

Case Study: Accelerating primetime sports for TF1

Using ISP-aware Mesh Delivery

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Who is Lumen?

Fortune 500 telecommunications & technology company
working with some of the largest media brands in the world

Acquisition

Transformation

Origin

Delivery

Security

Acceleration

LUMEN®



Level(3)®



The customer

Primetime television & large replay catalogue



European Media Giant

Leading broadcaster in France

Range of streaming services offered via MyTF1 platform

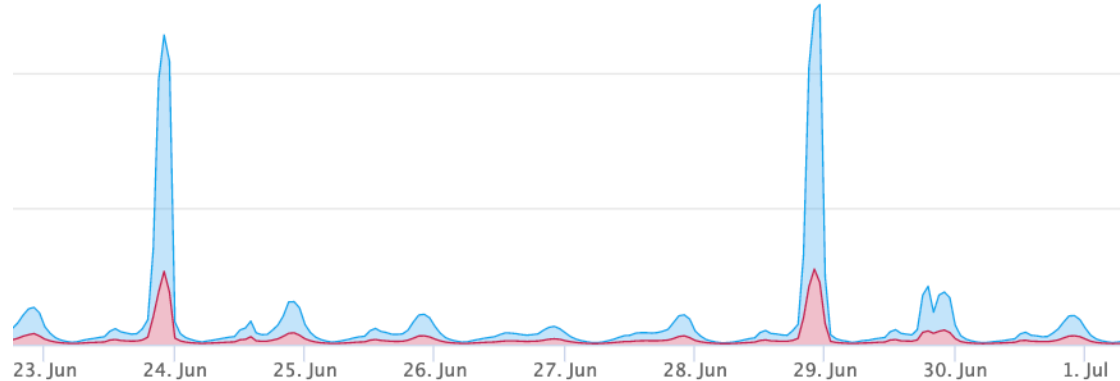
- Live & catch up TV on 5 linear channels
- Primetime sports
- Breaking news

Multi-screen strategy with native apps on smart TV & mobile



Delivery challenges

- MyTF1 serves 27 millions unique users each month
- Catalogue features 7500+ hours of video
- Ambitious growth strategy via acquisitions
- Prime time daily traffic spikes at 4x average traffic
- Large sporting events traffic spikes at 10-20x daily peaks



We take pride in offering TV-quality streaming to our growing online viewer base. Scaling to TV-size audiences on a digital platform – while maintaining the same quality standards – requires more than simply adding servers. It calls for a ground-breaking solution.

- Thierry Bonhomme
CTO, TF1



Streaming tech overview

Web desktop



& Dash

Android



ExoPlayer

HLS on Live
Dash on VOD

IOS



AV Player

& HLS

QOS Analytics



SSAI



Google
DAI

Delivery overview

Multi CDN

- One internal CDN & multiple CDN providers
- Daily automatic switching for peak traffic
- Manual load balancing during large events

+

Lumen Mesh Delivery

- Automatic activation for peak hour traffic & unanticipated spikes
- Manual activation before large events



Mesh Delivery

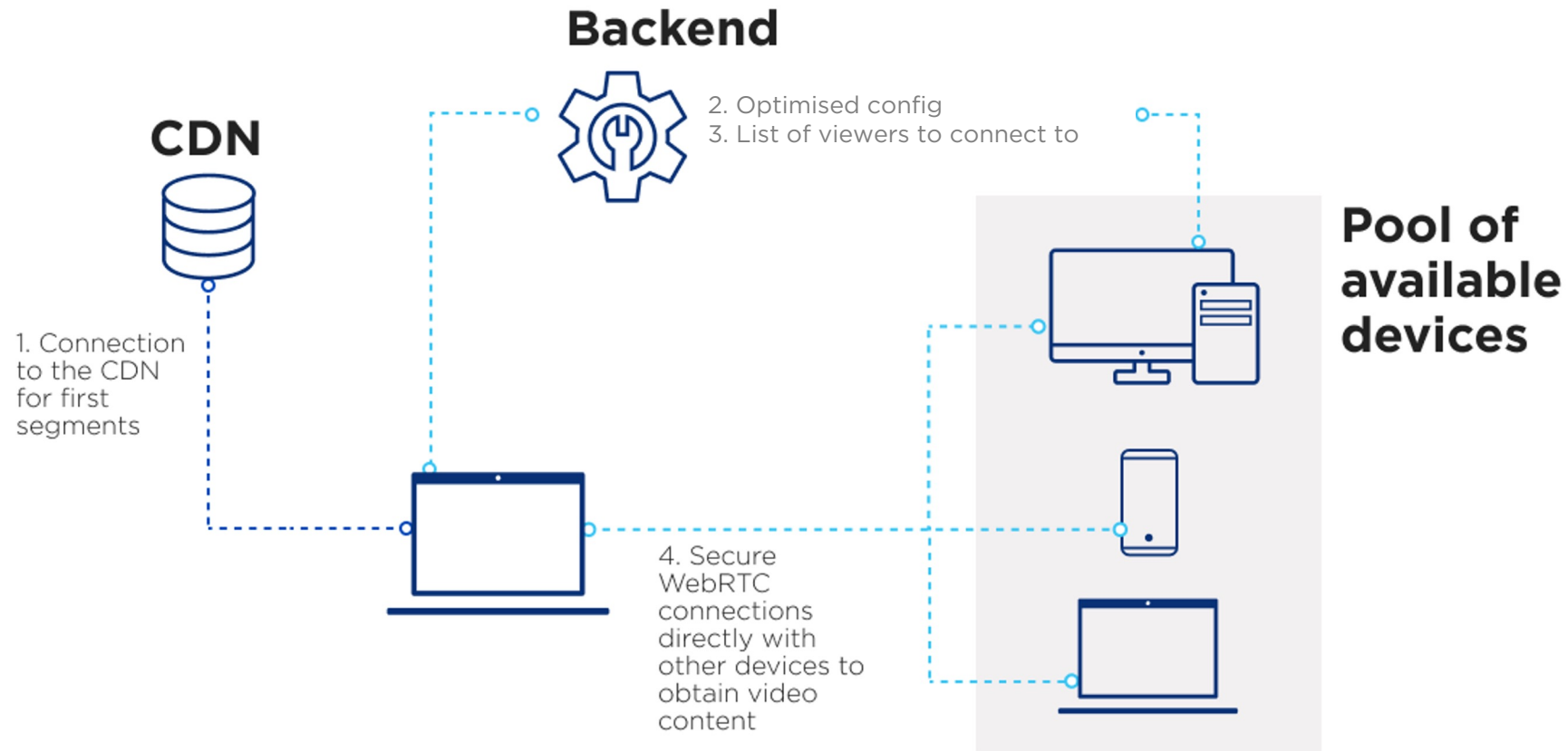
Combining P2P & CDN infrastructure

Mesh Delivery: combining peer-to-peer and CDN infrastructure

- Mesh Delivery dynamically sources video segments from the CDN or a network of users watching the same video.
- Combines the best of a controlled network & the resilience of a distributed architecture.



Mesh Delivery: combining peer-to-peer and CDN infrastructure



Mesh Delivery: an extension of the WebRTC protocol

Open-source standard maintained by Google and supported by Apple, Google, Microsoft and Mozilla

Uses the DataChannel API, which is similar to Websockets and features encryption by default and the STCP protocol

Other use cases include:

- Low latency live streaming (using the PeerConnection API)
- Video conferencing (Google Meet, Amazon Chime)
- Social (Facebook Messenger, Discord)



Leveraging Mesh

For primetime sporting events



Leveraging Mesh - Greater scale

Major Primetime live sporting events with some of the largest football & rugby championships.

Reach up to 20x average daily traffic effortlessly without need to re-provision CDN capacity.

Mesh brings elasticity to the internal CDN, absorbing daily peaks smoothly.

“ As an innovator in our industry, partnering with Lumen was a logical choice for TF1. We're extremely pleased with the results. CDN Mesh Delivery delivers 80% of our most popular streams and offers the elasticity that we need to scale to hit primetime content and the world's largest sporting events with ease.

-Thierry Bonhomme
CTO, TF1



Greater scale – Daily traffic

Daily traffic peaks absorbed by mesh with
over 70% of traffic going through mesh.

Stability & elasticity of the mesh network
means the internal CDN isn't overloaded by
unexpected traffic spikes

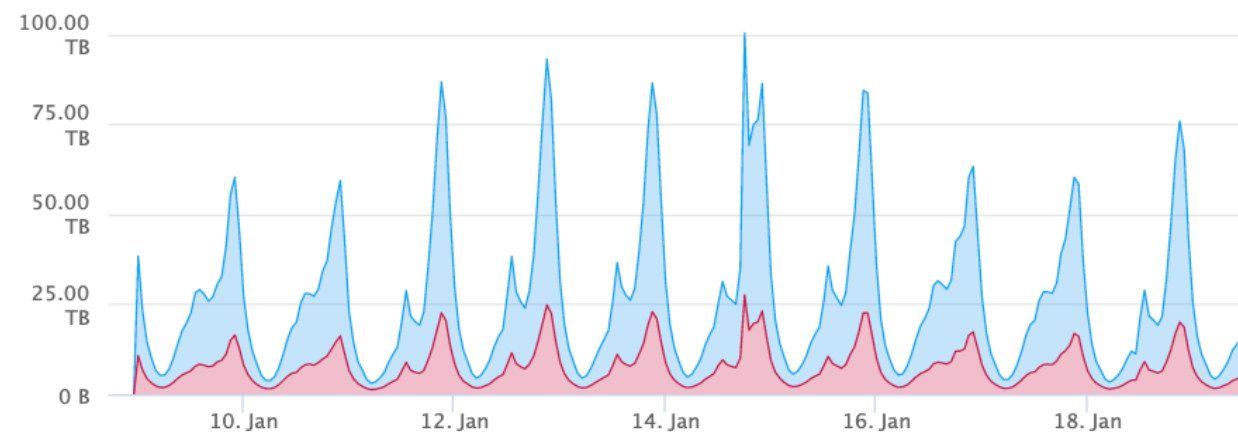
VOLUME

Mesh
71.30 %

Mesh
10.17 PB

CDN
4.09 PB

● Mesh ● CDN

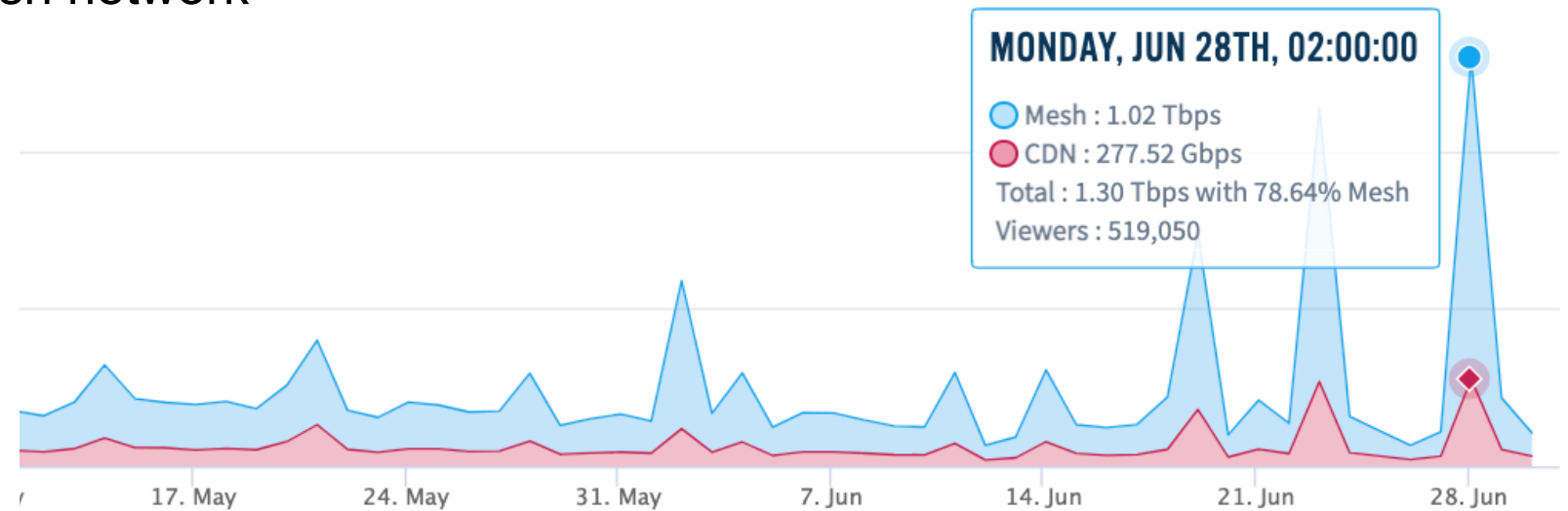


Greater scale – Dive into Euro 2021



Traffic from Euro 2021 absorbed smoothly at peak time

- Over **78% P2P** for the most watched game
- **1 Tbps** delivered by the Mesh network

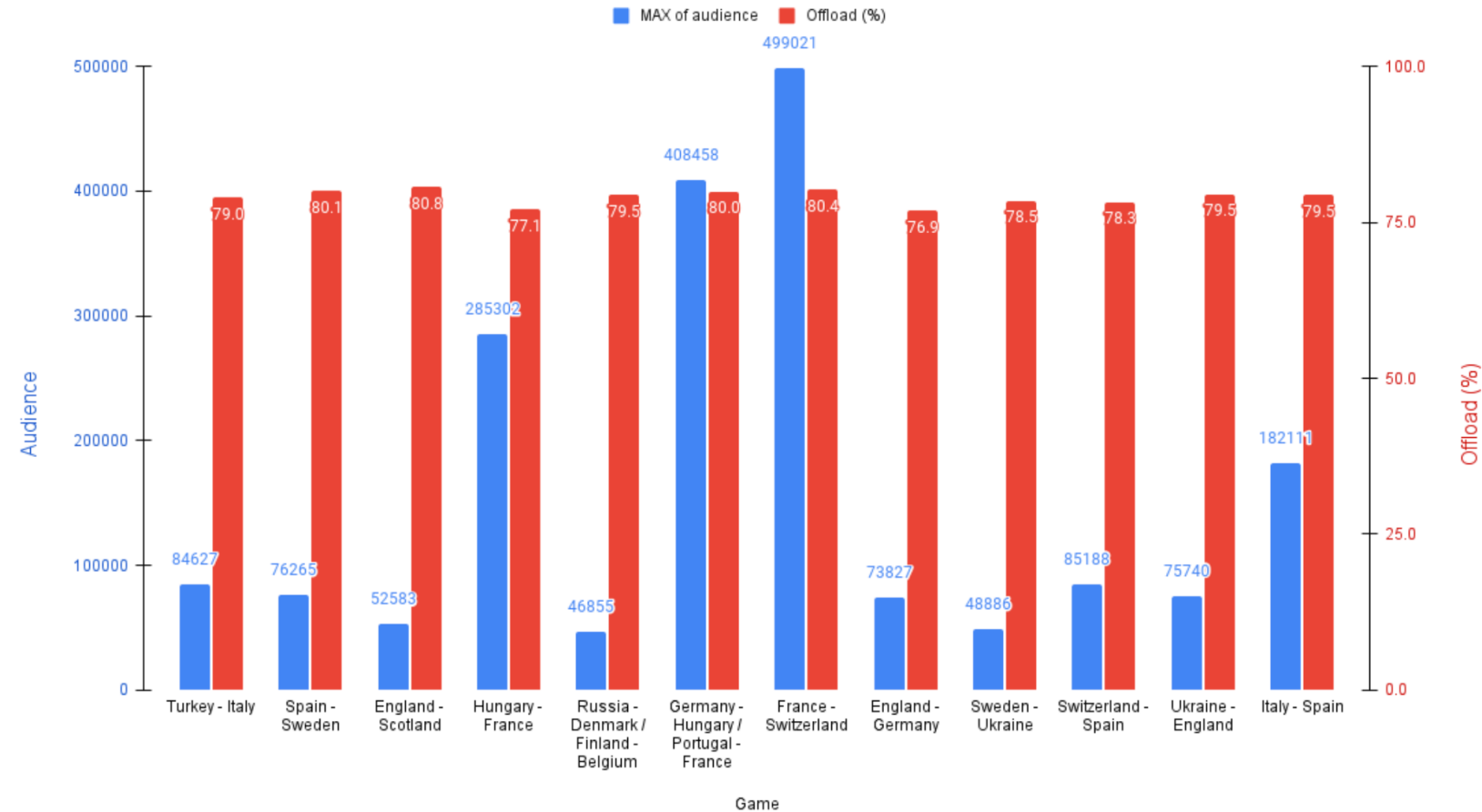


Greater scale – Dive into Euro 2021



80% of offload regardless of the number of viewers.

Mesh organically grows with the audience, bringing peace of mind & capacity where it is needed.

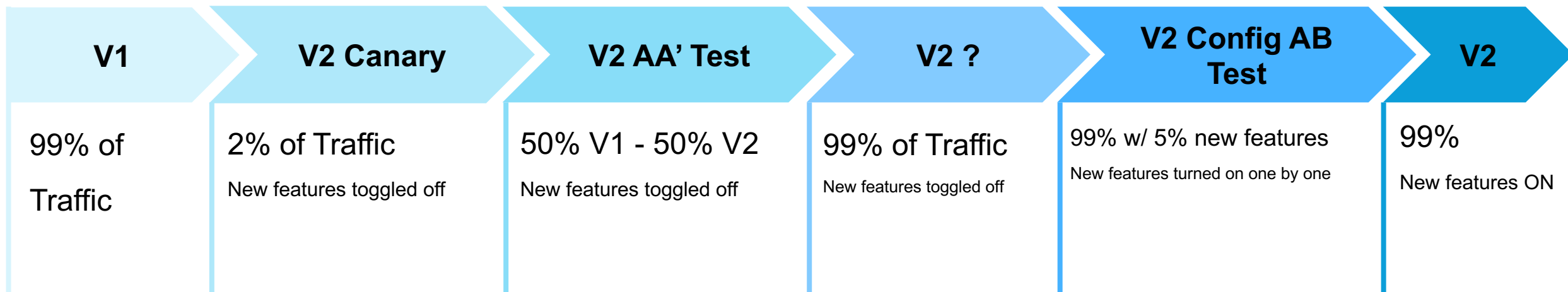


High performance

QOS impact for large scale events



AB testing methodology

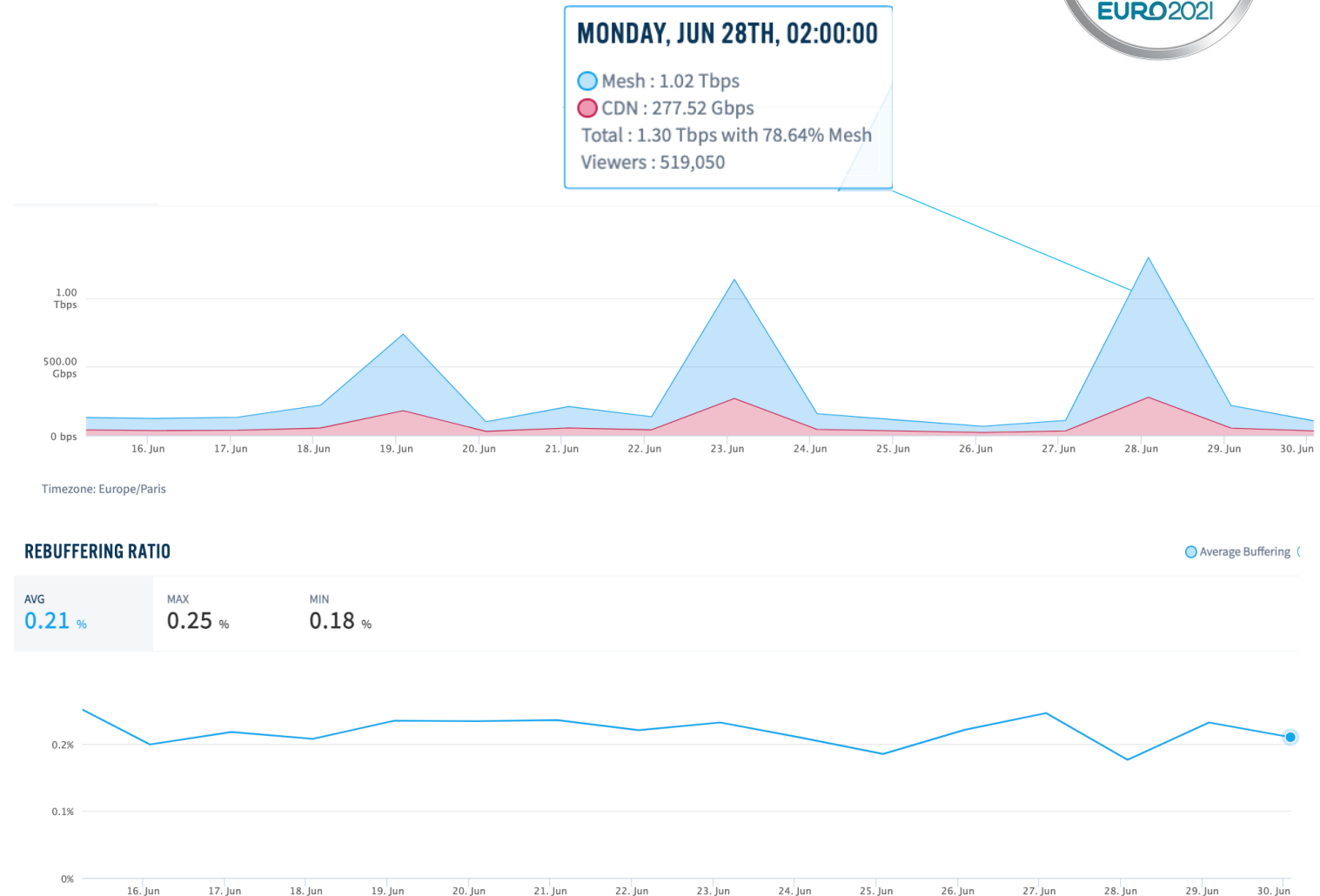


Combined with a detailed analytics pipeline, this methodology is what has led us to being fully transparent to TF1's end users.

Leveraging Mesh - high performance



Fast traffic ramp up doesn't
generate rebuffering increase



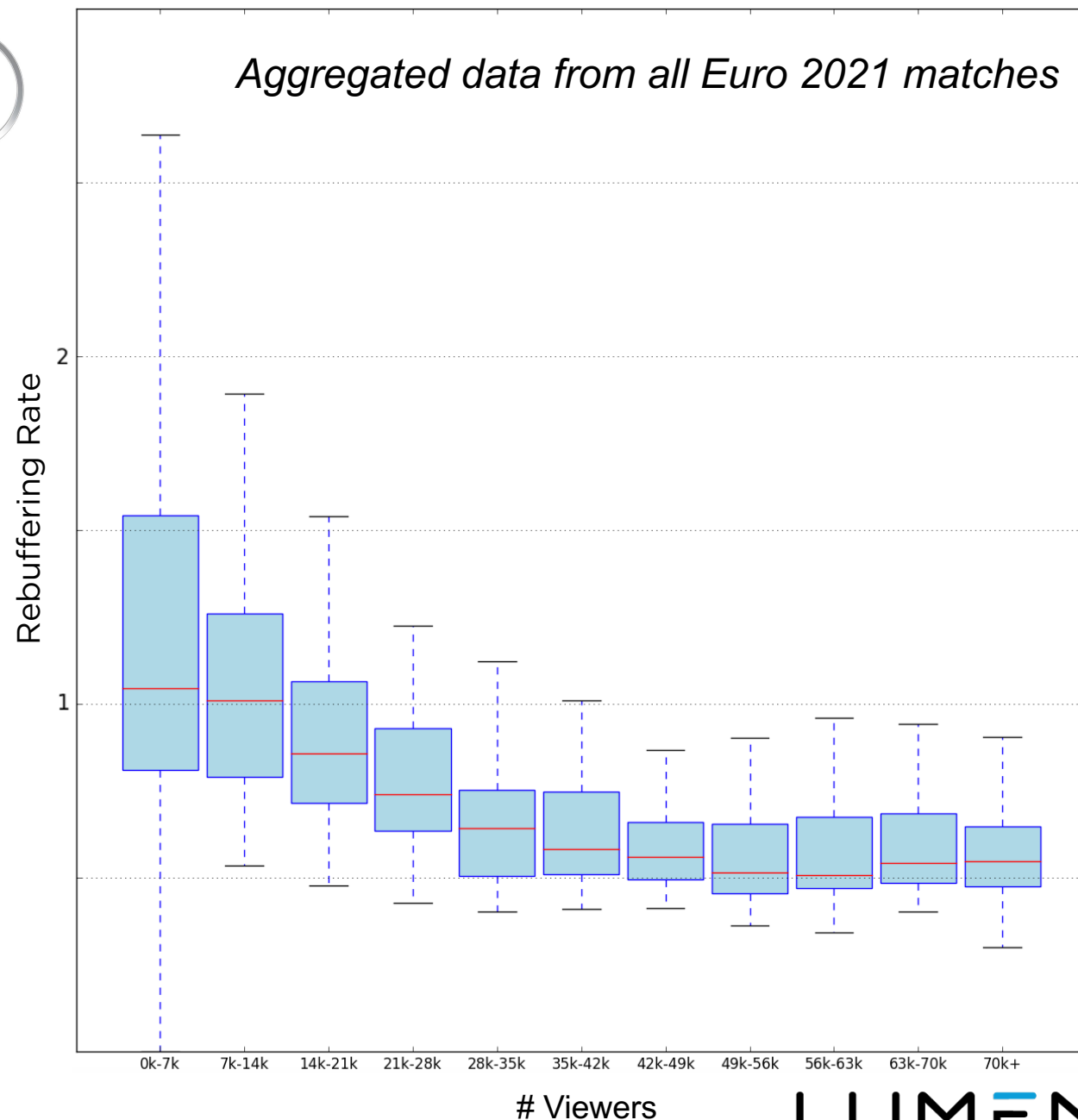
High performance



On the contrary!

**The more mesh users on a stream,
the lower the rebuffering rate.**

With a healthier network of viewers, it becomes
easier to ensure high connectivity between them.



High performance



1% of users with mesh deactivated to compare QOS metrics.

→ Shows stable QOS with lower track switching over the final stage matches of the Euro 2021

Status	# Data points	Buffering Ratio	Track Switch CPM avg	Avg Bitrate (Mbps)
With Mesh	65845488	0.20	0.21	4.63
Without Mesh	725449	0.21	0.31	4.63

Aggregated data for all Euro 2021 matches

High performance - player integration

ABR algorithms of video players are not designed to take into consideration P2P traffic.

To keep Mesh integration simple from broadcaster perspective & feed ABR algorithms with the right information, we have deep integration with all major video players.

This allows us to tune P2P bandwidth feedback for each video player & make sure we have a positive impact on QOS metrics.

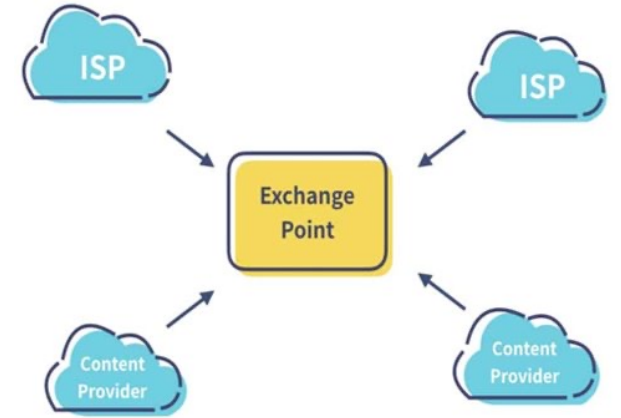
```
<video id="demoplayer"></video>
<script>
  var videoElement = document.getElementById('demoplayer');
  var shakaplayer = new shaka.Player(videoElement);
  var playerConfig = {};
  var dnaConfig = {};
  var wrapper = new ShakaPlayerDnaWrapper(shakaplayer, "YOUR_STREAMROO
  shakaplayer.configure(playerConfig);
  shakaplayer.load("YOUR_PLAYLIST_URL");
</script>
```

High Performance – ISP aware routing

Large sporting events can generate enough P2P traffic to saturate the peering points between ISPs & ISPs/CDNs, resulting in network congestion which affects end users QOS.

The challenges for the Mesh technology:

- Maximize connections between viewers of same ISPs or ASNs where bandwidth is plentiful
- Keep peering point congestion low
- Keep the offload from CDN and QoS as high as possible



High performance – ISP aware routing

Matching algorithms relies on many parameters coming from viewers among which:

- Content sharing: quality of the video track
- Content Sharing: playback position
- Connectivity: ISP & ASN
- Connectivity Geolocation

% of intra ISP P2P traffic during Euro 2021

95%

Avg for largest ISP

92%

Avg for the 5 largest ISPs

87%

Avg during max audience

Moving forward

Premium high bitrate offer launched
leveraging Mesh Delivery for high volume streams

Upcoming event based & **4k/UHD streams** addition to the OTT Catalogue

Major version of **Mesh Delivery SDK** targeting lower end STBs & mobile



LUMEN

Thank you!

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Check out <https://blog.lumen.com/> for more content!