INTRODUCTION
As viewers continue to consume more video content online, their expectations for a broadcast-quality viewing experience continue to rise. In fact, if a video rebuffers twice, more than 61 percent of people will stop watching1. Satisfying global demand for your Video on Demand (VOD) content while delivering the best possible online experience can create unique challenges. Many large content distributors employ a multi-CDN workflow that leverages the capabilities of multiple CDNs to improve availability, performance, capacity and security. However, preparing and storing multiple renditions of a VOD file in order to serve a variety of devices through different CDNs introduces workflow inefficiencies, costs and additional latency. Fortunately, Limelight offers a solution that satisfies all viewers and devices and helps you minimize cost and increase efficiency, even when delivering video content through multiple CDNs.

CHALLENGES PREPARING VIDEO ON DEMAND CONTENT
Delivering video on demand content at scale requires simultaneously serving many individual video streaming sessions to viewers using different devices. Each session must deliver video in the correct streaming format and optimum bitrate for the viewer’s device. If Digital Rights Management (DRM) protection is also to be used, the number of streaming media files that need to be created for each title to support the multiple combinations of streaming formats, bitrates, and encryption schemes can be quite high.

When content is requested for playback by a viewer, the CDN must determine if the content is already available in cache in the proper format for the device that is requesting it. Sometimes the requested video will be available in cache in the proper format. Otherwise, the CDN needs to retrieve the video in the proper format from origin. Pre-encoding video in all possible streaming formats, bitrates, and DRM encryption formats and retrieving it from origin storage creates challenges, including:

- **Multiple Streaming Format Preparation**—There is no universal streaming format, so content needs to be encoded in multiple formats such as HLS, MPEG-DASH, HDS and MSS. Preparing and storing four formats for each video title would quadruple the costs for origin storage.

- **DRM Preparation**—If your VOD workflow requires Digital Rights Management, you will likely need to support all three major DRM systems: Google Widevine, Microsoft PlayReady and Apple FairPlay DRM. Storing three versions of each title would triple the storage cost.

- **Latency when retrieving from origin storage**—If the origin storage is not distributed, the required transit distance could potentially be to another continent or the other side of the world. If the video needs to transit the public internet to get from origin storage to the CDN provider, retrieval can add significant latency.

- **Cost of storage and retrieval**—The costs of at-rest storage can be significant, especially if you need to store multiple renditions of each title. There also may be extra costs from the storage provider to retrieve the video from storage as well as access bandwidth costs to haul the video from the origin storage to the selected CDN.

How these challenges are handled can dramatically affect overall cost, efficiency and performance.
SOLVING CHALLENGES RETRIEVING VIDEO CONTENT

Limelight helps multi-CDN VOD customers save money on storage, deliver sustained high quality to a large audience, and streamline operations by eliminating the need to pre-encode and store multiple renditions of video content. Limelight’s edge cloud provides globally distributed on-the-fly video preparation services that package video content in the appropriate format as it is requested by viewers, regardless of which CDN is delivering a given session. With this approach, all of the CDNs that are delivering your content share the same globally distributed origin that prepares content on the fly. Delivery can be provided by Limelight or any other CDN, with all CDNs fetching content from the Limelight network.

THE LIMELIGHT NETWORK AS A DISTRIBUTED VIDEO ORIGIN

Here are some key elements of Limelight’s distributed video origin solution for VOD.

ON-THE-FLY STREAMING FORMAT CONVERSION

Instead of creating and storing multiple separate renditions of a streaming video file, Limelight lets you just store source MP4 files in Limelight’s globally distributed cloud storage system, dramatically reducing cost. When requested for playback, Limelight performs on-the-fly transmuxing in PoPs around the world to create the correct streaming format (HLS, MPEG-DASH, HDS or MSS).

CONTENT SECURITY AND ENCRYPTION

Limelight offers the ability to secure video assets against unauthorized access while stored and while being delivered. On-the-fly DRM adds the correct encryption for the end-user’s device (Google Widevine, Microsoft PlayReady or Apple FairPlay DRM encryption) in real time. For added efficiency, Limelight performs both on-the-fly streaming format conversion and DRM encryption to provide a final packaged stream for each session.

DISTRIBUTED ORIGIN STORAGE

Limelight’s distributed origin storage replicates content in multiple regions for up to 200% faster retrieval performance compared to a single storage location. Limelight Origin Storage is optimized for CDN workflows and ideal for multi-CDN delivery. When content is requested, it is automatically retrieved from the fastest storage site and transported over Limelight’s private backbone for any required on-the-fly processing before handoff to the selected CDN for delivery.

ORIGIN SHIELD

Limelight origin shield increases overall cache efficiency and reduces calls to origin by all CDNs in a multi-CDN workflow by assigning one or more Limelight PoPs to act as a proxy for your origin. Requests from each CDN are routed to the origin shield which determines if the requested video is already in cache. If the video is already cached, it will be served from cache without needing to be retrieved from origin storage. If the video is not in cache, it will be retrieved from origin and delivered to the requesting CDN over Limelight’s private backbone as well as cached in origin shield for future requests.
COMBINED VALUE
Limelight origin shield combined with on-the-fly format and DRM processing provides lower storage and retrieval costs with faster response time. Without these value-add capabilities, every version must be stored, increasing storage-at-rest cost, and every version must be retrieved separately from storage, increasing retrieval cost and latency. With on-the-fly processing, far fewer versions must be stored. With origin shield, response time is faster while fewer calls to origin storage reduces retrieval costs.

CDN SWITCHING AND LOAD BALANCING
Limelight Traffic Director lets you configure preset load balancing profiles for dynamic DNS-based traffic allocation across all CDNs. Traffic Director provides tools to manage worldwide traffic routing, management, and load-balancing needs, with changes propagated in near real-time. It offers policy-based load balancing based on the user’s IP address, geography or ASN. Health Check provides the ability to easily add or remove resources without having to go through every policy. In addition, if your workflow requires dynamic CDN load balancing, third-party switching solutions can be implemented to dynamically allocate traffic to Limelight and other CDNs.

EASY IMPLEMENTATION
Setting up Limelight as an intermediate origin for multi-CDN delivery is straightforward. Limelight can help you identify and configure the services you need to complement your existing workflow and implement distributed video origin. A complete implementation can be as simple as configuring a single CNAME in your multi-CDN switcher and three URLs from your other CDNs pointing at the Limelight edge. The multi-CDN switcher CNAME is used to allocate the traffic across CDNs. The three CDN URLs enable playback of the video stream, passing of an authorization token to the player, and delivery of the DRM decryption key. With this configuration, Limelight is able to shield the origin and provide chunking service and DRM across multiple CDNs.

CONCLUSION
For video on demand workflows using multiple CDNs, Limelight can reduce costs for hosting and preparing video while improving performance for all CDNs. On-the-fly transmuxing and DRM processing provide the correct format for each device while reducing storage costs compared with storing every rendition. Limelight Origin Storage supports replication to multiple locations with automatic fastest-site retrieval, improving performance on cache miss for all CDNs. Origin shield is able to serve origin requests out of distributed cache, improving performance for all CDNs while reducing calls to origin. Middle-mile transport across Limelight’s high-speed private backbone for handoff to the delivering CDN avoids the congested internet and helps provide excellent performance for every viewer session and every CDN. These capabilities combine to provide cost-effective distributed video origin that can enhance the performance of every CDN in your multi-CDN VOD environment. Contact Limelight for more information.

ABOUT THE ORCHESTRATE PLATFORM
The Limelight Orchestrate Platform is built upon a global, private backbone network with the speed, capacity, and availability to deliver the experiences today’s audiences demand. This industry-leading Platform includes integrated content delivery, web acceleration, origin storage, video management, cloud security, and support services. The unique combination of global private infrastructure, advanced software, and expert services surpasses other CDNs, to enable today’s and tomorrow’s workflows and put audience experience first.

ABOUT LIMELIGHT NETWORKS
Limelight Networks Inc., (NASDAQ: LLNW), a leading provider of digital content delivery, video, cloud security, and edge computing services, empowers customers to provide exceptional digital experiences. Limelight’s edge services platform includes a unique combination of global private infrastructure, intelligent software, and expert support services that enable current and future workflows. For more information, visit www.limelight.com, follow us on Twitter, Facebook, and LinkedIn.

1 The State of Online Video 2017, market research conducted by Limelight Networks