

BROCHURE

Lumen[®] CDN Mesh Delivery

Powering next-generation video delivery.



Summary

Lumen CDN Mesh Delivery is an overlay solution that works in tandem with your content delivery network (CDN) to extend the edge farther than ever before. Using hybrid peer-assist technology based on the WebRTC protocol, CDN Mesh Delivery turns user devices into mini edge servers that can share live and video on-demand (VOD) content with other user devices watching the same stream.

Lumen CDN Mesh Delivery uses dynamic multi-sourcing to get video segments from the most efficient source: either the CDN or the mesh network of user devices. User location, internet service provider, network topology, device type, content type and bitrate profiles are taken into consideration to determine the best possible source for the end users' video content.

This hybrid approach provides broadcasters with additional flexibility, scalability, performance and cost optimization. Not only does it help reduce network congestion during high traffic periods by distributing content requests across the mesh network, it also contributes to better end-user experiences as viewership levels rise.

Many Tier 1 broadcasters are currently leveraging CDN Mesh Delivery for their live streams, catch-up TV, user-generated content, and ad- or subscription-based VOD content. It has allowed them to rapidly scale their audiences and reach new geographies in the face of growing demand without having to invest in new infrastructure.



Benefits

Hybrid delivery

(CDN + peer-assist deliveries)

Lumen CDN Mesh Delivery combines the best of a controlled global content delivery network with the scalability of distributed mesh architecture to deliver consistently smooth and reliable live and on-demand video.

Cross-platform compatibility

Available on major web and mobile platforms, Android and iOS set top boxes, as well as smart TVs (FireTV, tvOS).

Easy integration

Simple plug-and-play integration with a broad range of HTML5 and mobile players.

Visibility

A feature-rich dashboard provides engineering teams with a comprehensive view of their platform's traffic.

Quality of service

By obtaining video segments from the source that can provide them most quickly, Lumen CDN Mesh Delivery helps reduce round trip time and promotes more efficient use of the infrastructure. Platforms using CDN Mesh Delivery have been able to improve rebuffering rates by up to 60%.¹

Traffic and user scalability

Handle traffic spikes with ease through a solution that scales naturally to viewers. More devices mean a more powerful network, increasing your delivery capacity and video quality in a cost-effective manner.

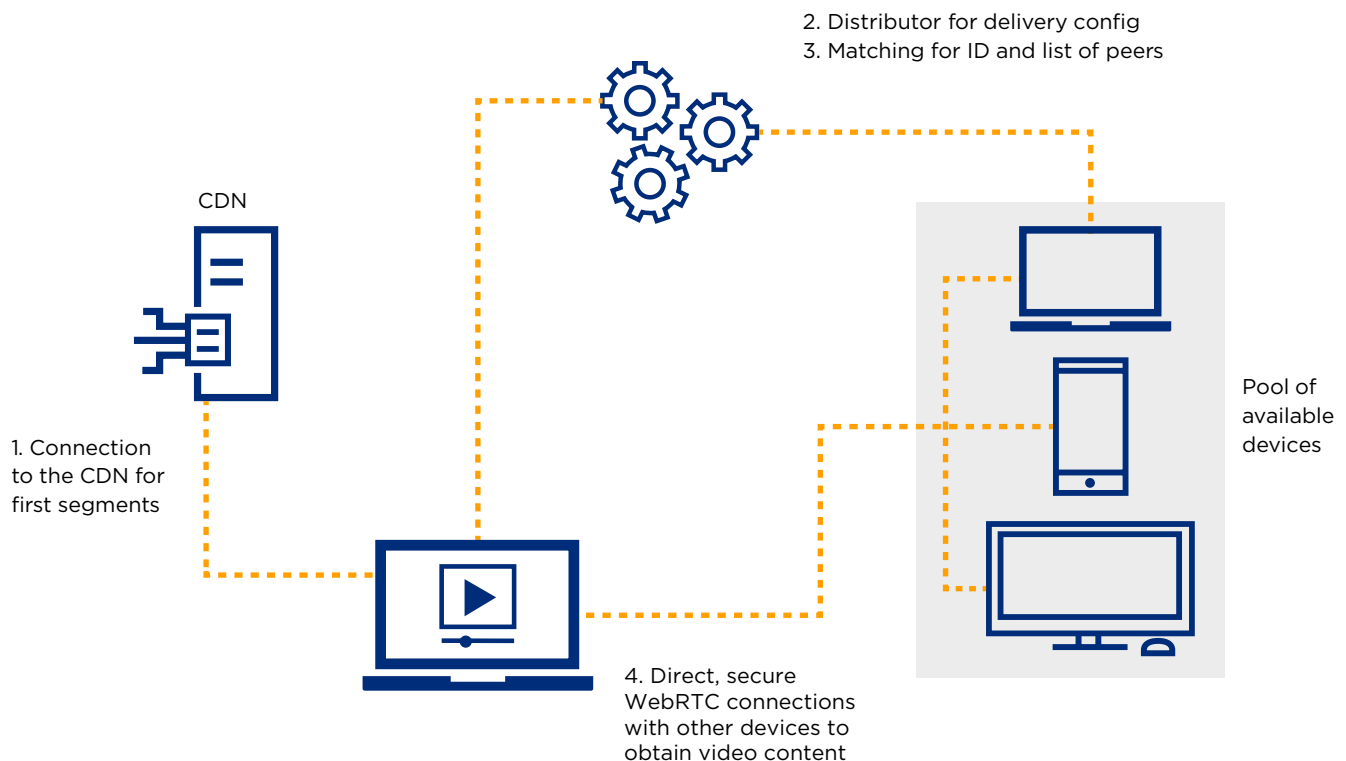
Geographic scalability

Extend reach to audiences all over the world—regardless of their proximity to the CDN—through our high-capacity, high-speed distributed content delivery network and hybrid peer-assist technology.

1. Based on Lumen customer statistics, September 2020.

Technology

1. On starting the video, the end user starts fetching the first video segments from the CDN.
2. The CDN Mesh Delivery module connects to the distributor service that authenticates the user and returns a specific configuration which has been fine-tuned to maximize QoS and delivery efficiency.
3. The CDN Mesh Delivery module connects to the matching service that assigns the viewer a unique ID. The device periodically requests video chunks and peers throughout the session, and the matching service provides an updated list of devices with which the peer should connect.
4. The client module connects to other devices watching the same content at the same time via the signaling service using a WebRTC connection. All WebRTC connections are fully secured via DTLS.



Once connected, individual device limitations are accounted for so device performance and data consumption are not burdened. A minimum buffer threshold is set for end users so that if the buffer falls below the threshold, Lumen CDN Mesh Delivery will instantly and seamlessly fall back to CDN delivery to avoid any impact on playback.

Specifications

Description	Details
Platform compatibility	Web browsers (Chrome, Firefox, Safari, Opera, recent versions of Microsoft Edge, Chromium-based browsers), iOS, Android, Android TV, iOS, tvOS, FireTV, all Android-based STBs (FireTV, etc.), Chromium-based STBs, Chromecast, Samsung TVs (Tizen 3.0+), LG TVs (WebOS 3+)
Player compatibility	hls.js, dash.js, video.js, Skaka Player, Flowplayer, Clappr, JW Player, THEOPlayer, Bitmovin Player, RadiantMP, Castlabs, Brightcove Player, Azure Media Player, thePlatform MPX Player, AMP, Kaltura Player, ExoPlayer, NexPlayer, AVPlayer
Custom players	<ul style="list-style-type: none">• Can integrate with custom HTML5 players upon request• Can integrate with custom Android and iOS-based players upon request
Media format support	<ul style="list-style-type: none">• HTTP streaming formats: DASH, HLS, Smooth Streaming• Supports both live and VOD streaming, without adding any latency for live• CMAF support• Support for multi-bitrate streams
Media features	<ul style="list-style-type: none">• DRMs, tokens, geo-blocking and authentication mechanisms supported• SSAI providers support: Amazon Media Tailor, Yospace, AdInsertion Platform• Supports common media features like subtitles, multi-audio, DVR, fallback URLs, etc.
Security features	<ul style="list-style-type: none">• Mesh network cryptographic integrity checks• Domain whitelisting• App secret key whitelisting• Fully encrypted communications with the backend (HTTPS and WSS)• Backend authentication and matching features• Fully encrypted DTLS mesh network communications
Dashboard	<ul style="list-style-type: none">• Monitor CDN Mesh Delivery vs. CDN traffic in volume and throughput• See number of concurrent users over time• See details per platform• QoS data: buffering ratio over time• Real-time monitoring panel showing top streams with CDN Mesh Delivery vs. CDN efficiency and audience
Data API	<ul style="list-style-type: none">• Basic Data API:<ul style="list-style-type: none">- CDN Mesh Delivery and CDN traffic over time- Concurrent viewers over time- Buffering ratio over time- Top 100 streams in traffic, audience, efficiency (% of CDN Mesh Delivery), and capacity offload
Advanced data analysis	<ul style="list-style-type: none">• Advanced Insights allowing multidimensional queries including:<ul style="list-style-type: none">- Platform- Live and VOD- Content- Site- Country- ISP• Custom efficiency reports per customer upon request (paid service), accessing and compiling data from our data pipeline

Specifications

Description	Details
Alerting and reporting	<ul style="list-style-type: none">• On-demand alerting service from our customer support if we detect anything unusual in different metrics: efficiency, audience, QoS, new release, etc.
Dashboard configuration	<ul style="list-style-type: none">• Create properties to use different configuration options for different types of content (live vs. VoD, premium vs. free, etc.)• SSAI detection• Range request detection• Wi-Fi and cellular network upload and download configuration• Activation Ratio feature for easy ramp-up and full control over the mesh network• Custom STUN servers to bypass a firewall• Custom signaling servers
Client-side configuration and API	<ul style="list-style-type: none">• Configuration: Content ID, asynchronous loading• Client API<ul style="list-style-type: none">– Per-user traffic data– Upload and download control API per network type• Activation threshold for VOD: activate the CDN Mesh Delivery plugin only on the most popular streams with more than 3 active users in the last 20 minutes
Client-side optimization features	<ul style="list-style-type: none">• UDP-based delivery, which has better resource utilization than HTTP/TCP• 100% transparent for end-users with nothing to install• In-segment multisourcing: pre-fetching each segment from several peers at the same time• Adaptive Device Resource Usage: our module constantly monitors core health metrics on the device (CPU, memory, QoS, battery, etc.) to adapt the efficiency algorithms to the capabilities of the device in real time• Advanced congestion control algorithms• Protection against uplink saturation via proprietary queue management mechanisms• Pre-buffering from other peers• Dynamic buffer level configuration (patented)
Matching features	<ul style="list-style-type: none">• Smart matching by network topology, ISP, country, region, city, etc.• Can restrict matching between specific ISPs or inside specific ISPs• Instant and seamless fallback to CDN delivery in case of any issues to avoid any impact on playback• Can overcome short CDN downtimes by offloading delivery to the peer network

F1

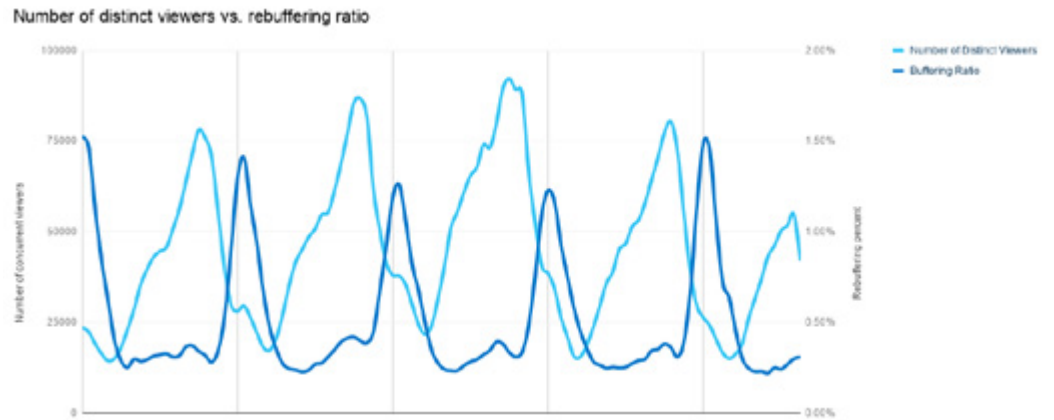
Traffic from a European live streaming platform in October 2020



This OTT provider delivers live video and catch-up TV to several European countries. The hybrid peer-assist technology helps this customer scale their infrastructure, with the mesh network regularly delivering over 70% of its live streaming traffic.²

F2

Global buffering rate improvement during spikes.

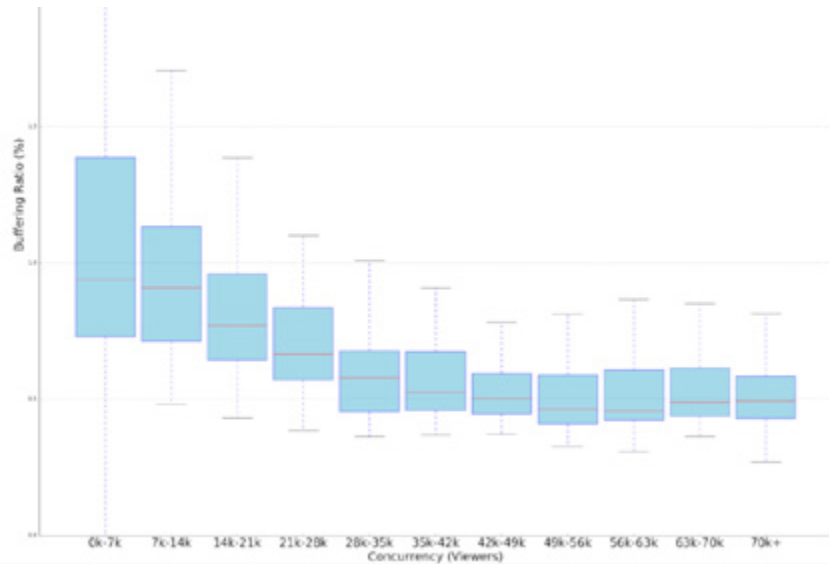


With hybrid peer-assist technology, rebuffering rates decrease as more viewers tune in. Micro-caching on devices means that more segments across all formats and bitrates are available to the network to help with faster downloads and greater local and regional capacity.

²CDN Mesh Delivery customer data, Sept. to Oct. 2020.

F3

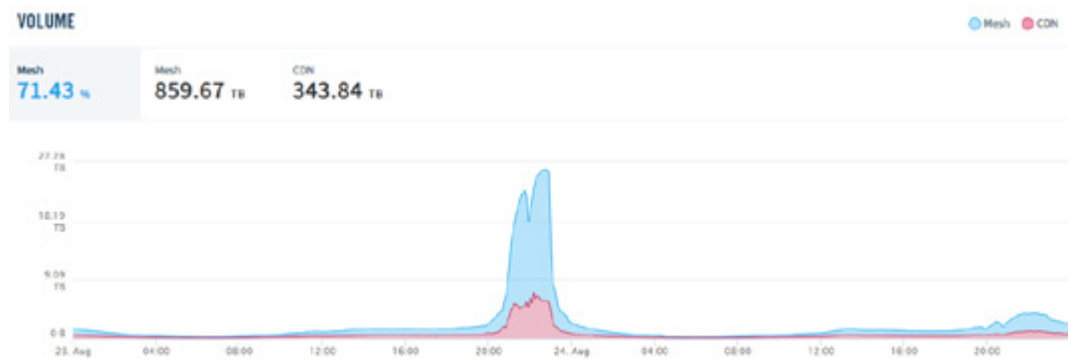
Higher quality as concurrency increases



Average and median buffering rates drop significantly lower as more devices connect to the streams.

F4

Scaling to large-scale live events



This European broadcaster utilized CDN Mesh Delivery to scale to drastically higher audience levels during a popular live sporting event. The event drew 23x their average viewership for the month at its peak, with the mesh network delivering over 70% of the content³.

Why Lumen?

Lumen delivers trusted, high-performance live streams and on-demand content virtually anywhere in the world. Our powerful IP backbone connects you to AWS, Google Cloud and Microsoft Azure, and our CDN points of presence reach six continents with a mesh topology that deploys globally. For more information, contact us at content-delivery@lumen.com.

³CDN Mesh Delivery customer data, August 2020.