

DIGITAL



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Live streaming

MULTISCREEN & OTT PART 4



The meaning of live

OTT has been a mainstream technology for the delivery of on-demand content for a long time, but live streaming still presents challenges, especially in the case of mass-audience events such as the World Cup. Anna Tobin looks for solutions.

The 2018 FIFA football World Cup has long been cited by the tech industry as a major staging post in live streaming going global. In the first stage of Russia 2018, international media measurement provider Conviva reported that a record-breaking 7.7 million viewers had watched the Argentina versus Iceland match via an online streaming service. UK broadcaster the BBC revealed that the England versus Tunisia match was watched by

three million people via BBC iPlayer, a record for its streaming platform.

For the 20 games played during the first week of the competition, Conviva reported that there were 393 million successful streams. Just under a quarter, or 93 million, streamed plays were lost, however, due to streaming errors and/or slow start times. That's a lot of disappointed viewers. So what needs to be done to get the service pitch-perfect ready for the Qatar World Cup in four years time?

There is a two-part answer to this question, according to Brice Clinton, senior solution consultant at business support solutions provider CSG.

"The challenges in delivering large scale sporting events to OTT streaming models are both business and technology-driven," he says. "From a business perspective, sports broadcasting rights are extremely valuable and traditional providers are often reticent to give broadcast rights up and/or share them. From



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a technology perspective, the largest hurdle to overcome in providing live sports content over OTT, is latency – no one wants to hear the next-door neighbour going crazy over a goal two seconds before they see that goal.”

Latency is seen largely as a side effect of legacy HTTP technology, which was not designed for the live streaming of 4K HDTV or even traditional digital-quality broadcast. This shortcoming of HTTP technology is not one that’s easy to overcome.

“OTT streaming is built on top of HTTP technology,” explains Nivedita Nouvel, VP of marketing at video delivery solutions provider Broadpeak. “HTTP protocol has been designed to display web pages as fast as possible and to transfer files by bursts in a best-effort mode. It is not a real-time protocol designed purposely for handling video streaming constraints. Still, it was a smart move to leverage this technology to deliver video, even live video, in order to deploy unified and standard solutions. Its usage simply has to be adapted to cope with the main current drawbacks that prevent a smooth experience with massive live streaming: high latency, often higher than 30 seconds; and low scalability due to massive usage of unicast streaming.”

Users expectations

The problem is that users’ expectations have changed. Whereas 10 years ago watching video online was a marvel and a blurry, jittery postage-stamp-sized image was perfectly acceptable, now we expect the same high quality video experience with streaming as we do with HDTV broadcast services, despite the two running on completely different distribution methods.

“Broadcast services rely on satellite up and down links that deliver content to a completely isolated network, while streaming uses IP networks and ABR encoding, which may sometimes not adjust to the bandwidth available or the amount of detail in the picture immediately. This can result in loss of synchronicity between different users and devices,” explains Christopher Mueller, CTO and co-founder of video infrastructure solutions provider Bitmovin. “Bandwidth is another challenge for live streaming, especially for cross-regional scenarios, where the viewer experience can vary from excellent to poor simply because of the infrastructure each

subscriber has access to. Nowhere is this as prevalent as in APAC, which combines the world’s fastest speeds in South Korea and Japan with regular outages in places like Nepal or Cambodia.”

The internet, by design an open network, doesn’t allow for that end-to-end quality of service that has always been expected of cable, satellite and terrestrial broadcasters who have control over their entire path and that’s the biggest challenge for live streaming, says Mark Blair SVP, international at video platform provider Brightcove. “You can come up with all sorts of other challenges around whether the bandwidth between the stadium,

“It is not always the same CDN that is the most appropriate according to the region of the world where you are streaming and also according to the network operator of your subscriber,” says Nouvel. “They can deploy local caches in the operator’s networks where the traffic is concentrated or that face specific quality issues. Streaming from a point closer to end-users increases the quality of experience – fewer contention points, higher layers – and decreases the fees paid to CDN service providers. And they can always use player analytics to control the quality of the streaming.”

Today’s streaming solutions are perfect for on-demand viewing services and this is

“Whatever delivery optimisation is made by the CDN service provider, its benefits can become invisible if the network operator does not do his part.”

Nivedita Nouvel, Broadpeak



if it’s a live sports event, and the encoders is there; whether the bandwidth between the cable operator and the home is there, etc., but ultimately it is a problem that we can’t actually solve and so the focus has got to be on how to mitigate the design problem of the internet.”

It’s this lack of control over the entire delivery network that makes live streaming so vulnerable to disruption and poor quality of experience and service. “Content providers usually rely on a CDN service provider to convey their content in the network, and they pay heavy fees to the latter based on the volume of unicast or point-to-point traffic involved. But the content ultimately has to go through a network operator infrastructure that owns the link with the subscriber,” says Nouvel at Broadpeak. “Whatever delivery optimisation is made by the CDN service provider, its benefits can become invisible if the network operator does not do his part.”

Nivel explains that “although several actions can be taken by content providers to enhance the quality of their video delivery, they can control their origin server and not rely on the one provided by CDN service providers”.

Service providers can use multiple CDNs with a CDN selector tool and assess their quality in real-time to privilege the ones that are doing best.

what they are really designed for. Services that stream high-quality content on demand to download and then play later however further give rise to the expectation that live streaming content should be available in the same high quality.

When content is streamed live over these networks, the problems start and the content suffers, says Gustav Grundström, VP of live OTT at media solutions provider Net Insight.

“On-demand services, such as Netflix, have no relation to time. For live, however, time is critical and the experience is shared by all others viewing the same scheduled event. This was very evident during this year’s World Cup, which has become one of the first to be streamed by millions of people. Media have covered how games have been ruined when fans have heard others with better connections celebrating goals before they’ve seen them, due to issues with latency,” says Grundström.

Grundström says that while it is not possible to provide a perfect live experience using on-demand technology, Net Insight’s Syc platform, which is specifically designed to solve the syncing problems for live streaming, “provides fixed and faster than TV experience for all, with playback in frame-sync across devices, a TV-like experience”.

“To improve traditional streaming made



Q&A: Pablo Hesse, Teltoo

Pablo Hesse, CEO of Teltoo, talks about the rise of live-streaming and the challenges of delivering mass-audience events over the internet.

What major changes in consumption of TV do you believe will have the biggest impact on the business in the next couple of years?

We will see the biggest impact in live TV. Right now, it is the fastest growing market segment, and it's full of opportunities. Online TV started as a VOD format because it helped to break an old paradigm: TV schedules. The same way MP3 and playlists changed the way we listen to music, VOD and streaming changed the way we watched TV. It created a revolutionary way of consuming content. Today we see how people watch VOD content on the go as if it was normal, when five years ago that sounded crazy. Now that VOD is mature, the entire industry is moving to an online TV experience that includes live content.

Live content represents a bigger challenge than VOD, but also new opportunities. We can now enjoy live events that were hard to watch before, and that allows us to satisfy an increasing consumer base all over the world. Sporting events, music festivals, industry events, education... we can reproduce all those experiences live, everywhere – and that is why live TV will be the biggest revolution in the next few years.

To what extent do you see live TV switching from broadcast to streaming?

TV will become a complete streaming experience. We have already changed the way we consume content. The internet redefined the rules, and now we want content immediately, everywhere and on all devices. Live content is one of the most demanded video formats, and it will be integrated into this new TV experience.

So, rather than thinking if that will happen or not, as industry leaders, we need to think how we are going to complete the move quickly while giving consumers a wonderful experience. Technology and infrastructure are always running behind demand and trying to meet it. It's time to get ahead and control this demand through innovative and scalable ways to give people the content they deserve in the way they demand it.

What are the key challenges in delivering live-streamed coverage of mass-audience sports events?

If you look at the live video streaming process chain there are several factors to take care of: capturing, encoding/transcoding, encryption, breaking

down the files, caching, delivery – all in real-time. It's very challenging. But, preparing to meet mass audience levels is even more complex. Live streaming is relatively new, and there is still little data, so most companies over-provision their network, through multi-CDN strategies, to create enough capacity in case something unexpected happens. That strategy is not wrong, but shouldn't we be able to stream with the certainty that everything is going to work and scale when needed?

What needs to be done to overcome these challenges?

We must think differently. Go backwards and modify what has been used in the past. The internet was never designed to distribute video, so why not stop, take a moment to think, and try different ways of doing things? We have been using standard technologies for a long time, but isn't it time to move forward and embrace new ideas? It is challenging to innovate in an industry where millions of viewers expect the highest quality, but precisely because of that, we need to be ahead of the demand, instead of always trying to meet it.

Most of the companies we have the pleasure to talk with now have innovation teams tasked with creating a new way of thinking and doing things. A new way of defining what should be done. This is what we need in our industry to overcome these challenges.

What do you see as Teltoo's role in this environment and what are the key elements of your technology?

Teltoo is a new way of distributing content. It challenges the current way of thinking, and uses technologies that are completely reliable and, even better, completely scalable. Teltoo maximizes the current infrastructure that is in place, which means a benefit for all the stakeholders involved: consumers – better content; content owners – efficient delivery; and operators – network optimization.

The key element of Teltoo is how it complements the other technologies used in the video streaming chain, and how it enhances the whole viewer experience by reorganizing the way video is distributed. Teltoo provides full control, enormous flexibility, and will soon become an essential element in the video streaming toolbox.

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Live-streaming of live events is becoming more popular.

this capability with content providers, the latter could benefit from it as well,” she says.

Though live streaming is challenging, it can be delivered immediately and in high quality, providing every possible link in the delivery chain is covered, says Kristen Vise, product marketing manager at OTT technology solutions provider iStreamPlanet. “Service providers need high availability in every part of the workflow from feed acquisition to syncing multiple camera feeds to CDN and origin integration,” she explains. “A comprehensive encoding solution is also required for high-quality live streaming. Playlists are generated optimised for specific platforms to achieve the best possible playback based on device capability. Streaming delivery must be architected for maximum coverage and automatic scalability. And, coverage-wise, the CDN should span as large a footprint as possible to ensure the best experience. Simultaneously, the solution must scale with viewership.”

Being able to deal with sudden high peaks in viewership without losing quality is particularly crucial when streaming sports programming, when viewership can spike instantly if the game takes an exciting turn. To deliver high-quality video at scale service providers must continually monitor their networks for any degradation in quality and schedule regular load testing.

“Extensive monitoring is critical for maintaining a high-quality live streaming experience. This includes monitoring source quality, encoding, packaging, publishing, CDN performance and quality of fans’ experience on every platform in all regions. By monitoring every aspect of the workflow, from ingest to the fan’s screen, providers can proactively mitigate potential issues and quickly troubleshoot when issues arise,” says Vise.

Affordable streaming

With all these checks and balances required to deliver high-quality streaming, content providers and network operators are striving to simultaneously keep costs down and monetise at every possible opportunity.

There are a number of ways that live streaming can be made more affordable says

for on-demand, there is only one thing to do; lowering segment sizes of the streaming files in order to shorten latency. This creates a chain of problems though,” says Grundström. “First, more overhead, i.e. non-video data, which mean less quality per streamed video. The second problem is less reliable streaming. The only way to overcome this is get a better internet connection and for the CDNs to distribute the streaming servers further out in the network, in order to come closer to the end-users. Sye does not have these built in limitations and uses non-file based, non-

efficiency is critical as content quality goes up, [as with] 4K, but also increases the delivery bandwidth of content overall. Along with compression, technologies like Just in Time Packaging (JIT), where the packaging of video assets for the particular screen type is managed just-in-time, rather than being stored previously, also help increase that operational efficiency across devices,” he says. “HVEC and JIT help to reduce the dreaded buffering of content. Along with those technologies, more robust asset preparation technologies and processes, like ring buffers for catch up



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Brice Clinton, CSG

caching streaming, made for live, resistant to distance from the end-user.”

Improved compression

It’s necessary to leverage new compression technologies to improve the quality of experience and quality of service of live streaming says Clinton at CSG. “With new standards such as HEVC, the goal was to provide twice the compression efficiency of the previous standard, H.264/AVC. This

and start over, continue to improve the quality of content delivery in both live and VOD scenarios.”

Network operators that harness ABR technologies can further solve the scalability and latency issues, says Nouvel at Broadpeak.

“By bringing the OTT traffic into the managed multicast domain, it removes the need of an infrastructure that scales with the number of users and it creates the mandatory conditions to allow players to work properly with a limited buffer size, which is the key to reducing latency. If operators could monetise

Second-screen expectations

To add an extra layer of complexity to the live streaming business, many people watch a live stream on a second screen to enhance their first screen broadcast experience, but trying to synchronise those streaming experiences isn't easy.

"Ensuring total platform and device coverage is absolutely fundamental, and needs to be treated as a priority today," says Christopher Mueller, CTO and co-founder of Bitmovin. "Viewers using a smartphone or tablet should no longer be a minute or even two seconds behind the live broadcast signal when watching a live streamed sports event and definitely not face complete blackouts."

There's a lot of work that needs to be done around this, says Mark Blair SVP, international at Brightcove. "One of the big emerging technologies that is both exciting and necessary is around low-latency streaming technologies."

Gustav Grundström, VP of live OTT at Net Insight says that the answer to the second-screen live problem is his own platform Sye. "Second screen applications are important to get user engagement. Let the user become the

producer of extended content to the produced main feed. In order to fully leverage on a pure second screen experience it's critical to have all the feeds in sync and across platforms, this is what Sye does. Sye is faster than TV, but it can also be adjusted to align to a broadcast," he says.

Eradicate second-screen latency and you don't just improve viewer satisfaction you also unlock a whole new revenue stream from the interactive gaming and gambling industry says Blair at Brightcove. "You can't have gaming on the outcomes associated with live events if you can't deliver the streams for a couple of minutes. You need low latency to unlock the gaming side of live," he says. "There is more data than ever now that shows that the quality of the experience drives the engagement. If you're working on a paid model you particularly care about quality and engagement, because you don't want the churn to go up, which it will do if people are not getting value out of the experience. This is an even bigger problem with advertising-based experiences. If you lose engagement you lose the advertising revenue that goes with it."

service provider we are building out a platform and an infrastructure that will be able to leverage over many customers. Whereas if you're, for example, a niche sports provider building all of that redundancy out for yourself, that's economically challenging and in some cases not viable."

This is why some providers of live content will decide that it makes financial sense to subcontract the actual delivery of their services to an outside operator, although they will be seeking quality of service assurance.

When it comes to making money from OTT streaming, operators are considering a myriad of ways of enhancing their offerings, with a choice of camera angles and supplementary content, for example.

Offering feeds of different camera angles, player bios, stats and highlights are ways of personalising the fan experience and must be tightly integrated with the live streaming video solution, however, points out Vice at iStreamPlanet. "Standardising every aspect of the workflow from signal acquisition to encoding to publishing into the CDN and even monitoring allows for a more efficient and cost-effective solution. In addition to workflow standardisation, service providers should automate every part of our platform from ingest to encoding to CDN failover. Automation drives costs down by removing extra people and extra tooling from the equation. In turn, standardisation and automation also allow for scalability and with scale comes cost saving benefits."

With augmented reality and virtual reality now evolving for OTT streaming and more HDR and 4K content being readied for

Mueller at Bitmovin.

"First, through using a multi-codec approach to reduce bandwidth demands and CDN costs. By encoding your videos using a multi-codec approach you can double the quality while still reducing your bandwidth consumption and maintaining maximum device reach. Roughly 83% of the internet users in the US could be reached with H.265 or VP9; a live streaming provider targeting this market using these codecs will immediately reduce their CDN costs, while consuming less bandwidth for end users," he says. "Combining this with a player that works on all devices and platforms to reduce overheads of maintaining multiple players will also help. By adapting the bitrate to the specific content, such as per-scene adaption encoding, each stream can be optimised further to reduce CDN costs and make necessary improvements both affordable and economical."

Economies of scale will also naturally drive prices down, but as the live streaming industry is still in its infancy and investments still need to be made and software and hardware are

constantly evolving, costs are unlikely to fall any time soon.

"Whilst we all talk about how fast live-streaming is growing and how big it has become, if you compare it to traditional viewing it's nowhere near the same scale. As the scale [grows] we need to see the economies



"Streaming uses IP networks and ABR encoding, which may sometimes not adjust to the bandwidth available or the amount of detail in the picture immediately."

Christopher Mueller, Bitmovin

of scale factor in," says Blair at Brightcove. "The cost of delivering the products and services will get driven down as that happens, but that's going to take time to happen. One of the things that I think really plays to companies like Brightcove's strengths is we're already being able to capitalise on some of those economies of scale, because as a cloud

streaming, those looking to stream content have their work cut out getting it delivered in real time and in optimum quality.

Qatar 2022 will come around quickly. Whether those World Cup football matches will be streamed truly live to perfection is not yet a certainty. The game plans are already being worked on though. ●