



www.pipelinepub.com

Volume 20, Issue 3

Embracing the Edge: Redefining Content Delivery Standards

By: [Jonathan Candee](#)

In many markets, streaming media has overtaken traditional TV broadcasting in minutes consumed, with audiences embracing expanded choice and accessibility across various devices. However, one constant amidst this transition has been an unwavering desire for quality. Despite most streaming content being transmitted over the unpredictable terrain of the Internet – an unmanaged network fraught with potential issues – viewers still insist that online video perform with the flawless operation and visual clarity offered by broadcast television delivered via cable, satellite, and DTV providers.



In the ongoing evolution of streaming video quality, especially with the advent of UHD and 4K formats, network operators find themselves grappling with formidable challenges. The primary hurdle surrounds establishing scalable delivery architectures that eliminate buffering and ensure smooth, uninterrupted playback across an extensive range of connected smart devices and diverse home and mobile networks.

In this environment, where content is not merely consumed but highly valued, the onus falls heavily on content providers to invest in media delivery solutions that guarantee the best quality of experience (QoE) even during peaks in demand. Nowhere is this more noticeable than in live sports, where investment in sports rights for subscription OTT services is undergoing a staggering surge. According to a [Nielsen Study](#), 80 percent of all sports fans, 76 percent of NFL fans, and 89 percent of soccer fans regularly or sometimes watched sports on a streaming or online service during 2022.

Addressing the Issue of Internet Traffic

As the demand for additional content increases, coupled with the widespread adoption of 4K and other more immersive viewing experiences, resolving a problematic internet connection is becoming increasingly unpredictable and challenging for streaming platforms.

The primary concern stems from the end-to-end delivery of content over the Internet, which has historically relied on the uncoordinated efforts of various entities to ensure quality of service. This journey involves the broadcaster or origin, Content Delivery Networks (CDNs), peering and exchange

sites, and ultimately the last mile through internet service provider (ISP) networks to viewers. The last-mile segment is particularly susceptible to issues, as ISPs must plan for excess network capacity to handle unpredictable "peak of peak" demand. With a growing preference for watching sports content through over-the-top (OTT) services, the inevitable surge in traffic during a big game – especially an end-of-season championship – routinely results in new peak live streaming audiences and traffic records.

Use Case: Sports

Barring unusual atmospheric conditions, satellite-driven sports coverage remains consistently reliable. However, when encountering a "bad day" on the Internet, streaming services may face disruptions, resulting in a subpar QoE for viewers. Instances such as the recent Cricket World Cup final in India underscore the need for ISPs to optimise their networks to cope with the network strain, unpredictability, and inevitable internet traffic spikes during the game. [According to Disney/Hotstar](#), this year's final on November 19 reached a "concurrent viewers" peak of 59 million on the Disney+ Hotstar platform.

As an OTT rights holder, there's a real risk of paying billions of dollars to acquire or maintain content rights only to see consumer churn increase because of poor streaming QoE. Fans don't care who's at fault. They just want a broadcast-quality experience. It's such a significant issue – potentially affecting so many viewers – that in some European countries the regulators are now involved.

In response, most streamers are turning to the use of multiple CDNs, which, by some estimates, are involved in delivering 80 percent of all streaming video content over the internet. A multi-CDN strategy provides alternatives when delivery issues occur. Within the CDN category, the fastest growing service – and most promising development – is Open Edge Caching, which offers a flexible architecture better suited to address the traffic surge and latency challenges posed by high-profile live sporting events.

Deeply embedded in service provider networks, Open Caching edge nodes are placed closer to end-users than ever before, avoiding congestion encountered by traditional CDNs when passing content through peering and exchange points and the service provider core. Understandably, quality improves when the stream originates closer to the end user, bypassing network congestion.

Use Case: Gaming

The use of edge technology to improve the streaming experience is also extending beyond video. For the cloud-based gaming community, the quality of the experience is more than just graphics and game play. Gaming performance, including frame rate and the dreaded "lag" – a euphemism for latency experienced in games – is a crucial factor in the success or rapid demise of certain gaming franchises. Responsiveness is critical as games potentially have hundreds or thousands of players within the same virtual world and will become even more pronounced as the gaming landscape converges with concepts such as the Metaverse. But beyond game play challenges within cloud gaming services, concurrent downloading of a new game title or even a game update can be an issue. For example, suppose 50,000 gamers simultaneously initiate a download of a new 122GB game through a single ISP. In that case, it will undoubtedly result in a notable surge of traffic.

These surges can surpass the capacity limits of the ISP's peering infrastructure and strain the capacity of the ISP's core. While traditional CDNs may have successfully brought the content closer to its final destination, the bottleneck may still reside within the ISP – in other words, the last mile network – leading to slow game downloads and significant lag for all subscribers across the network.

Powering an Immersive Future

The evolving landscape of immersive content encompassing virtual reality (VR), augmented reality (AR), and 360-degree mixed reality experiences, holds immense potential for widespread adoption. Despite its burgeoning popularity in virtual education, meetings, and entertainment, the seamless flow of this content remains complex within a diverse ecosystem of creators and intermediaries. Engaging in industry dialogues around immersive experiences sheds light on the strategic utilisation of collaboration, standardised technologies, and rigorous testing to elevate the delivery of premium immersive content at scale. Although lacking a universally accepted industry definition, immersive content typically offers multi-dimensional, often interactive experiences, ranging from VR/AR gaming to ground-breaking narratives exemplified by productions such as Netflix's *Bandersnatch*.

Immersive content presents unique challenges owing to its bandwidth-intensive nature, necessitating higher throughput and lower latency compared to traditional video streaming. For instance, streaming 360-degree videos demands significantly more bandwidth – over 25Mbps for UHD 4K and 50Mbps+ for UHD 8K – while immersive gaming requires low latency to ensure uninterrupted experiences. This content extends beyond media and entertainment and finds applications in remote healthcare, manufacturing, and beyond.

The success in delivering immersive video at scale hinges on increased collaboration among partners spanning the creation and distribution chain. Initiatives such as Open Edge Caching specifications underscore the need for cooperation to drive innovation and establish industry standards, unlocking unprecedented content dimensions and propelling sustained technological advancements in the coming decade.

Open Caching: Embracing a Standards-based Approach

Looking to the future, most video streaming and some gaming use cases will benefit from edge-based caching technologies. At the heart of this change is Open Caching, a standardised approach originated and supported by the Streaming Video Technology Alliance (SVTA). This new architecture has gained significant traction and continues to redefine how content publishers reach and engage with their audiences.

The collaborative model brings together content publishers, game developers, network operators, and consumers, creating a mutually beneficial ecosystem that promotes high-quality content delivery at the network edge, deep within service provider networks. By pushing content caching and delivery closer to users than ever before, Open Caching tackles latency and the challenges posed by peak demand head-on, efficiently streaming live and on-demand video content, cloud gaming, and large software downloads to eager consumers.

With live and on-demand streaming services continuing to cannibalise traditional TV audiences, there is a likelihood that within the next two decades all content will be streamed over IP networks. For the industry to meet this demand, using the edge for content and application delivery will become a universal requirement.