Consumers have more options for watching online video than ever before, and higher expectations for quality viewing experiences. This paper explores the technical challenges OTT providers face in delivering live and on demand video globally and offers solutions for addressing them.
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NEW MARKET TRENDS MEAN NEW CHALLENGES FOR OTT SERVICES

Whether you are just beginning to investigate options for distributing your video content, or have been providing OTT services for a while, achieving your business objectives in this highly competitive and rapidly changing market is challenging. Consumers have ever more options for watching online video, and higher expectations for quality online experiences than ever before. To grow and retain a loyal audience, it’s essential to provide the best OTT experiences. To help you better understand and address the top challenges of viewers, here is what was identified in Limelight Network’s 2019 “State of Online Video” report:

1. **Strong Competition** – To feed their appetite for online video and content preferences, viewers are willing to subscribe to multiple OTT services. Globally 67% of viewers subscribe to one or more service.

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<th>Two</th>
<th>Three</th>
<th>Four</th>
<th>Five or more</th>
<th>Average number of SVOD services</th>
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<td>9.3%</td>
<td>3.2%</td>
<td>2.5%</td>
<td>1.2</td>
</tr>
</tbody>
</table>

*Figure 1*: How many pay online streaming video services (i.e., Netflix, Amazon Prime, etc.) do you currently subscribe to (by country)?

Younger viewers age 18-45 are especially likely to do so.

<table>
<thead>
<tr>
<th>Age</th>
<th>None</th>
<th>One</th>
<th>Two</th>
<th>Three</th>
<th>Four</th>
<th>Five or more</th>
<th>Average number of SVOD services</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-25</td>
<td>21.5%</td>
<td>28.8%</td>
<td>28.5%</td>
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<td>4.1%</td>
<td>4.3%</td>
<td>1.5</td>
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<td>26-35</td>
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<td>29.0%</td>
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<td>3.5%</td>
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<tr>
<td>36-45</td>
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<td>33.8%</td>
<td>25.9%</td>
<td>10.9%</td>
<td>5.8%</td>
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<td>Over 60</td>
<td>47.2%</td>
<td>34.8%</td>
<td>12.1%</td>
<td>3.4%</td>
<td>1.3%</td>
<td>1.3%</td>
<td>0.8</td>
</tr>
<tr>
<td>All Ages</td>
<td>29.6%</td>
<td>33.4%</td>
<td>22.0%</td>
<td>9.3%</td>
<td>3.2%</td>
<td>2.5%</td>
<td>1.2</td>
</tr>
</tbody>
</table>

*Figure 2*: How many pay online streaming video services (i.e., Netflix, Amazon Prime, etc.) do you currently subscribe to (by age)?
2. **Quality of Experience** – Increased competition means OTT providers must provide great content and the best viewing experiences in order to retain an audience. As viewership of online video increases, so do expectations for performance and quality. The data is clear: online viewers expect “broadcast quality” experiences and are increasingly less tolerant of rebuffering.

For OTT providers, the challenges are to ensure consistent high-quality global delivery, minimizing rebuffering, and effectively handling traffic spikes, especially for live online streaming.

3. **Growing Variety of Viewing Devices** – Online audiences expect to be able to watch online video on the devices of their choice. In addition to smart phones, computers and tablets, they also watch from streaming devices, smart TVs, set-top boxes and video game consoles.

![Figure 3: How many times will you let an online video rebuffer before you stop watching and abandon it?](image)

![Figure 4: How much of your online video viewing is on the following devices? (Scale 0-4)](image)
With a greater variety of devices comes the requirement to support multiple video formats for delivery, which means detecting the requesting device type and automatically formatting video correctly for each device type. And, of course, as noted earlier, the demand for a broadcast quality experience on every device, every time, is necessary to keep your audience engaged.

4. **Live Streaming Latency** – Online live streaming is a tantalizing growth area for OTT providers and viewers, but overcoming the delay from a TV broadcast remains a hurdle. For example, viewers age 26 – 60 would stream more sports online if it was not delayed from the broadcast. For OTT providers streaming live events, lower latency would open opportunities to interact with viewers.
Online live streaming on the congested internet often results in low quality video and rebuffering. To improve video quality, today’s HTTP-based video streaming protocols such as HLS and MPEG-DASH, segment video into chunks that are buffered before playback. While this improves video quality, it introduces latency that can be one minute or more. New streaming technologies are required to solve this challenge.

In addition to the issues highlighted by viewers themselves in our survey, there are two other critical challenges facing OTT providers:

- **Global Audience Reach and Scaling for Peak Traffic Spikes** – To maximize your audience size it’s important to have a video distribution strategy that enables consistent high-quality delivery to viewers anywhere. Along with large audience size, comes the possibility for popular video programs and live event action to drive rapid ramp up in viewers logging in to watch. Also essential is sufficient delivery network capacity to support the traffic load.

- **Protecting Video Content** – Whether you create your own original content, or license some or all the content you distribute, you will need to have protections against unauthorized uses in place by restricting access to subscribers, or other authorized viewers, without impacting viewing quality. Addressing content protection measures can be complex if you don’t have in-house expertise.

In the next section, requirements for addressing each challenge will be discussed, with solutions for each, and the business benefits they provide:

**DELIVERING THE HIGHEST VIDEO QUALITY EXPERIENCE**

For online video viewers, a broadcast quality experience means a video starts playing quickly, at the highest bitrate possible, with no rebuffering. The “State of Online Video” results make it clear that only a few rebuffer incidents will cause you to lose significant audience.

Global Content Delivery Networks (CDNs) are built to provide high performance content delivery by distributing services to where end users are located, making content globally available for delivery at broadcast quality.

Important capabilities for high-quality live and on-demand video delivery includes last mile TCP optimizations to increase performance over any internet connection type or speed. Continuous monitoring of viewer connections and optimizing delivery based on realtime analysis provides the best quality of experience even over mobile networks. For video on-demand distribution, caching files at CDN edges located near to viewers, provides rapid delivery, so on-demand videos can start to play immediately.
**Delivering to the Wide Variety of Viewing and Streaming Devices**

To reach the broadest possible audience, make sure you can deliver to all viewing options: smartphones, tablets, laptops, smart TVs and gaming consoles, in addition to streaming devices from Apple, Amazon, Google and Roku.

For video on-demand, a CDN can provide device detection, with automatic conversion to the correct video format for each device, with on the fly transmuxing to HLS, DASH, MSS, and HDS video formats. This saves storage costs by avoiding the creation of renditions in different formats prior to publication, whether you use your own origin storage or utilize CDN storage.

- Saves storage costs by avoiding the creation of multiple renditions in different formats prior to delivery
- Automatic transmuxing of MP4 files on the fly to HTTP chunked streaming formats

**Figure 7: Video On Demand Workflow**

For live streaming, the CDN should transcode the ingest stream to multiple bitrates for Adaptive Bitrate playback, and transmux on the fly to HLS, DASH, MSS, and HDS video formats. In most cases, live streams will need to be recorded as they are delivered for re-use as on-demand assets.

After the format conversions, the CDN should distribute the video globally using the CDN specific content delivery capabilities.

- Automatic transmuxing on the fly to popular streaming formats
- Custom chunk size to reduce latency to as low as 6 seconds

**Figure 8: Live Streaming Video Workflow**
Live Streaming Latency Requirements
As live streaming has increased in popularity for viewing live events, the relatively longer latency of online video streams compared to TV broadcast has prevented OTT providers from effectively monetizing this technology. Including interactivity with realtime video, for instance, can enable new business models, and provide viewers with a more social experience that keeps them engaged longer.

But latency has also become a big frustration for online viewers. No one wants to see a spoiler text message about the action from someone watching the same event on the TV broadcast.

The cause of streaming latency is the method used to stream video. The internet wasn’t originally designed for streaming live video. To address this limitation, HTTP-based live streaming formats such HLS and MPEG-DASH, which are the dominant formats for delivering video online, were developed to allow live internet streaming using the TCP/IP protocol. Video streams are encoded in segments (or chunks) that are delivered to the receiving application and then buffered before being played. This allows the playback application to accommodate the inherent potential delay in the transmission of live video over the internet by buffering (or storing) the video before it is played. The typical stream latency can be 30 seconds or more due to the amount of video that is typically buffered.

HLS and DASH live video streaming latency can be reduced by making the chunk sizes smaller to minimize the amount of video that is buffered before playback. If chunk sizes are reduced to one or two seconds, the total resulting latency will be in the 6-10 second range, which is close to the latency of broadcast cable delivery. Deploying this solution for a major sports event with a large traditional TV broadcast and online viewing audience would mitigate the potential spoiler issue, and with the potential to offer some interactivity use cases.

Global Reach to Deliver to Viewers Anywhere
When you deliver video online, audiences can be anywhere in the world. Relying on the public internet to distribute your content means competing with the congestion from all the other traffic typically carried on the internet every day. Avoiding this issue is a key reason content owners consider using CDNs to distribute online video.

Top tier CDNs will have the global coverage required to reach global audiences. For example, Limelight operates one of the world’s largest global networks, consisting of over 120+ Points-of-Presence in more than 45 metropolitan locations, directly interconnected with over 1000 major ISPs and last-mile networks, offering 50+Tbps of global egress capacity. Our private fiber backbone enables content to bypass the congested public internet, resulting in faster more reliable content delivery, helping you get your OTT video to virtually any device anywhere at high quality.

Scaling for Peak Traffic Spikes
Online video can go viral at any time, and unexpectedly. It could be sudden popularity of a program, or a close sports match with time running out. You never want to be in the position of not being able to handle all the requests for your content. Part of scaling is having sufficient server capacity to service heavy loads of logging in requests, then having enough delivery network capacity and bandwidth to deliver video without rebuffering or failures to load.

When monetizing content, you want to support the largest audience possible, so it is important to choose a CDN that has Points of Presence (PoPs) in all the areas where your viewers are located.

Each PoP should have adequate egress capacity to ensure your audience receives the fastest possible experience. The CDN should also have peering agreements with the local Internet Service Providers (ISPs) and last-mile networks that serve your audience, in order to eliminate “last-mile” bottlenecks between the CDN and the user’s internet connection.
**Online Video Platforms**

As your video library grows, you may need better solutions to ensure it is efficiently managed and organized. An online video platform (OVP) can offer a wide range of useful functionality including:

- Convenient video file uploading
- The ability to add metadata to files to make them searchable
- The ability to create channels and playlists
- A simple yet powerful user interface for your users to search the content
- Robust analytics and reporting
- Integration with third party ad networks

When selecting a solution, there are many options. You can license a commercial online video platform, some of which have partnerships with CDN services to distribute content. You can also choose a platform and a CDN and manage the integration on your own. The third option is Limelight’s Video Platform (LVP), the only major Online Video Platform that is fully integrated with a CDN, enabling you to more easily manage and distribute your video content without having to manage a separate CDN for distribution.

**Video Content Protection**

There are many reasons for securing your video content. Whether it’s your own original content, or if you license films or TV shows, protections from unauthorized access, sharing, or theft must be in place.

There are multiple security measures that will block unauthorized access to content such as IP address whitelisting and blacklisting, Geo-blocking, TLS encryption, tokenization, and digital rights management (DRM).

DRM capabilities allow restricting unauthorized access and distribution of your digital content, and supports the multiple popular DRMs in use that includes Google Widevine, Microsoft PlayReady and Apple FairPlay. A solution with a cost-saving feature to add DRM to your content on the fly as it is converted for delivery as HLS and DASH, will reduce storage costs by avoiding the pre-encryption and storage of different DRMs and video formats.

Beyond these access control protections, deterring unauthorized leaking of content with forensic watermarking provides a way to uniquely and invisibly mark each delivered video so that any unauthorized sharing can be traced back to the viewer that received the original content.
Support Services
Implementing new services or responding to changing business requirements may tax your in-house staff. Once you have made the decision to use a CDN to deliver your video, your entire organization will be excited to realize the results. On your list of considerations for exploring options should be CDN support services such as free unrestricted access to 24/7/365 live technical support, implementation services to speed integration with your workflow, and assistance solving complex integration challenges. If you deliver live events, support from experienced system engineers with event pre-planning, configuration and testing will help ensure a great viewer experience.

ABOUT LIMELIGHT NETWORKS
Limelight Networks, Inc. (NASDAQ: LLNW) is a global leader in delivering the highest quality online video experiences and edge-enabled workflows. Limelight’s edge services platform makes knowledge, information, and entertainment instantly accessible anywhere in the world and accelerates the next generation of real-time, interactive and immersive content. For more information, visit www.limelight.com, follow us on Twitter, Facebook, and LinkedIn.