that YouTube creators "understand them better than their friends do".

Social power

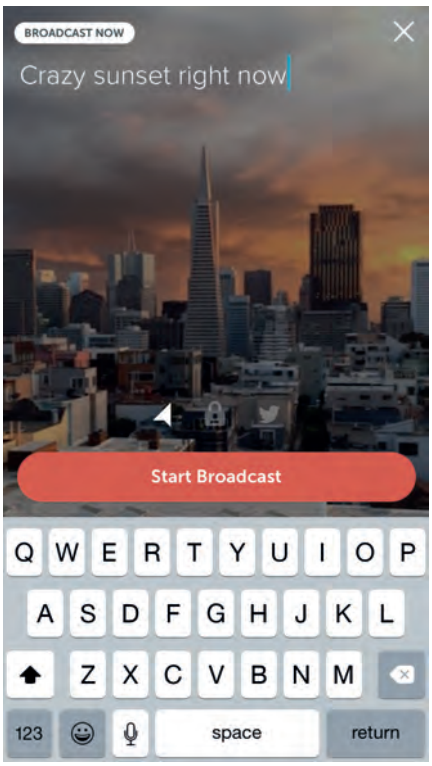
Jim Louderback is editorial director of the industry track at VidCon and is a veteran of the internet video space. Previously the editor in chief at *PC Magazine* and chief content officer at CSB Group, he joined web video firm Revision3 as CEO in 2007 and helped to build up the firm before selling to Discovery Communications in 2012.

"Live video itself on the internet is nothing new," says Louderback. "What is new is the platforms, the technologies and the networks are now good enough to make it easy. What's really interesting is the way that the social platforms have adopted live. The real innovation there, I think, is two things: one, is how easy it is; two, is the social back-channel that really works. You can both find viewers and then engage them in ways that you couldn't do before."

Like Facebook, Twitter is using its social power to throw its weight behind live streaming. Twitter launched Periscope, an app that lets users share and watch live video broadcasts from their mobile phones, in March 2015. After one year, Periscope claimed that more than 110 years of live video were being watched every day on its iOS and Android apps, and that some 200 million broadcasts had been created in total.

More recently Pericsope added three new features to its live video streaming service, designed to make it easier for users to discover and watch content: Highlights, a new feature that automatically generates a short trailer for every Periscope broadcast; the ability to embed Periscope videos anywhere on the web in embedded Tweets; and the addition of Autoplay Live Broadcasts for Android and iOS.

Twitter has also pushed aggressively to licence premium content for the service, tying up a deal in April with the NFL to deliver a live over-the-top stream of *Thursday Night Football* matches to a global audience for free. In July it also struck a deal with Sky Sports to broadcast real-time video clips of Premier League football to mobile devices in the UK and Ireland.



Twitter launched its mobile live streaming service, Periscope, in March 2015.

Ampere Analysis' Borer says that the Premier League highlights deal "makes a lot of sense" and will allow this content to reach a "whole new group of fans", presenting an alternative to the BBC's long-held Saturday night football highlights show, *Match of the Day*. "If you think about how people watch highlights, there's no need for that to all be done in a broadcast method all at the same time at 10.30pm on a Saturday night. It's actually completely consumable," says Border.

As live sports and premium content increasingly makes its way online, it seems clear that this is a response to technological advances and changing viewing habits – particularly among younger demographics. According to recent Gartner statistics, the smartphone market in the mature markets of western Europe, North America, Japan and parts of Asia-Pacific has now reached 90%. Meanwhile, UK broadcast regulator Ofcom noted in its *Public Service Broadcasting Annual Report 2016* that live TV now accounts for just 36% of daily viewing among those aged 16-24.

However, this shift is also a reflection of the tremendous spending power of today's tech giants, and their desire to take as much ownership as they can of the live and premium content space.

"The sports leagues are mercenaries," says Louderback. "They're going to go where the money is and they're going to go where the audience is because their business is engaging people in the best possible way with the most possible people. As more people are getting more and more of their video experiences online, they're going to want to be there."

While the traditional linear broadcast model still makes financial sense for reaching a large number of viewers – particularly for tent-pole events like live sports fixtures – the media landscape is changing at a rapid pace. With TV audience figures in decline and the power of the social web stronger than ever, live broadcasting has well and truly gone online, and this is just the beginning.

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MULTI-SCREEN & OTT 2

360°, VR & UHD TV

A rounded view

The current buzz around 360° video and virtual reality belies the fact that these formats still only account for a tiny proportion of overall video traffic. Whether they become mainstream depends on a wide variety of factors – but OTT distribution will be a key part of the puzzle. Stuart Thomson reports.

Virtual reality and 360° video are in their infancy as formats. Broadcasters and content providers have experimented with 360° video services that can be viewed via dedicated headsets or smartphones and tablets, but challenges remain around the production, delivery and commercialisation of services.

Bandwidth battle

The developments of these new formats is bound up closely with OTT delivery, and the distribution challenges remain a key element that could hold back the development of services. One of the key challenges facing any new high-bandwidth format is how to manage the cost of delivering it.

"The protocols and formats required for UHD, 360° and VR are similar to a standard OTT video or streaming service, from a basic technology perspective. The big difference with these UHD, 360° and VR categories is that the size and quality of the video is far higher, so you're dealing with much larger files and higher bit rates," says Jon Alexander, senior director, product management at CDN provider Level 3. Alexander says that the file sizes of around 50-60GB typical of these formats "can still present issues for CDNs". However, the growth in files sizes and the need for delivery networks to support these has been progressive, with 360° content following on from UHD, which in turn follows on from HD and from standard-definition video.

He identifies "three pillars" that are necessary to support UHD, 360° video and virtual reality – adequate last-mile broadband infrastructure, sufficient content to provide an incentive to invest, and a compelling user experience or packaging of the content.

Alexander says that "the majority of the population in the US, where we have pretty good broadband infrastructure, couldn't access a true UHD stream" currently. "That's the first problem – the physical infrastructure isn't there," he says.

While production tools are becoming available at a reasonable cost, the packaging of the content – and identification of ways to make money from it – is lacking, he says. "The challenge that service providers have in this space, is user expectations keep increasing. People want the newest and best format, highest quality – but it's not necessarily something one can drive

Viaccess-Orca has beein involved in 360° video trials with TF1.

incremental revenue from," says Alexander, adding that CDNs like Level 3 "can help" by enabling "better scalability and economics for supporting content delivery as the volumes of content increase".

However, says Alexander, Quality of Experience of 360° video is currently lacking, with content providers hemmed in by a lack of agreement on standards. "A number of start-up companies globally are currently experimenting, but we don't have locked-in standards and general agreement across the industry of what the best practices for delivering 360° video are," he says, meaning that the risk in launching something is greater.

The bandwidth issue compounds the problem, with consumer broadband connections struggling to sustain the throughput required for a smooth 360° video experience.

Currently, 360° degree video is a minority-interest field, and Ian Munford, senior regional marketing manager, media, EMEA at CDN provider Akamai says that OTT video providers will ultimately face the cost-related challenges of delivering both UHD services and ultimately 360° video to large-scale audiences.

The bandwidth hurdle is particularly important because much of the buzz around both UHD content and particularly 360° video is centred on live events – particularly sports.

"We are still at the fledgling start of what we think will be an exciting and immersive trend," says Munford. "Both of those formats come with unique challenges – not least the bit-rate we need to delivery superb better-than-TV quality UHD, and then also 360° immersive experiences."

Munford says there is still a question of how to deliver live OTT 360° video to large audiences. He adds that the quality of the viewing experience is still questionable in some instances, with services marketed as '4K' often falling short of the experience that marque is supposed to guarantee.

To some extent the Quality of Experience issue is simply a function of bandwidth. Akamai has itself sought to identify what proportion of the population of any given market is capable of receiving a piece of 4K content over the web. At the end of last year it estimated that about one in six global IP addresses were '4K-ready', with seven European countries appearing in the global top 10 for adoption of 25Mbps internet and above.

Munford said that the backbone of the internet is a bigger bottleneck than the last mile, where subscribers now typically have access to relatively high bandwidth in most developed countries.

"In certain countries, we measure that it is possible to deliver 4K video to a large percentage of the population at any given time, but it is not a TV-like experience. You can't run a sustainable 4K experience for viewers," he says, pointing out that adaptive bit-rate streaming, a necessary technology for 4K services, means that the actual viewing experience occasionally falls short of what it might be.

Munford says that there are a number of technologies that could radically improve the 4K experience. Not least among these is the replacement of the standard internet technology Transmission Control Protocol-Internet Protocol (TCP-IP) as the transmission protocol of choice by User Diagram Protocol (UDP) or a hybrid between UDP and TCP. Abandoning the use of TCP-IP would "remove inefficiencies" and improve the delivery of packets by reducing latency, says Munford. "We are moving beyond [TCP-IP] to use UDP or hybrid UDP-TCP as a delivery protocol that allows us to dramatically improve the latency of video packets," he says. "We can deliver higher bit-rates at a more sustainable level in a wider range of circumstances."

The use of UDP removes the error correction functions of TCP-IP, simplifying delivery. Akamai is using a proprietary player-based technology to recover lost packets that Munford says allows it to deliver 4K live content over the web. "The same is almost true for 360° video, albeit this is more of a challenge in terms of the transcoding and encoding of the content," he says.

The population of devices that include Akamai's player current numbers is about 30 to 40 million, according to Munford. The company is disseminating its technology directly through manufacturers of routers and gateways via partnerships with chipset providers, and indirectly, which requires customers committing to integrating the Akamai technology into their own video players. In the case of 360° video, this also means working with content producers directly.

Akamai's approach builds on its acquisition of Octoshape last year, which had developed a similar technology. Munford says the company plans to launch a range of "accelerated delivery" propositions over the next nine to 12 months, kicking off with ingest. "To get good high-quality content on to a nice 4K TV you need to get the ingest right," he says.

Other technologies that can help deliver high-bandwidth live content include peer-assisted delivery and the implementation of multicast technologies by telcos.

While 360° video is more challenging than 4K, Munford says that Akamai is "seeing some stunningly good initiatives". He says the company is working with a broadcaster in Europe that is using a linear channel to promote 360° video.

There have also been a number of initiatives around the Euro 2016 football tournament and companies including Red Bull are producing compelling 360° content. News is one genre identified by Munford where the format has a strong potential use,

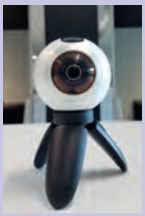
while e-sports is an obvious area where 360° experiences would be compelling for users.

Munford thinks the "jury is still out" on a wider use of the format in video entertainment. However, he strongly believes that there is potential for it to be used to create compelling second-screen experiences around major sports events, as well as other live events. The typical scenario here would be for viewers of a sports event – say – on the main TV to turn to their handheld devices for enhanced 360° supplementary content to enable them to immerse themselves more fully in the experience. Nevertheless, he says, challenges remain to be overcome.

"With live sports there is potential for 360° degree content to enhance the experience, but there are questions around that experience and whether the glasses and headsets work, and whether 360° video offers enough value to be commercially viable," he says.

The bigger picture: Euronews goes 360°

Pan-European news channel Euronews has been one of the first news broadcasters to pitch itself wholeheartedly into the world of 360° video. The news provider recently secured funding from Google as one of the projects supported by internet giant's Google Digital News Initiative Innovation Fund.



The broadcaster kicked off its move into the format in June, organising training sessions and investing in – relatively low-cost, transportable – Samsung Gear 360 cameras.

According to Thomas Seymat, a freelance journalist with Euronews who worked on the project, the Samsung cameras have the advantage of being easier to use on the ground and in post-production than more sophisticated devices, with a trade-off in terms of quality.

The company launched a 360° version of its *No Comment* strand of reportage, with a playlist on YouTube. The Google funding is to support the creation of two videos each week – one *No Comment* piece and one with a voiceover commentary.

Following its *No Comment* start, says Seymat, Euronews is now "looking into filming stories we can develop with more complexity and length and in all languages". He says that the broadcaster will film videos with commentary, including longer reports, during the autumn.

Seymat says Euronews is also looking at ways in which some revenue might be secured against 360° video, such as virtual reality advertising and sponsored segments – as well as the potential sale of footage to third parties.

In addition to the technical challenges – mitigated somewhat by the use of the Samsung cameras, which allow fast turnaround of footage – Seymat says that there is a challenge in getting subjects to cooperate with the unfamiliar format. "We are also trying to figure out how 360° video changes things," he says. "We want to represent all opinions and 360° video fits in with this," he says.

For Seymat, the format broadens the viewer's perspective by showing what is happening outside the main focus of traditional journalistic coverage of an event – it provides greater space for multiple perspectives, and shows that there is more to one side to any story. "You get the whole picture," he says.

Seymat says that the best events for 360° video are – obviously enough – those where "a lot is happening" such as the Pamplona Bull Run. While viewers are granted the freedom to roam around a scene, journalists do 'editorialise' the content by, for example, deciding the height at which the camera is placed.

"The whole grammar of video journalism has to be reinvented. A lot of people are working on that and we want to be part of that discussion," he says.

The second screen

The idea that 360° video will essentially be a second-screen experience that complements whatever is happening on the main screen in the home is taken up by Chris Wagner, executive vice-president and online video provider Neulion.

Wagner says that Neulion is working on 360° video for the Ultimate Fighting Championship 200 event, with the aim of presenting "a second-screen experience as if you are sitting in the arena".

The company is testing a Nokia Ozo camera with eight lenses connected to an encoder in a set-up that will be demonstrated at IBC. Wagner says the content is targeted at tablets, meaning it will be encoded at 5Mbps. He says there is scope for 360° video to become a "natural second-screen opportunity" complementary to 4K streams delivered to the main TV screen. "The two go hand in glove," he says. "The first use case for 360° video will be to the second-screen mobile or tablet."

According to Wagner, adaptive bit-rate streaming is key to ensuring a 360° experience – or, for that matter, a live 4K experience – in decent quality, by avoiding buffering and freezing of the content. Neulion uses MPEG DASH, which Wagner says is a better protocol for live streaming that HLS. Content is encoded in HEVC. Neulion's player provides diagnostic information that is fed back to operations centres providing statistics around average bit-rates delivered, buffering times and dropped frames. The live content is switched between multiple CDNs in real time.

For 360° video, says Wagner, there is an additional layer of complexity in the shape of the need to stitch the content together from the various camera lenses on the fly. Neulion is testing stitching on the fly with Nokia.

While 360° video is something for the future, Neulion already has considerable experience in delivering live 4K video over the top, having recently worked with UFC 200 and Sony to deliver coverage of the combat sports event to Sony smart TVs. Wagner says

Q&A: Chris Wagner, NeuLion

Chris Wagner, Executive Vice-President, Neulion talks about live-streaming, 4K OTT and virtual reality.

What are Neulion's priorities in the European market and what do you see as the opportunity for the company following the acquisition of Saffron Digital?

NeuLion is expanding in Europe. The acquisition of Saffron Digital gives us a strong European presence and our London office will become our international centre for expanding our business outside of the United States. Our portfolio of clients is also growing in Europe. We are working with both sports and entertainment content owners and rights holders that include EFL Digital (English Football League), BT, Carrefour, the EuroLeague, and Eleven Sports Networks. Through our partners our connections with European consumers are also continuing to grow as the NFL, NBA and UFC expand their NeuLion-powered services throughout the continent. The NeuLion Digital Platform is already well positioned in Europe as a leading OTT and TV Everywhere platform and now we are right next door, operating out of London.

What are the main challenges posed by adding live streaming to OTT services and how can these be overcome?

When you live stream sports there is no margin for error. If you miss streaming the goal, touchdown, or great play, and the fans miss that play due to a streaming error, they are not happy. It is therefore critical as an OTT service provider to control the entire end-to-end delivery of live and on-demand content; from ingestion and management of the content to delivery over multiple CDNs, and the design and development of the consumer app. Just like a conductor leading an orchestra, the OTT service provider needs to direct all of the technology components to ensure a great experience for the viewer. This reduces the complexity of projects and eliminates the finger pointing often found in multi-vendor OTT implementations.

How do you see enhanced video quality like 4K streaming attracting subscribers and what are those business models?

Consumer research is clear - video quality is key to driving activation, engagement and renewals of OTT services. 4K is the next big step in video quality and with four times the quality of HD, viewers will feel like they are actually in the arena or the concert hall. The internet is the perfect platform for 4K video delivery which will be delivered over IP or OTT and not on operators' set-top boxes. Fans interested in paying more for high quality video will get the opportunity to watch live 4K events through pay-per-view services or digital tickets. UFC (Ultimate Fighting Championship), which is one of our customers, was the first to offer fans a 4K digital ticket for the live fights. We work with them to deliver the fights live in 4K at 60 frames per second. At NeuLion we have the technology for the entire 4K ecosystem. The NeuLion Digital Platform can stream 4K content at 60 frames per second and our NeuLion CE SDK - which has been licensed to Sony, LG, Samsung and others on their line of Ultra HD televisions - ensures the quality of the experience.

How is NeuLion embracing new viewer experiences like 360° video and virtual reality?

Just when you think it can't get any better than 4K live content coming online, 360° video and virtual reality (VR) are shaking things up and will be the next step to enhancing the viewing experience for consumers. NeuLion will support live streaming of 360° video that can be surfaced on second screen devices like smartphones and tablets and also on leading VR headsets. NeuLion's encoders will work with leading camera providers like the Nokia Ozo. Nokia will integrate with the NeuLion Digital Platform for the live streaming of 360° video. All of this will be showcased on our stand [Hall 14, F.34] at this year's 2016 IBC conference in September in Amsterdam.

What is important for subscriber acquisition for new OTT services? How do you support content packaging, pricing, and offer management?

Content packaging, pricing and marketing offers are all important tools that often get overlooked when evaluating OTT providers. Packaging content into separately priced SKUs; setting prices based on local currency and market conditions; making free trial offers; and inviting friends and family to help promote your service are all important tactics to drive subscriber acquisition of any OTT service. It's essential that your OTT service provider can handle all of this. Our customers rely on the NeuLion Digital Platform's multiple service management features to effectively monetise their OTT content through advertising, subscription billings, per-per-view, electronic sell-through or a combination of all of these.

What tools are service providers and content rights holders looking for to maximise revenues from OTT services?

It's a combination of technology and principles. Service providers and rights-holders should be looking for an all in one platform to support all major business models required by the industry including dynamic ad integration, subscription services, AVOD and SVOD support, electronic sell-through capabilities and pay-per-view support; complete merchandising and content management services offering them flexible content packaging support, multi-tier pricing, multiple currency support, subscriber offer management features necessary for driving subscriber activation; and A/B testing to measure and analyse marketing offers. NeuLion has always coupled together a commitment to video quality, content packaging and merchandising with the viewer experience. When combined, these tools ultimately drive revenue for OTT providers.

NeuLion is expanding its team in Europe. ***Click here*** *to find out more or visit us at IBC stand 14.F34*

that the company delivered a 4K live stream at 18-20Mbps. Consumers could buy a ticket for the event and download a UFC 4K app from the Sony store to view the content on their TVs. Sony, which along with Samsung and LG licenses Neulion's player, performed a software update to its installed base in the US prior to the event. Previously, Neulion had also live streamed the El Clasico football fixture in Spain with Mediapro and events for BT from the O2 Arena in London and for US Hispanic broadcaster Univision from the Marlins Park stadium in Miami.

For the UFC event, Neulion provided a 4K live encoder in the T-Mobile Arena in Las Vegas, backhauled and transcoded the compressed content and delivered it via CDNs to the end customers. Users viewed 185 minutes of content from the event on average, with over 75% of streams delivered at the maximum available 18Mbps bit-rate. Viewing on the Sony 4K TVs that made the event available saw an uptake four times higher than TV portals that streamed the event in HD, according to Wagner.

Neulion is working on second-screen 360° video experiences for UFC 200.

TF1's live 360° streaming of the France-Russia football match during the Euro2016 tournament, described by Nochimowski as a "very interesting project" that involved the company validating the entire production and distribution process as well as providing analytics about how people watched the event. Viaccess-Orca has also been involved in other 360° projects including an experimental broadcast of basketball for Sky Italia.

"We are still at the fledgling start of what we think will be an exciting and immersive trend."

Ian Munford, Akamai

Making money

Alain Nochimowski, executive vice-president of innovation at Viaccess Orca, says that pay TV operators and broadcasters see an opportunity to make money from 360° content by charging consumers for it while network operators see an opportunity to make money from an application that is extremely bandwidth-hungry.

In terms of delivery, Nochimowski says that because the format is still at an early stage of development, the technology platforms that support the delivery of 360° video are very much best-of-breed efforts, offering companies such as Viaccess-Orca the opportunity to take on the role of integrator.

One trial in which the company has been closely involved is French broadcaster

Nochimowski identifies three key areas related to 360° video distribution that are challenging for Viaccess Orca. The first is to decide on a trade-off between image quality and bandwidth. HEVC encoding is employed to cut the amount of bandwidth required to the minimum possible, but it is necessary to optimise every aspect of the delivery chain given the current constraints of 360° production. Content is encoded in HEVC and makes use of adaptive bit-rate to deliver a consistently smooth experience.

Another key challenge is to provide meaningful analytics to enable broadcasters to further improve the production of content in the future. At IBC in September, Viaccess Orca will highlight its ability to deliver insight into audience behaviour via analytics, which he says is "a key element in paving the way to monetisation". The Quality of Experience is crucial, and this relates not only to the robustness of the devices uses in terms of their ability to render the content without pixellisation but also to factors such as batter consumption and the amount of heat generated – factors which, says Nochimowski, could "make or break the format".

The third area that Nochimowski is focusing is the need to protect high-value content. While revenue is not currently a priority for these services, "this will come", says Nochimowski, meaning that providers of 360° video will have to consider the requirements of securing what could become high-value content.

Nochimowski says that the projects in which Viaccess Orca is involved are aimed at mobile users and mobile screens via head-mounted displays such as Gear VR. "This is part of the challenge – mobile sets the bar high, but this is where we see a lot of traction," he says. The experience can include viewing content from multiple camera angles, with 2D content added to enable experiences such as "watching the game [on TV] in your virtual living room while switching views", says Nochimowski.

In addition to offering experiences that are compelling, there is a need to tailor the content to the nature of the material, he says. He cites the contrasting examples of basketball and football. In the case of the former, cameras placed near the pitch can enable viewers to follow the match closely. In football, on the other hand, it is necessary to maintain a distance.

The fact is that 360° video and virtual reality entertainment are still at a very early stage of development. Level 3's Alexander says that 360° and VR traffic on the company's network today is "probably a fraction of one per cent". There are numerous trials, but development remains stymied by a lack of content. Questions remain, says Alexander, over which platform – Oculus, Steam, Microsoft HoloLens – will predominate, as well as how people will actually use the content or experience available to them.

"We're very much dealing with early adopters and because the industry is changing so rapidly, things could look very different in six months," he says. "There are few technologies I've seen over the past 10 years that have generated as much interest and as much experimentation from the industry, and from that perspective it looks interesting for the longer term. However, there are still substantial restraints on this becoming a mainstream, widely used service." ●

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MULTI-SCREEN & OTT 3

Multiscreen delivery: the challenges

Getting up to speed

Challenges remain in delivering OTT services to multiple devices with decent levels of quality. Anna Tobin takes a look at three key areas – available bandwidth, content security and DRM, and the challenge of delivering a meaningful and consistent user experience.

Cisco expects video traffic online to grow dramatically.

High-resolution OTT video is fantastic, when it works. The trouble is, it doesn't always work; not to its optimal performance anyway. There are a number of reasons why disruption and dips in quality occur, and pinpointing where the problem lies is a challenge. The players involved in different aspects of the supply chain will often try to lay the blame elsewhere, sometimes legitimately. Ultimately, it is the end user who is left in a fix, with no idea where to turn for a solution.

Frequently, and to their surprise, the problem is inside the consumer's front door. The home network is often one of the key bottlenecks; and it's not always clear who is responsible for this weak spot, says Steve Christian, SVP, marketing at content security provider Verimatrix.

"Let's assume for the moment that you've got a great internet connection to the outside world. Your ability to see video streams inside the home is often a function of whether you are in a bedroom or the living room, or out in the garden; and your access to wired or wireless networks that will carry the bandwidth of video that is required. The main problem here is that it is ambiguous who is responsible for the set up and management of the home network," says Christian.

It may not be inadequate transmission technology, poor inbound speeds or capacity that is at fault. It is necessary to troubleshoot the different types of access needed in various parts of the home to make sure that the home network is operating at its best and that wireless coverage is adequate. While the content suppliers and broadband operators rightly don't want to take responsibility for this ,says Christian, "they are now frequently trying to include some diagnostic capability on the home gateway that will tell them that things aren't working as they should there."

Having this functionality helps the operators to explain to the consumer why the problem stems from within their home set-up. The idea is that consumers need to be educated so that they can accept some responsibility for their network problems and then take the necessary action to alleviate the congestion and facilitate retransmission within their four walls.

When difficulties arise before content reaches the home gateway or at the gateway itself, the consumer has a cause for complaint. In urban areas where there is competition and the customer is king, operators are more likely to take heed of complaints. Customers who are not happy with the speed and quality of their service they can switch supplier. This is incentive enough to keep operators pushing to be on top of their game.

Time for an upgrade

Increasingly, it is possible that the home gateway will be unable to cope with the amount of traffic it is having to funnel into the home. Solving this problem may require a massive product upgrade rollout. "Ultra high-definition content is being made available now and it's not always clear that today's internet infrastructure can handle that," warns Christian at Veritmatrix, "We've got on-demand content being paired up with live content; and live content is demanding in terms of bandwidth management, particularly with sport."

Added to all this will be the growing demands placed on the connected home. The phone calls in to customer service, and churn figures will likely grow unless action is taken to upgrade home gateways.

The pace of innovation in video and video quality formats, with the introduction of 4K and High Dynamic Range, and increased rates of frames-per-seconds, is increasingly likely to outpace the ability of service providers to handle it, agrees Gideon Gilboa, director of market management for Cisco's video portfolio. "According to our video networking index, by 2020, 80% of all traffic will be video, so we haven't reached a peak yet for bandwidth demand. And, in our view, video is going to move to IP. A lot of video is delivered over IP today. But broadcast is still more convenient and in some cases it's cheaper for delivery at scale, but that will change over time and, therefore, the bandwidth requirements will go up for it," he says. "There are a few things that we are doing to help our service provider customers in that regard. If you look, for example, at what Sky is doing in the UK [with the help of Cisco], it is deploying a media gateway type of environment with Sky Q where there is a set-top box that is capable of receiving high-bandwidth content through the satellite and through broadband and distributing with high quality of service throughout the home. This is maintained through a dedicated WiFi network for video in the home to make sure that it is capable of delivering the video to the different end devices."

Managing how content is streamed within the home is vital, agrees Sylvain Thevenot, managing director of Netgem Europe. "Broadband speeds have improved

significantly over the years. However it is not enough. OTT services are now consumed on multiple devices meaning that the new challenge is now not getting sufficient bandwidth to the home, but to guarantee that services inside the home work well. With the growing number of devices consumers are using to watch video services, from tablets to smartphones and TV, it is not easy to guarantee the best quality of services in a consistent way," he says. "Post Luxembourg, for example, has taken up a solution from Netgem that serves OTT video streams at different bitrates depending on the device. The tablet will be different to the phone and again for content delivered via the STB – with a consistent user interface, but optimised for each screen, and the best quality of streaming across each of those devices. This has been done deliberately to reduce complexities within the platform, and is much simpler to implement and run than an operator-owned, IPTV-based managed network."

The introduction of very high throughput technologies will also give a boost to bandwidth availability. "The technical basis of in-home distribution of high-bandwidth video is being solved, in many cases, with the introduction of high throughput 802.11ac 5GHz Wi-Fi being leveraged in addition to powerline, G.Hn and other wiring overlay methods," explains Andy Hooper, vice-president, cloud solutions EMEA at broadband technology provider Arris.

Hooper says that operators are looking at adaptive bit-rate (ABR) techniques to become the unifying IP-based mechanism for delivery and distribution of high-quality video. "The inherent resilience of the protocols make them well suited to this role, but not without challenges. Two in particular stand out – first, the inherent 'greediness' of clients in an ABR world, and the resulting network effects that this can cause at scale; and, second there is the challenge of the network capacity required in order to deliver that quantity and aggregate amount of unicast ABR traffic," says Hooper.

"On the first challenge, Arris is trialling network-side intelligence to provide an overlay decision capability to drive the available bitrates in an ABR environment. This will help avoid the 'oscillations' that we see in real-world ABR networks, where each client requests the maximum available bandwidth, which in turn leads to congestion and requests for lower quality and bandwidth 'chunks', oscillating back to higher bandwidth requests as conditions improve for all clients, etc. On the second challenge, Arris is trialling the introduction of multicast technologies for the distribution of popular concurrent streams of ABR content to achieve massive bandwidth savings. This technique is deemed to be critical for 'event' television, such as live sport, debates, news etc."

The industry expects to see a lot of advances in this area being demonstrated at IBC. "At IBC, Cisco will be showing ABR multicast that optimises the delivery of OTT adaptive bitrate content to multiple viewers in live events," says Gilboa at Cisco. "We are also working on making video a lot more network aware. So, for example, with the emergence of 5G wireless networks we will be looking at how we can integrate the video delivery with the mobile network, in order to increase the quality of the service by understanding what bandwidth is available, what subscribers are currently connecting to, and working out what to prioritise."

"Most service providers need to focus on the 20% of platforms that will deliver 80% of the consumption."

Andy Hooper, Arris

Checks and balances

When anytime, anywhere OTT services launched, consumers were willing to accept that the quality would not be on par with what they had come to expect from their TVs. The buffering, the restarts, the poor resolution and the complete outages, were all seen as acceptable teething problems. Now, however, consumers expect streaming services to be of the same high standard as broadcast video.

"Quality of service is increasingly important for OTT. While IPTV used to be the best default for managed networks, OTT is now becoming mainstream," says Thevenot at Netgem Europe. "Netflix, for example, now has four million subscriptions in the UK – with its content consumed across a variety of fixed and mobile networks. As a result, the issue of QoS is becoming as important to OTT providers as when operators launched IPTV services. However, as OTT requires multiple parties to deliver it, it requires the entire ecosystem to buy into measuring quality of service."

To ensure the highest standard of QoS, TV operators need to be forward thinking, says Rodrigo Fernandes, product director, multiscreen services at content security technology provider Irdeto. "They need to be proactive in terms of supporting the latest versions, especially when it comes to mobile devices, Many of our customers are now requesting a lot of metrics from the players and from the applications so that they can monitor the QoS and the devices that users experience individually. They then aggregate this to give an insight into QoS and user experience. This information is being used to improve their entire content pipeline from the encoding, to the packaging, to the video player application."

Most of the major content providers carry content from a wide range of sources and will seek to have the rights for live, catch-up, download and on-demand across all devices. Consequently, keeping secure control over rights is an added complication when delivering to multiple screens. "When it comes to 4K, I think it's only going to get harder to secure rights for multiple screens," says Fernandes at Irdeto. "Security also must not interfere with the end users' experience. A lot of operators are focusing on QoE. The users should not have to know what the security is."

In this world of multiple devices operators also have to deal with the fact that all these devices have different encryption formats and different protocols and the fact that the landscape of DRM is very fragmented, says Gilboa at Cisco. "What our customers are telling us is that they want to be able to touch all of these devices with the high

Magine

Q&A: Rahul Puri, Magine

Magine chief technology officer Rahul Puri talks about new market opportunities, the importance of Quality of Experience and how to make money from OTT TV.

What are the key underserved market opportunities in OTT TV and what challenges do content providers face in addressing these?

The internet creates new opportunities and challenges. Opportunities lie in accessing new markets and audiences globally. You need to be excellent in micro-targeting, branding and online promotion, or find distributors that can promote you locally or in different interest communities. Additionally, there needs to be flexibility in monetisation strategies as one target group in a region may prefer to pay for content differently from another group. The use of analytics is key to success. OTT can facilitate the acquisition of data in near real time that allows marketers and content owners to generate the most value from existing and new customer bases.

Magine's global distribution network and commercial OTT experience are the key pillars of our managed streaming services for content providers that want to go direct to consumer and aggregators who want a secure and reliable platform for anywhere in the world. Our view is that great content coupled with deep analytics in a global framework helps bring new opportunities that would otherwise go unnoticed in the traditional media value chain. This has been validated by both Magine's direct to consumer offerings in Germany and Sweden as well as in our partner network that looks to monetise globally.

How significant a barrier to achieving sufficient reach is the bandwidth challenge of delivering live and on-demand OTT video at consistent high-quality?

It is of course crucial. Magine started with the distribution of live and linear channels via OTT so bandwidth optimisation is part of our DNA. No OTT service is better than its weakest link and for example, DSL households will of course have less possibility to have an acceptable multi screen environment.

Increasing deployment of fixed fibre networks and Mobile 4G is needed to meet the new demand from consumers.

The highest barriers exist in emerging markets (APAC, LATAM, Africa) due to lack of infrastructure and more importantly the costs of data. However, these parts of the world are on the cutting edge of mobile networks and usage and this creates new opportunities for OTT in these regions. Magine works with partners, local governments and ISPs to mitigate these issues to ensure that consumers have the best experience at the right price points.

What do OTT providers need to put in place to ensure that they maximise the bandwidth available?

No OTT service is better than its weakest link. Magine has focused on creating a reliable end-to-end service from signal ingestion to the home across many different consumer devices. We work very closely with ISPs, cloud providers, and other suppliers to ensure that bandwidth is available from the point we ingest content to the distribution to the home. For example, we are placing our own edge nodes in key telecommunications networks based on our customer behaviour to ensure that there is enough bandwidth at a lower cost.

How important is consistent Quality of Experience and what do OTT operators need to do to ensure that it is achieved?

Consistent QoE is critical to success. People are used to the traditional means of consumption – in cable, satellite and terrestrial distribution. OTT needs to strive for the same quality. Magine consistently optimises picture quality delivery to ensure customers are happy with their experience. In addition, to have a stable and reliable back-end platform that can handle the right number of concurrent viewers, the operator needs to add a set of features that can secure a great quality of experience including adaptive bitrates, advanced filtering and algorithms determining local client performance in real time to optimise both back-end and client performance.

What are the most relevant opportunities to make money from OTT and what do operators need to do to maximise the available revenues?

There is no single way to monetise content via OTT. Key here is providing an integrated experience to create upsell and new opportunities for monetisation. However, this is not enough. Global distribution with deep analytics creates new opportunities that would otherwise go unnoticed. New markets and segments continue to emerge and micro-targeting them will be the name of the game in the future.

What is Magine putting in place to broaden the OTT opportunity and what are the minimum requirements for content rights holders?

Market development is fast. Magine provides faster launch and implementation by offering TV Superhighway end-to-end solutions to reach new audiences. Direct to consumer offerings, in combination with offering distribution via aggregating distribution partners, creates flexible monetisation models without sacrificing the traditional model. In fact, we have incorporated the traditional model, albeit through a facilitation and bet that OTT will be the future model of consumption. It needs to be very simple for content owners so they have time to create amazing experiences. Self-service monetisation, access to analytics, and global distribution are key tenets of what Magine provides to simplify the work of the content industry.

Magine will be at IBC on Stand 14.E10. ***Click here*** *for more information.*

Rovi is tackling the challenge of providing content discovery tools for OTT.

quality content that they have to protect the rights for, and they want to do it also with the highest level of functionality. For example, Sky wants to allow you to download high-quality content from your PVR at home to your tablet for offline viewing, which is a very valuable service for them as part of their Sky Q offering; and we're using our Videoguard Everywhere multi DRM solution in order to allow that."

There is often a different approach to DRM in different territories and from different companies, says Thevenot at Netgem Europe. "Germany is an exception to the rule, having adopted HbbTV, which allows simpler integration of catch-up services. Delivering to a mobile device, however, particularly outside the home, requires negotiation on a case-by-case basis. While Germany does have an association that can offer bulk rights for the key channels, it remains very difficult to implement the same content across multiple screens between 'in home' and 'out-of-home', due to restrictions that broadcasters are artificially imposing on network operators," he says.

"Typically at the moment optimising delivery from an OTT provider through to the end user requires an operator in the middle and technology services, such as those provided by Netgem, through which to run it. This requires bilateral agreements between the OTT provider and the operator. In most cases, with public service broadcasters, it is in the public interest to create caching mechanisms. EE for example has implemented direct viewing capabilities, creating a direct link between the BBC and EE, meaning both entities reduce their network transit costs. While it is pragmatic, it isn't a standard practice. France Télévisions has an equivalent to BBC iPlayer and is trying to ensure content is available through Pluzz TV on as many platforms as possible, though it always proves difficult when incorporating programming from private broadcasters."

"Across all their screens, consumers are inundated with content choices from broadcast, on demand, and OTT."

Michael Hawkey, Rovi

Content discovery

With all the content secured you then need to help people to find it. Without adequate recommendation tools, even the best content will disappear from view.

"From [our] perspective, the biggest challenges that we see our customers trying to solve with regard to multiscreen delivery are: ensuring that the discovery experience is highly personalised; that it is universal and connected across all services and devices; and, that it can cut through the clutter to connect them to the content they are looking for as simply and quickly as possible," says Michael Hawkey, senior vice president and general manager, discovery at content discovery specialist Rovi.

"Across all their screens, consumers are inundated with content choices from broadcast, on demand, and OTT. Having to search through multiple apps for a piece of content is beyond frustrating, while at the same time, managing competing, siloed, and often mediocre recommendations isn't helpful either. An advanced multi-screen discovery experience needs to be more than consistent across screens. It needs to serve as the hub of the consumers' video entertainment experience, providing personalised and intelligent recommendations, regardless of device, service, or location. This type of platform will offer consumers a slick and intuitive content discovery service across the growing range of devices used to consume content."

The key to making your content standout is to concentrate on the larger distribution platforms adds Hooper at Arris. "Most service providers need to focus on the 20% of platforms that will deliver 80% of the consumption. Only the largest can claim significantly more ubiquitous coverage. Even then, differences between platforms will drive differing experiences on different devices."

Voice operated search is also expected to take precedence in the future, while search parameters will change, so that instead of simply searching for a particular genre of content or specific programme or series, it will be possible to search for all the work carried out by a particular actor, for example.

With clever and managed use of available bandwidth this is all possible without impacting on QoE or QoS. Enabling this possibility, however, requires a lot of component parts working in sync, which, in practice, is currently not always guaranteed. But progress is being made. ●

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The rise of online sports

This sporting life

In the OTT streaming world, all screens are born equal and delivering live and near-live sports anywhere is fast becoming the norm, despite nagging issues of latency, writes Adrian Pennington.

The broadcast of live premium sports is the rock on which pay TV service providers have historically built their business. Until recently, it was seen as the last bastion of content keeping OTT TV at bay.

However, the unrivalled feeling of a shared 'history in the making' experience has seen the value of media rights skyrocket. For example, the collective value of TV rights for the FIFA World Cups in 2018 and 2022 is more than US$2.5 billion (€2.2 billion) while rights to Premier League soccer from 2016–19, soared

Net Insight has been working on a way to synchronise live feeds with frame accuracy.

to US$7.8 billion, a rise of 70% over the last bundle.

To maximise their investment, rightsholders and sports franchises are highly conscious of retaining millennials, the demographic that prefers anytime, on-any-device access to sports content that may not necessarily be part of a big and expansive pay TV package.

NBCUniversal, for example, paid the International Olympics Committee US$7.75 billion to air a decade of Olympic Games coverage from 2022-2032 and has already shifted the entire 4,500 hours of coverage from Rio online at NBCOlympics.com and via the NBC Sports app – and also to connected TV platforms, including Amazon Fire, Apple TV, Chromecast, Roku, and Win10 – offering a free 30 minutes-a-day pass to entice viewers to subscribe for more.

In fact, sports arguably lends itself to OTT more than any other content genre. One obvious reason is that traditional linear TV finds it hard to cover big events comprehensively. At Rio, some 28 World Championships took place over 18 days. Although an extreme example, event concurrency within competitions lends itself to OTT since linear TV is not designed to scale for such short-term peaks.

"CDNs really only help mask the shortcomings of using unicast connections for what would be far more effectively delivered using multicast/broadcast."

Kurt Michel, Ineoquest

A second reason is that broadcast production creates far more content than is delivered to audiences through traditional channels. "Making available unseen content, for example multiple angles of key events, and visualising live data, provides a true immersive experience for audiences," suggests Deltatre business development manager Pete Burns. Deltatre delivers digital media services for sports organisations like the IOC and UEFA and apps for BT Sport and ATP Media. "With the growth of AR and VR, I can only see this area growing."

A third reason for OTT TV's superior live sports capability is that fans can view sports on a growing number of devices, even during live events. With media streaming devices and connected TVs added to the growing list of smartphones and tablets in the market, global audiences expect to receive content on their devices at anytime.

"Having a platform that supports the introduction of new players in this market is crucial," says Burns.

Going direct

Instead of regional audiences, sports rights holders can potentially tap a global audience. In addition, observes Kurt Michel, senior director of marketing at quality assurance specialist IneoQuest, OTT offers owners the potential capability to have a direct relationship with their fans, and receive instant feedback on what audiences like and don't like through the ability of OTT platforms to deliver richer analytics than traditional broadcast provides. "They can better tap social media, since internet connectivity makes it simple to tie that into the viewing experience," says Michel.

Examples are multiplying: BT delivered live coverage of the UEFA Champions League football tournament on YouTube and will stream Champions League and UEFA Europa League games in the UK and Ireland for 2016-2018 seasons over a BT Sport app and via the BT Sport desktop player. Eurosport-owner Discovery created a Snapchat channel for the Olympics, with content supplied by BuzzFeed; Sky is streaming in-game clips of English Premier League football matches this season on Twitter.

Increasing average revenue per user from rights held is one of the KPIs used to measure the success or failure of any OTT solution. Deltatre observes that increasing ARPU would contribute to achieving a direct and bigger return on investment for the acquisition of sport TV rights.

While sports federations reap massive revenues from selling rights to broadcasters, they are not immune from the temptation to distribute content over their own subscription OTT services in tandem. Examples include the NBA, which provides fans with NBA League Pass to access live games and library content, and ATP Media, which is re-launching Tennis TV, its direct to consumer live streaming service from January.

Sports federations are also using the reach

Limelight uses a variety of techniques to deliver Quality of Service for video.

of social media to market their product. In turn, social platforms are reaching out to sports as key content to reach wider audiences and switch on new ways to earn money.

The most aggressive in this respect is Twitter, which has teamed with the US's four biggest pro-leagues to live-stream games. This includes a pact with MLB Media to stream live weekly games from Major League Baseball and the National Hockey League.

"Social giants are increasingly moving into premium sports because the audience and profile of these businesses rely on scale," says Ampere Analysis research director Richard Broughton. "Sports are mass market entertainment and capable of attracting large audiences with a high value to sponsors and advertisers."

There is another camp of online only sports aggregators. One to watch here is DAZN, an on-demand service launched this summer by Perform Group in German-speaking territories – Germany, Austria and Switzerland – plus Japan, and self-described as the Netflix of Sport. Its rights include 10 years' worth of Japan's J-League.

All this activity would suggest that the technical challenges of delivering live sport OTT have been mastered. This is not the case. The challenges are driven by scaling requirements, cost constraints and the diversity of viewing platforms. To scale at an affordable cost, content caching via CDNs is relied on but this introduces the problem of latency, not so much of a problem for binge-viewing drama, but an issue that is particularly sensitive for live sports events.

"For caching to be most effective, it must be implemented as close to the viewer as possible and in an increasingly mobile world, this requires a lot of cache nodes in multiple networks," says Steve Plunkett, chief technology officer, broadcast and media services, Ericsson. "The variety of viewing devices also increases the number of media formats required, increasing the number of files that must be stored and distributed to cache locations."

What passes for broadcast-quality today will change as market traction and content availability of UHD TV and High Dynamic Range (HDR) video come into play. "Broadcast quality is best defined as a perception by viewers, and is also a moving target," says Charlie Kraus, senior product marketing manager at CDN provider Limelight Networks. "A large part of the capability to deliver broadcast quality comes from CDNs and HTTP protocols carrying the traffic. CDNs integrate monitoring in their networks to measure bandwidth and latency, and the players in the viewing devices also beacon video quality metrics such as re-buffering rates. ABR transmission, such as HTTP HLS to mobile devices, ensures the best possible quality video for given network conditions at any point in time."

While image quality is considered on a par if not better than broadcast, buffering and latency have been far from solved – according to some. "There is still a major latency issue between OTT and broadcast for live delivery," says Matthew Huntington, chief technology officer at UK-based free-to-view satellite platform operator Freesat, which carried eight channels of live coverage of Rio Olympics via the BBC Red Button service. "The lowest latency that's been reported to date is 30 seconds, though often it can be more."

Reducing latency

Ericsson's Plunkett feels latency and buffering have been greatly reduced thanks to technological advances, "but the variability inherent in current unmanaged network access cannot be entirely eliminated."

A study by network performance analytics firm IneoQuest found that that sports buffering inflicted actual rage in viewers with two out of five consumers likely to wait 10 seconds or less for the video to resume – or leave the stream.

"For live events, CDNs really only help mask the shortcomings of using unicast connections for what would be far more effectively delivered using multicast/broadcast protocols," says IneoQuest's Michel. As viewers continue to shift to OTT viewing, he expects new technologies and protocols to displace standard HTTP delivery for huge live streaming events like the Olympics. "These new technologies will address the 30-60 second delay inherent in today's streaming platforms, and will dramatically reduce the load on the network backbone."

OTT video specialist Conviva's chief strategy officer, Keith Zubchevich, points out that pay TV operators supporting both OTT and satellite services – like Sky – are "running into issues of concurrency where you can be watching an event on TV but the goal happens with a second or more delay to your second screen."

At the same time, the TV and OTT live video might be undercut by the speed of text to a 'back channel' such as Twitter which might Tweet a goal ahead of the stream.

Despite CDN providers' best efforts, live-event OTT latency continues to be stubbornly persistent at 30 seconds or more. "This creates problems for people watching the OTT stream within earshot of people watching the broadcast feed. No one wants to

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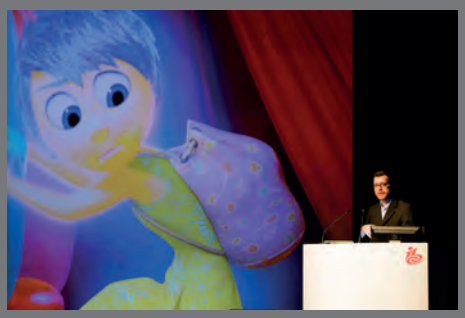

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Mind the lag: new solutions to the latency problem

Latency is one of the key problems facing delivery of live events – particularly time-sensitive sporting events – over un-managed networks. Technology company Net Insight has however been working on a way to synchronise live feeds with frame accuracy, whether delivered to a main TV or OTT to a second screen.

"This means that when the Formula 1 cars are lined up at the start and they all go into the first curve, I can view this moment on the big screen and see the exact moment the driver steers into the curve in sync on a second screen," explains Per Lindgren, co-founder and SVP, strategy and business development. "This makes for more of a 'game-like' experience, as if using an iPad as a virtual steering wheel."

Net Insight teamed with Tata Communications for a trial with F1 at the Singapore Grand Prix and has brought the tech to market, branded as Sye. Tata has integrated Sye into its video connectivity systems.

"OTT and CDN infrastructure is too focused on on-demand distribution not optimised for live," argues Lindren. "Yet the big money in television still emanates from live events like sports. When you want to swap between channels – or angles in a multi-cam OTT player – it can take anything from two to 20 seconds to start. This delay can add rise to minutes over the course of a live event. In a fast paced sport like F1 you want to change between driver-cams instantly."

Net Insight's software runs over Tata's Global Video Connect Network, spanning 44 data centres, converting it effectively into a virtual CDN and delivering synchronised content to all end points, so that from there video can be broadcast and streamed simultaneously.

Lindgren: OTT and CDN infrastructure is too focused on on-demand rather than live video.

"We're not trying to be real-time, but to harmonise with existing satellite distribution," says Lindgren. "The aim with satellite is to deliver within eight to 12 seconds and with the delay resulting from video contribution and other upstream processes being typically around five seconds, we still have three to seven seconds to play with for synchronisation."

Aside from eliminating the risk of social media spoilers, the technology means that applications such as being able to 'swipe' a viewing session from tablet to a TV might actually work. In other words the service provider can move a user to the satellite signal or IPTV multicast on the main set without jumping them forward in time from the delayed internet stream on a handheld tablet to the (almost real-time) broadcast.

An F1 directed race feed follows the leading cars 80% of the time with most action captured from the circuit not shown. Synchronised OTT could therefore be used to provide multiple perspectives and additional content.

Net Insight has taken this approach further, conducting 360° tests using Sye. It sees interesting applications for those in live sports coverage. For example, Lindgren suggests that the six to seven cameras on a virtual reality rig could complement or replace the current single camera on-board race cars. Instead users could switch between each of the individual angles from the VR rig they wanted to watch, or view a panoramic stitched 360° picture.

hear about a scoring event from the next door apartment before they see it themselves. What most people don't know is that this latency is an inherent limitation with current streaming technologies," says IneoQuest's Michel. "For example, if we use Apple's HLS streaming format and iOS players, a 20-30 second minimum delay is 'built-in'. This delay is necessary to deal with the fact that internet-based packet delivery is not smooth, and the delay is needed to avoid re-buffering stalls in the middle of playback. This is one of the clear differences between the purpose-built broadcast networks, and the internet."

Another issue is platform diversity. Zubchevich points out that different device types have different impacts on the streaming experience. "Different versions of Android, or delivery to devices like Roku or a Sky box all have different versions of software and players which create layers of complexity for issues to develop. There may be no issues in the network itself but that particular consumer's smart device that recently updated a player has a software problem. The ability to detect the issue when it occurs is critical," he says.

So how can you get a consistent view of service delivery over a combination of broadcast RF, IPTV and OTT? How do you handle the fact that part of the delivery infrastructure is outside a rightsholder's control, in the hands of an outsourced CDN?

From QoS to QoE

The industry has conventionally fallen back on Quality of Service metrics to ensure that services are operating in a way that keeps viewers tuned in, but this is changing. "The QoS concept needs to be broadened beyond its traditional definition of network-to-consumer premises equipment that multicast networks provide as opposed to OTT," says Sylvain Thevenot, managing director at Netgem Europe. "Indeed, QoS for OTT needs to be extended upstream to what we have referred to as CDN/caching edge servers in ISP networks, for example with QoS monitoring tools, as well as downstream in home such as optimised WiFi in gateways and set-top boxes."

According to Limelight Networks' Kraus, internet traffic has been treated as "best effort" and QoS has not been a priority. "With video growing to become the dominant type of traffic on the internet, it will not be acceptable to rely on best-effort delivery – dropped packets, re-transmission, latency and jitter will result in the poor quality video often experienced today, manifested in re-buffering, frozen images, and stuttering."

Defending Limelight's performance, he explains that some of the ways QoS is handled is by reserving bandwidth for video traffic, and monitoring network conditions to enable pre-emptive adjustments to the network before issues show up on audience screens. "Many CDNs use in-network bandwidth and latency monitoring, along with beaconing data from video players to get constant video quality data that is used by the Network Operations Centre

to make adjustments on the fly. This is why OTT on-demand and live video has such high quality today."

Ericsson's Plunkett believes QoS remains challenging to implement across multiple unmanaged networks and argues for a wider focus on Quality of Experience (QoE). "This takes into consideration a broader number of performance measures than network traffic optimisation alone," says Plunkett.

In order to deliver that, quality assurance specialist Ineoquest recommends monitoring all content before it enters the network and after it is formatted for OTT, then QoS at multiple points in the delivery networks, and finally measurement at the end-point. "Unless you can correlate all of those measurements by programme asset, from one end of the network to the other, the amount of data can be overwhelming, and not useful for real-time quality management," says IneoQuest's Michel. "We are focused on providing the right measurements in each location, along with that correlated end-to-end view."

Aside from data analytics tools delivered by CDN vendors and QoS specialists, the most important source of insight comes from the video player. TV technology provider Nagra says its MediaLive Player – as employed by Telefónica Spain's Yomvi service – uses existing video capabilities or supplements existing capabilities, to track an extensive set of performance and usage data points that help service providers quickly detect and solve delivery issues.

"Having control over the player layer is key to be able to transform data into actionable insight," says Simon Trudelle, senior product marketing manager at Kudelski-owned technology provider Nagra.

4K UHD TV

Live-streaming video becomes even more challenging in the case of high-bandwidth video such as 4K UHD. OTT providers were at the forefront of introducing 4K UHD, which does create a higher burden on all parts of the OTT delivery system. Not everyone has a 24Mbps connection at home and the OTT industry norm for streaming HD content remains 720p.

"For live events, 4K UHD OTT has not been proven," says Netgem's Thevenot. "We think most operators will prefer to use a fully managed network with QoS and QoE mechanisms to offer what will be mostly premium sports, initially paid for at a high price by consumers."

Ericsson's Plunkett agrees. "UHD increases the level of contention that often exists at the subscriber edge. We need to solve this using a combination of better, faster, networks and QoE optimisations," he says.

"The QoS concept needs to be broadened beyond its traditional definition of network-to-consumer premises equipment."

Sylvain Thevenot, Netgem

Essentially, 4K UHD doesn't change the game so much as it raises the viewer's expectations and the minimum network performance bar even higher. "The providers who can best meet those expectations by having the real-time intelligence tools they need to take the appropriate quality-maximising actions will succeed," says IneoQuest's Michel. "Those who 'fly blind' are unlikely to."

For all forms of video, in home, the availability of high-bandwidth WiFi routers has made the opportunity to reach devices a reality with a consequent significant increase in usage and traffic to smartphones amongst customers. Outside the home, however, the very nature of mobile networks, with bandwidth dynamically changing within a given cell, can create sudden variations in streaming quality that even adaptive bit-rate streaming struggles to solve.

In truth, the only answer is faster broadband networks, in particular 5G.

"At a certain point the existing 4G LTE technology will not be sustainable to cope with the massive growth in video data," says Volker Held, head of innovation marketing at Nokia "We need a new structure. This is the kernel of the 5G business case. Utilising it means we won't need to talk about bandwidth constraints for the foreseeable future."

The three main goals for 5G are sub one-milisecond latency, downlink speeds of over 1Gbps, and a 10 years lifespan for dormant Internet of Things devices, but there are lots of other, less high-profile goals including low-cost, high-efficiency networks that can deliver higher number of connections per area.

The development of 5G includes a large number of media specific enhancements that will make a very high quality viewing experience possible. These include the application of 4K to mobile broadcasting, mobile news reporting without satellite uplink, VR and AR – which need both high bandwidth and very low latency – greater use of the cloud for storage, on site 'live event experiences' and collaborative gaming.

"The difference in latency from 0.5 seconds to 0.001 seconds with 5G will have a positive impact on live OTT broadcasting but perhaps not as much as expected, as it will only improve one element of the chain," says Tony Maroulis, research manager, Ampere Analysis. "The data will still have to be captured, encoded, compressed, transferred, received, decompressed, and played back."

European operators and vendors including BT, Nokia, Hutchison, Telefónica, Orange, Vodafone and Deutsche Telekom have pledged to launch a 5G network in every country within the EU by 2020. This however is dependent, the operators argue, on freeing up what they see as EC restrictions on net neutrality.

Demonstrations of 5G are planned at the 2018 Winter Olympics in South Korea and the World Cup in Russia, where Huawei has shown interest. The first 5G standards are due to come online by 2019, with 2020 identified as the magic date for commercial deployments.

In the meantime, broadcasters and content rights holders still have to work out ways to make money from all this. Ampere's Maroulis suggests that broadcasters could mine a treasure trove of user data. "If broadcasters were able to maintain a data connection between the users' devices and their servers, it would give them better profiles of their viewers and how their engagement changes. Ad-funded broadcasters could offer entirely personalised targeted advertising," he says.

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