Delivering world-class OTT sports experiences

Lumen® CDN Mesh Delivery for premier professional sporting events

Live video is all around us, from concerts and political rallies, to product launches and season premieres. Live sports, however, is the undisputed champion when it comes to attracting huge audiences around the world.

This trend is propelled by unprecedented viewer numbers on digital platforms, the popularity of multi-screen viewing, and increasingly bandwidth-heavy media formats; the global pandemic has only accelerated this growth by forcing fans to swap stadiums for screens in their living rooms.

This case study examines how Lumen® CDN Mesh Delivery can help platforms scale profitably to live sporting events while offering broadcast-grade quality of service. We use the examples of large soccer and tennis tournaments that CDN Mesh Delivery has powered in recent years.

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How CDN Mesh Delivery works

CDN Mesh Delivery uses a hybrid peer-assist approach to video delivery. By multi-sourcing video segments from both CDN infrastructure and nearby viewer devices watching the same content, the technology dynamically acquires video segments from the source that provides them most efficiently, either the server or a local peer-to-peer exchange.

In this way, the mesh network harnesses all possible video delivery sources and keeps content towards the outer reaches of the network.

Origin

CDN Mesh Delivery

Content Delivery Network
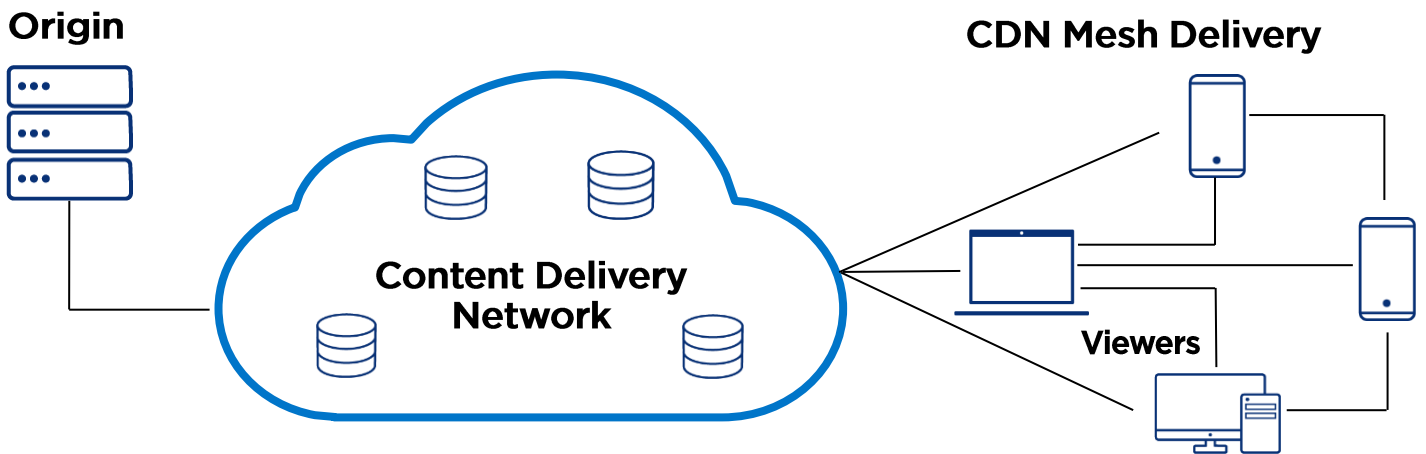
Viewers

GREATER SCALE

Micro-caching on devices makes more video segments available at the edge. As more viewers tune in, the stronger and more resilient the network becomes. This additional capacity is instant and flexible, scaling naturally to audiences without relying on physical CDN infrastructure.

HIGHER PERFORMANCE

By routing traffic more effectively to each device, CDN Mesh delivery can help alleviate congested network paths and personalize delivery to each viewer. This in turn promotes higher quality via lower rebuffering rates and higher average bitrates on the viewers' devices.

MORE PREDICTABLE COSTS

CDN Mesh Delivery can reduce the need to precisely predict traffic volumes and minimize the risk of inadequate CDN provisioning. Decorrelating costs with bits delivered can encourage longer viewing times and resolutions without affecting your bottom line.

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The Challenge: scaling to primetime sports

CDN Mesh Delivery has been used to scale to hundreds of sporting events, including Grand Slam tennis in France, the US and Australia, the world's biggest cycling tournament, as well as professional basketball, baseball and rugby.

Soccer, however, has been the undisputed champion when it comes to scaling to prime time around the world. In 2018, the sport's largest international tournament broke all streaming records for professional athletics as millions of fans tuned in on laptops, mobile devices and connected TVs. Regional tournaments also draw massive crowds, well beyond what TV platforms see on average.

CDN Mesh Delivery: enabling improved QoS during unprecedented demand

Demand on network infrastructures during live events of this scale is high. Many rights-holding broadcasters, particularly in soccer hubs like Europe (France, Spain, Germany, etc.) and Latin America (Brazil, Argentina, Colombia, Chile, etc.), have turned to CDN Mesh Delivery to deliver high-quality, uninterrupted service to end-users during these primetime events.

Over the course of the month-long 2018 international soccer tournament, CDN Mesh Delivery powered **40 million** video sessions and offloaded over **1.26 Tbps** from the global content delivery infrastructure on peak, safeguarding against congestion and providing a smooth streaming experience to fans across the world.

During the semifinals and final – which saw the largest audiences of the tournament by a wide margin – the mesh network delivered **62%** of the total traffic, greatly easing the stress that would have been placed on the CDN and consumer ISP networks.

CDN MESH DELIVERY POWERS THE 2018 WORLD SOCCER TOURNAMENT:

40 million
video sessions powered by CDN Mesh Delivery in Europe and LATAM during the tournament

62%
overall traffic delivered via CDN Mesh Delivery in Europe during semifinals and final

2.5 Mbps
average bitrate watched with CDN Mesh Delivery in Europe

1.26 Tbps
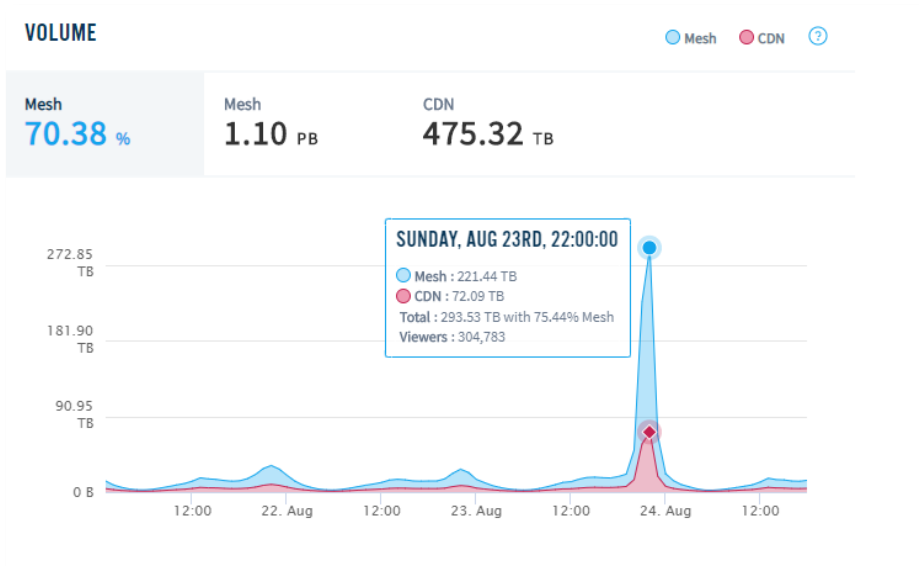offloaded from the global content delivery infrastructure on peak

All statistics: Lumen CDN Mesh Delivery customer data, July 2018

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The Solution: scale, performance, predictability

Greater scale through flexible capacity

Many live sporting events draw viewer traffic that is anywhere from 10x to 20x the normal volumes a platform sees. Because CDN Mesh Delivery does not rely on physical server infrastructure but on the viewers watching the content, this hybrid delivery solution provides **elastic scale**: broadcasters have capacity when and where they need it based on their viewer traffic.

This expanded capacity was necessary again in the summer of 2020, when the semifinal and final games of the biggest European club tournament drew more than **300,000 viewers**, which was roughly **15x** the broadcaster's standard peak audience size. But as we saw in the international tournament two years earlier, the mesh delivery network eased the burden on the CDN and the consumer ISPs by delivering **75%*** of the traffic during that peak time.

VOLUME			○ Mesh ● CDN ⑦
Mesh **70.38** %	Mesh **1.10** PB	CDN **475.32** TB	

SUNDAY, AUG 23RD, 22:00:00
○ Mesh : 221.44 TB
● CDN : 72.09 TB
Total : 293.53 TB with 75.44% Mesh
Viewers : 304,783

272.85 TB
181.90 TB
90.95 TB
0 B
12:00 22. Aug 12:00 23. Aug 12:00 24. Aug 12:00

CONCURRENT VIEWERS		● Audience ⑦
MAX **304,783**	AVG **20,031**	

SUNDAY, AUG 23RD, 22:00:00
● Viewers : 304,783
◆ 95th Percentile : 23,652

300 K
200 K
100 K
0
12:00 22. Aug 12:00 23. Aug 12:00 24. Aug 12:00

> **European Club Soccer Championship**
>
> Key Metrics:
>
> • 300k viewers (15x average peak)
>
> • 75% of traffic delivered by mesh network at peak time
>
> • 70% of overall traffic delivered by mesh network on average
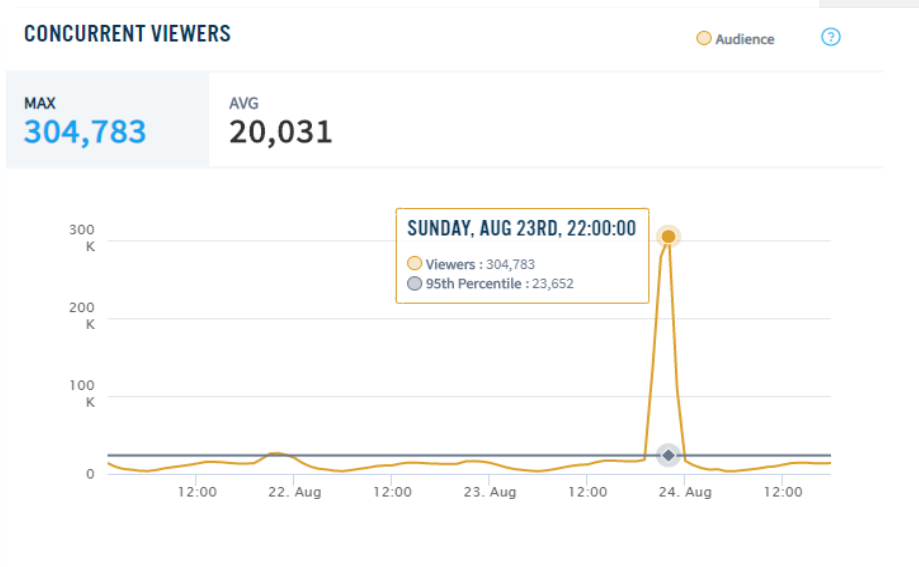
Lumen CDN Mesh Delivery customer data, August 2020

*Traffic managed for the portion of traffic on platforms on which CDN Mesh Delivery had been deployed
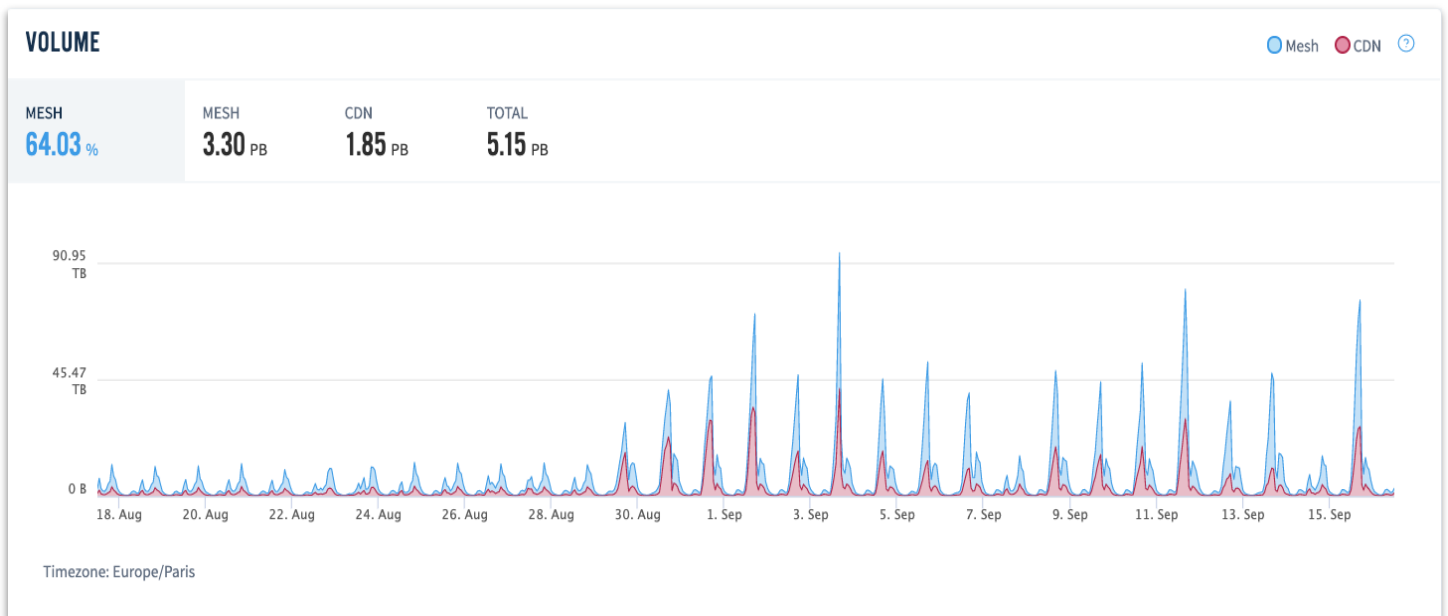
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In addition to greater overall capacity, this flexible scale is particularly useful in two cases:

1. **An influx of viewers at the start and end of the game**: Sports broadcasts often see viewership fluctuations throughout the event, as users drop off in the middle of the games before returning in time for the end. And no matter how resilient the CDN, an influx of viewers at the most critical moment of the action will always be a challenge. The final minutes of an exciting game are at the greatest risk for overwhelming networks and video platforms; performance issues at this time will also create the most ill will from the audience.

2. **Geographically dispersed audiences or regions with weak CDN presence:** For audiences that are spread out or located in areas where CDNs lack points of presence, CDN Mesh Delivery can help reduce round-trip time to distant servers and instead source content from local viewers, greatly augmenting regional capacity.

Manage periodic increases in demand

While a few individual games or matches may be the biggest nail-biters for operations teams, many major sporting events like soccer tournaments, tennis tournaments, and league playoff series tend to produce frequent and irregular traffic spikes over weeks or even months at a time. This can create headaches for the CDN provisioning teams, who are forced to anticipate when traffic spikes will occur despite fluid and constantly changing broadcast schedules.

This is where the provisional capacity offered by CDN Mesh Delivery becomes useful, as it automatically expands the reach and capacity of the network as needed, without requiring investment or provisioning of new infrastructure.

Lumen CDN Mesh Delivery customer data, August–September 2020

▲

This national broadcaster was able to prepare for periodic increases in demand without having to renegotiate commits or re-provision its infrastructure.

# Software-defined delivery enables exceptional performance

In addition to supplying the flexible capacity so critical for live sporting events, deploying a peer-to-peer network that works in tandem with the CDN infrastructure has also shown to help improve quality of service on the video streams. We see this through fewer instances of rebuffering as well as higher bitrates delivered to the end-user devices.

Personalized delivery promotes consistently low rebuffering rates overall

CDN Mesh Delivery personalizes content delivery by leveraging **user location, ISP, network topology, device, type of content** and **bitrate profiles** to determine the most effective connections for each viewer. Its algorithms take a quality-first approach, using rebuffering, CPU, and battery life to adapt delivery to the resources of each device.

While server infrastructures tend to struggle at peak traffic times, CDN Mesh Delivery helps to decrease instances of rebuffering as more viewers tune in. Quality of service rises as more devices connect to the stream; those devices function as mini-edge servers that help distribute the traffic and bring video content closer to other end users.

Despite experiencing over 10x their normal traffic, two broadcasters using CDN Mesh Delivery were able to keep rebuffering levels low during the 2020 European club championship final. One was even able to reduce buffering by 7% on peak compared to normal traffic times across their platform.

Buffering ratio Peak vs Normal times

■ Buffering Ratio Peak Time ■ Buffering Ratio Normal Time
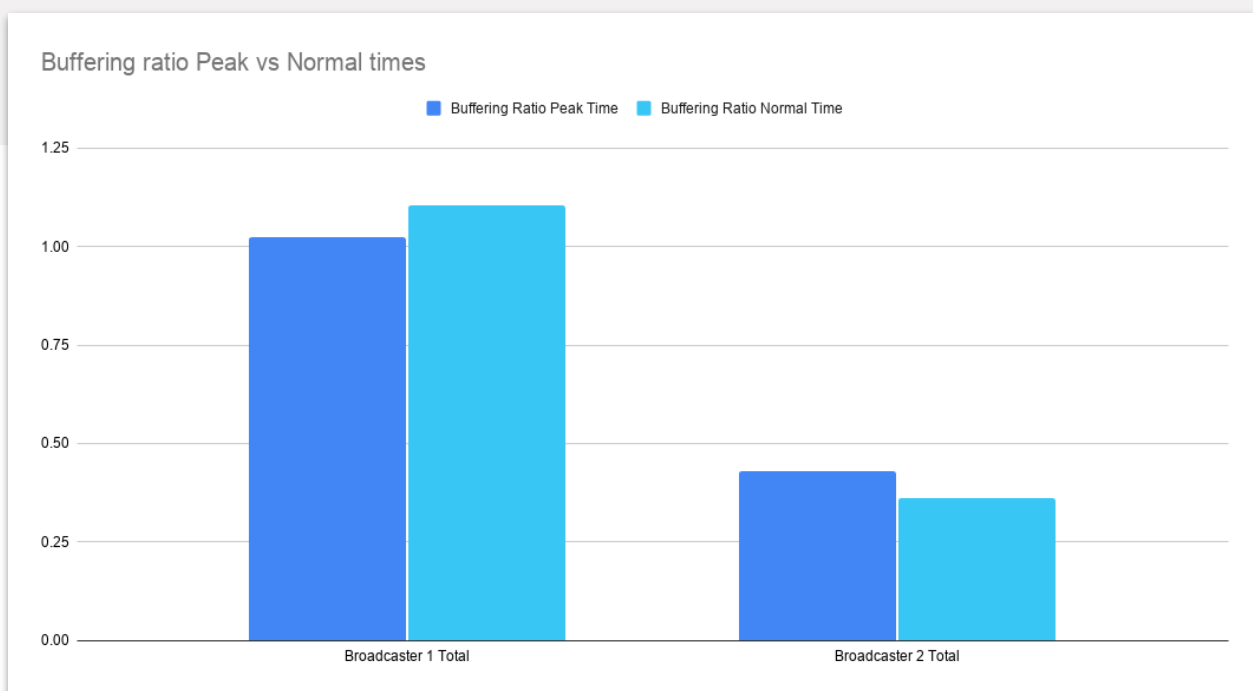
Lumen CDN Mesh Delivery customer data, August 2020

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By routing video delivery through the mesh network, it also alleviates the stress that is placed on consumer ISP networks, thereby improving quality of service across the board. During the 2020 European club soccer tournament's semifinal and final matches, three major consumer ISPs plus a handful of smaller networks (grouped as 'Other' in the chart below) actually experienced less rebuffering as viewership rose, including one by more than **21%**.

In addition to helping to improve the ISP performance, CDN Mesh Delivery also enables broadcasters to only allow sharing between user devices that are connected to the same ISP, thereby protecting the providers from having to send traffic outside of their networks.

By controlling the sharing parameters across end-user devices, broadcasters get the increased capacity necessary to improve their QoS while maintaining their CDN and ISP relationships.
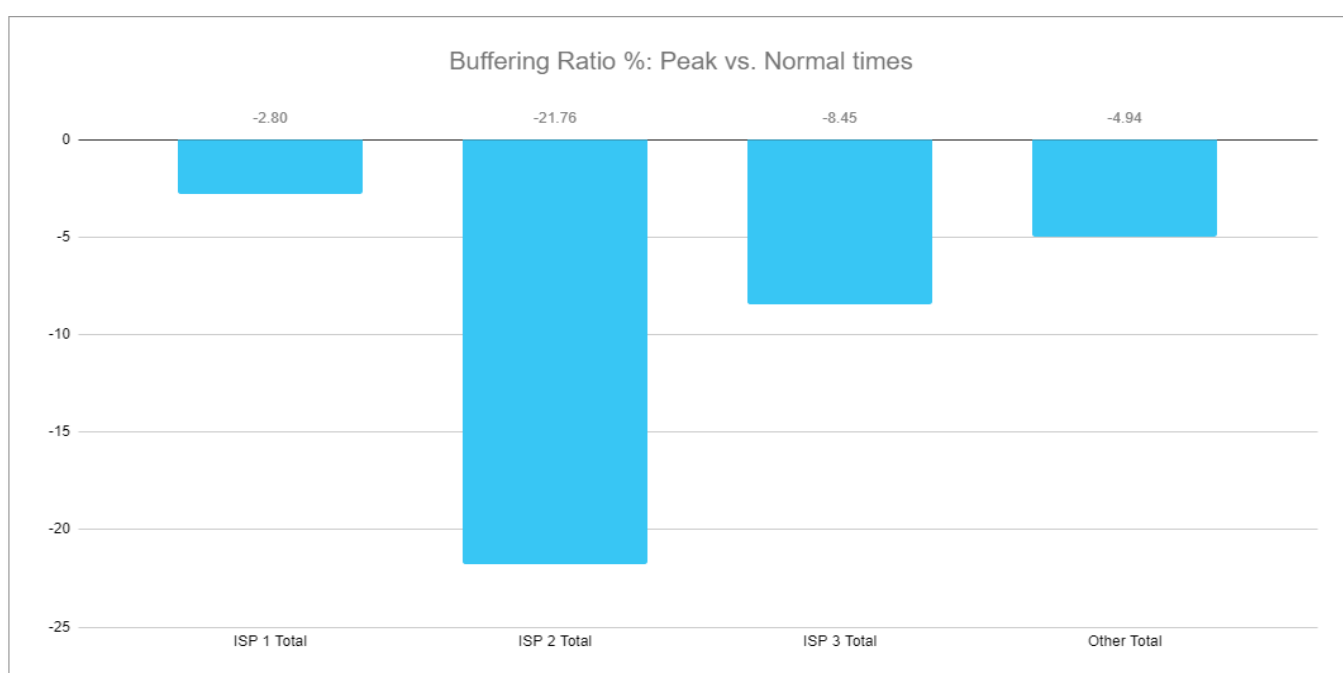
Lumen CDN Mesh Delivery customer data, August 2020

Consumer ISPs saw improved rebuffering during traffic spikes compared to normal viewing times* during the 2020 European club soccer championship, indicating that traffic routing via mesh delivery could have a positive effect on the network overall.

*normal viewing times refers to any time during a two-week period outside of the event broadcast

For more information on how to improve your live sports video delivery, reach out to us at content-delivery@lumen.com.

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