WEBINAR

Preparing CDNs for a resurgence of live sports

15.30 London | 16.30 Paris | 10.30 New York

MODERATOR
Nick Snow
Advanced Television

PRESENTER
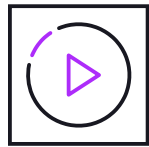**André Rosado**
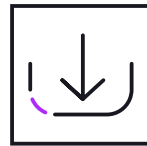CDN Product Manager, Velocix

VELOCIX EXTERNAL USE   1

VELOCIX™

The world's leading provider of carrier-grade content delivery and stream personalisation software
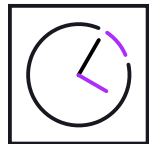
CDN
Efficiently distribute and stream video content

Origin
Record, store, and process video content

Recording Manager
Orchestrate time-shifted video applications
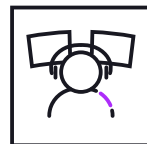
Personalisation Platform
Monetise and customise each individual stream
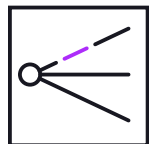
Multicast ABR
Optimise network utilisation for linear video services

Managed services
Save cost and boost QoE turnkey ops and maintenance

Some of our customers

vodafone

LIBERTY GLOBAL

sky

altice

Telefónica

TELUS

TalkTalk

Sports viewing during COVID-19

The dip and resurgence

TV viewership during COVID-19

Global impact of lockdown

60%

increase in the amount of video content watched globally during COVID-19 lockdowns*

- Quarantines resulted in a huge spike in news and entertainment viewing

- But sports viewership fell in Q2 2020 as sports events and tournaments were suspended worldwide
    - Reduced content monetisation opportunities
    - Decreased ARPU due to cancelled sports subscriptions and ads

TV engagement per person for 25 countries during COVID-19

*Nielsen

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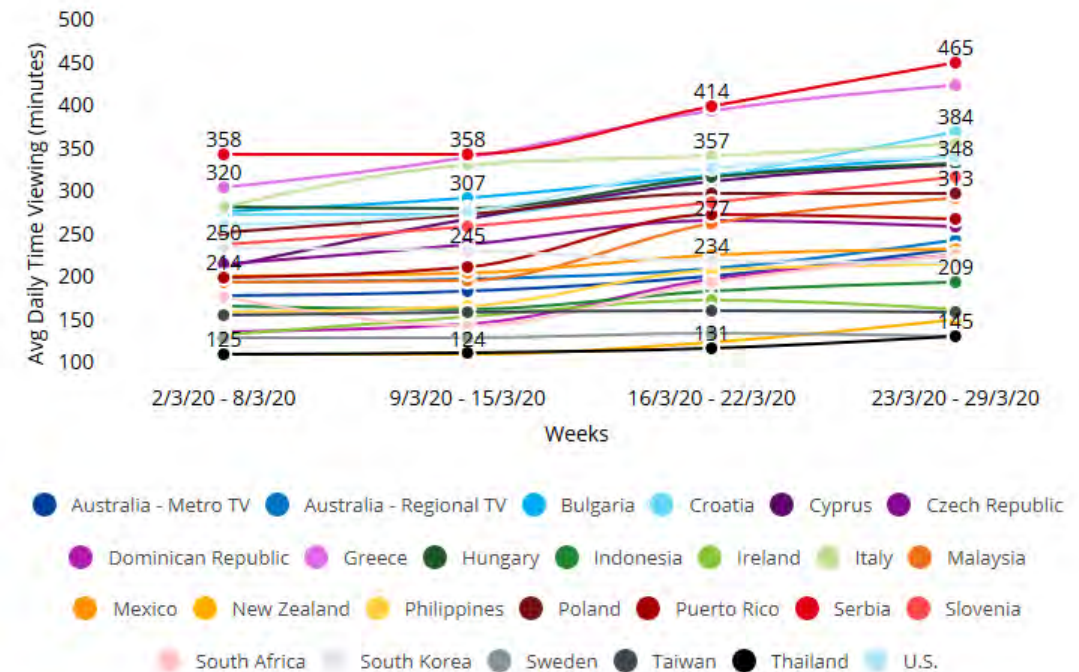
Pent up demand for live sports

LIVE SPORTS ATTITUDES

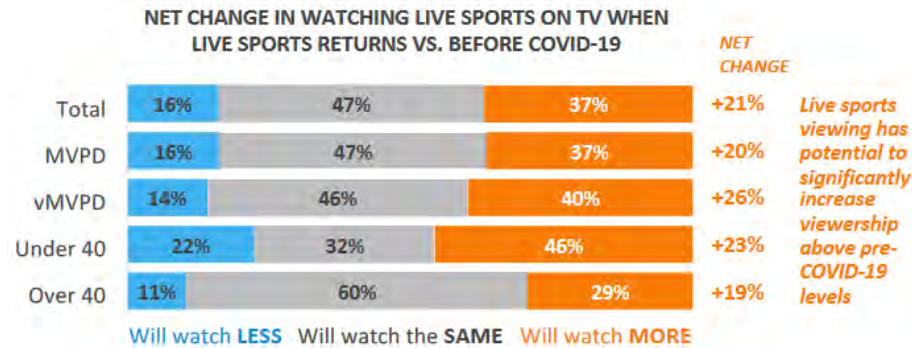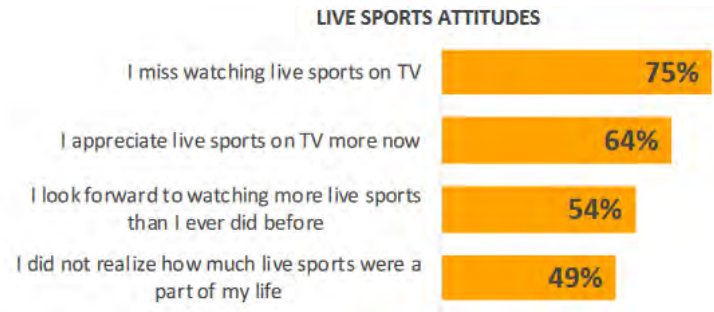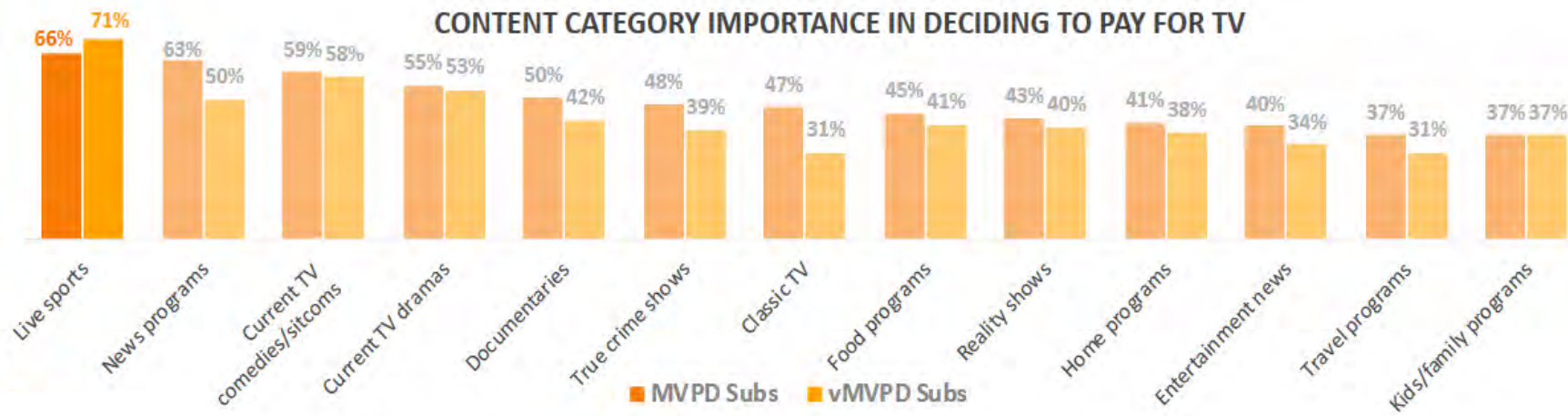| Attitude	Percentage
I miss watching live sports on TV	75%
I appreciate live sports on TV more now	64%
I look forward to watching more live sports than I ever did before	54%
I did not realize how much live sports were a part of my life	49%

NET CHANGE IN WATCHING LIVE SPORTS ON TV WHEN LIVE SPORTS RETURNS VS. BEFORE COVID-19

	Will watch LESS	Will watch the SAME	Will watch MORE	NET CHANGE
Total	16%	47%	37%	+21%
MVPD	16%	47%	37%	+20%
vMVPD	14%	46%	40%	+26%
Under 40	22%	32%	46%	+23%
Over 40	11%	60%	29%	+19%

Live sports viewing has potential to significantly increase viewership above pre-COVID-19 levels

21%

Projected growth in live sports viewership vs. pre-COVID levels

CONTENT CATEGORY IMPORTANCE IN DECIDING TO PAY FOR TV

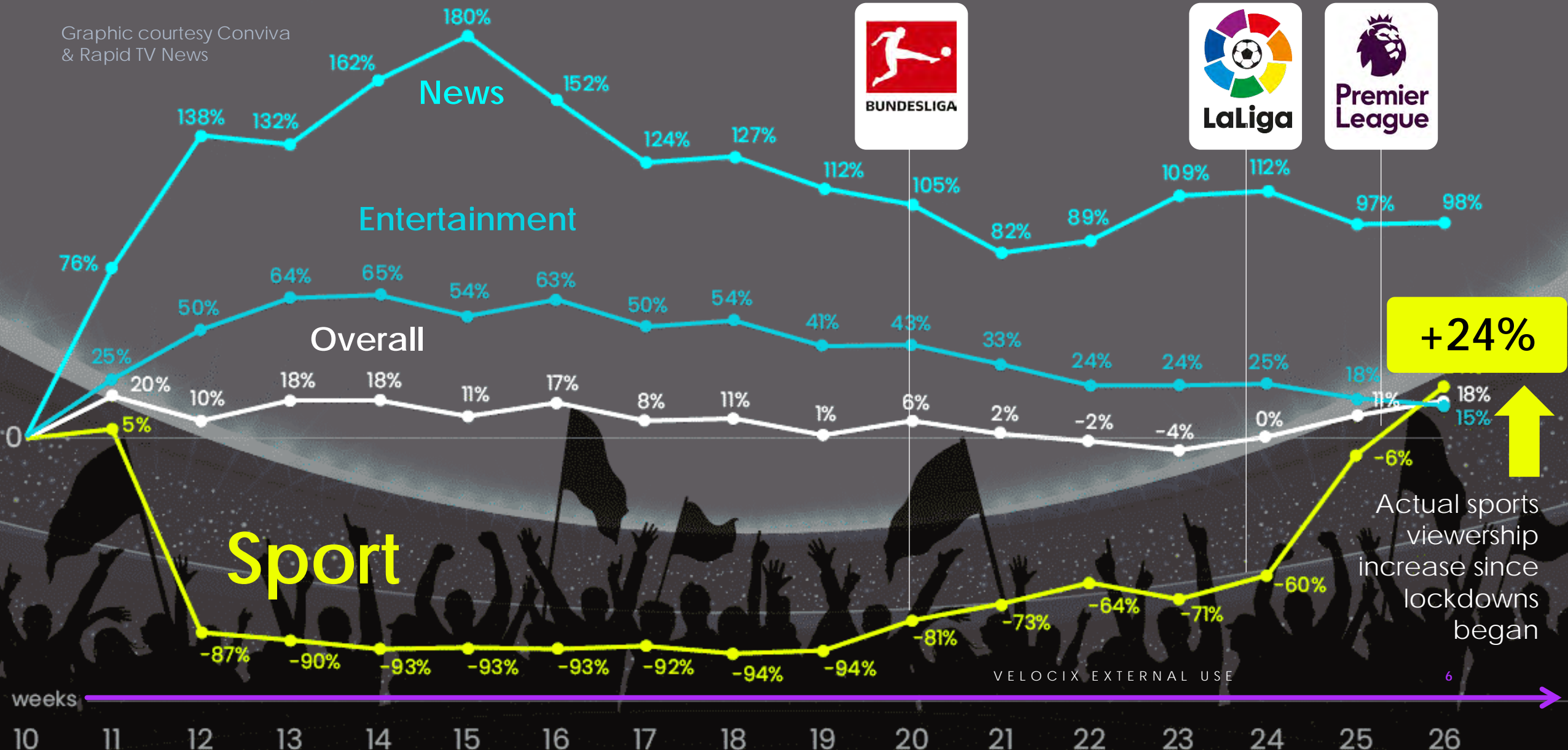| Category	MVPD Subs	vMVPD Subs
Live sports	66%	71%
News programs	63%	50%
Current TV comedies/sitcoms	59%	58%
Current TV dramas	55%	53%
Documentaries	50%	42%
True crime shows	48%	39%
Classic TV	47%	31%
Food programs	45%	41%
Reality shows	43%	40%
Home programs	41%	38%
Entertainment news	40%	34%
Travel programs	37%	31%
Kids/family programs	37%	37%

>2/3rds

of subs said live sports were important to their Pay TV decision

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The dip and recovery of sports viewing in Europe

Graphic courtesy Conviva & Rapid TV News

News

Entertainment

Overall

Sport

+24%

Actual sports viewership increase since lockdowns began

News values: 76%, 138%, 132%, 162%, 180%, 152%, 124%, 127%, 112%, 105%, 82%, 89%, 109%, 112%, 97%, 98%

Entertainment values: 25%, 50%, 64%, 65%, 54%, 63%, 50%, 54%, 41%, 43%, 33%, 24%, 24%, 25%, 18%, 11%

Overall values: 20%, 10%, 18%, 18%, 11%, 17%, 8%, 11%, 1%, 6%, 2%, -2%, -4%, 0%, 11%, 18%, 15%

Sport values: 5%, -87%, -90%, -93%, -93%, -93%, -92%, -94%, -94%, -81%, -73%, -64%, -71%, -60%, -6%, 18%

weeks: 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

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6

North American market

Strong uptick in sports viewership

*" There have been days when sports viewing has been up **100%** to **150%** over comparable dates last year."*

- Mike Mulvihill
  EVP Research & League Operations at Fox Sports commenting on US sports viewership over the summer

As published in the LA Times

+29% Viewership growth for ESPNs national telecasts of MLB

+60% NHL viewership growth post versus pre-pandemic

LA Times

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More live sports events to come

Monetisation opportunities will grow with the return of these high-profile events

Sept 5 2020

Feb 6 2021

June 11 2021

July 23 2021

Delivering a better fan experience

Gaining a competitive edge during the upturn

Strengthening social interaction

Lowering latency to boost the fan experience

- These days, live viewing is often enhanced with 2nd screen chat apps and social media, enabling viewers to connect with other fans and friends

- Consumers must experience key events in live programming at the same time to sustain a satisfying shared experience

Reduced stream latency is required to align with social media latency signatures

(Broadcast equivalent latency or better)

"Low latency into homes is a compelling proposition to capture fans' reactions quicker in real-time, particularly in the absence of live crowds in stadiums"

John Cave, VP of Football Technology, NFL
- CSI

Burst in social media engagement with La Liga when it resumed in June 2020

LaLiga
20,7 M

Premier League
5,6 M

NBA
1,2 M

BUNDESLIGA
1,3 M

SERIE A
1,8 M

Blinkfire Analytics

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Bulletproof stream quality and performance

Streaming issues that occur during major sporting events are a proven source and preventable cause of subscriber losses.

Seamless scaling during major events

Streaming must scale quickly to support demand, while ensuring that costs are minimized

Answer: Hybrid cloud CDN solutions

Safeguarding video network quality

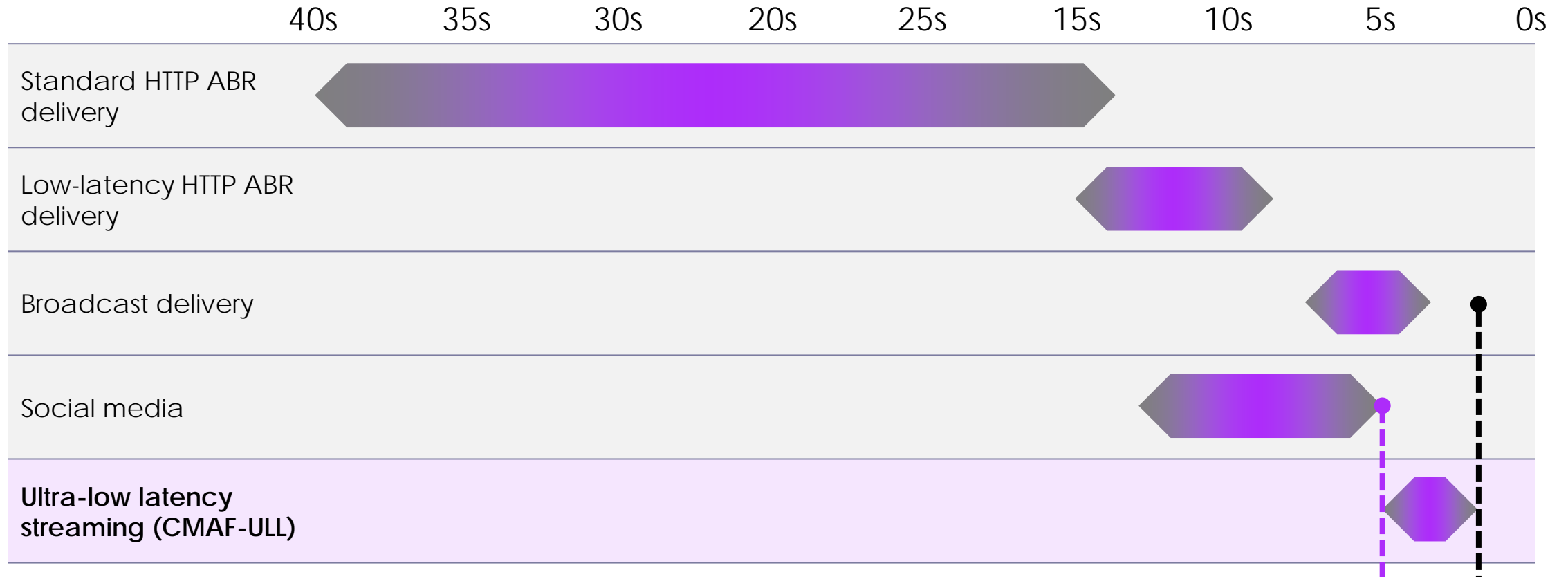Quality of service issues must be identified and fixed quickly, before the customer viewing experience is affected

Answer: Event-based monitoring

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Delivering Ultra-low latency

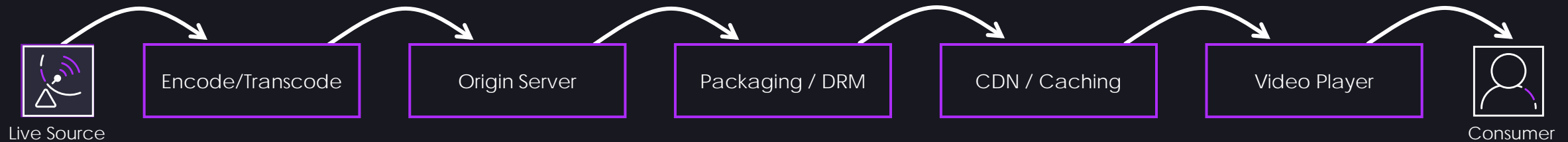## Bridging the live latency gap across screens

Latency spectrum

	40s	35s	30s	20s	25s	15s	10s	5s	0s

Standard HTTP ABR delivery

Low-latency HTTP ABR delivery

Broadcast delivery

Social media

Ultra-low latency streaming (CMAF-ULL)

Ultra low-latency streams arrive before social media posts

Ultra-low latency is similar or better than broadcast equivalent latency

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Latency in Standard HTTP ABR Delivery

Sources of Latency in the Streaming Workflow

Latency is introduced at many stages in the content delivery workflow

Live Source → Encode/Transcode → Origin Server → Packaging / DRM → CDN / Caching → Video Player → Consumer

Buffering

Data is temporarily stored in physical memory during various steps in the workflow to safeguard stream reliability and quality.

Data Communications

Systems must wait for full ABR segments to be built, transmitted, and received before relaying information onward or taking next steps.

Processing

Video processing during the content distribution process, such as transcoding, packaging, or content encryption, can cause delays.

Encoding (ABR Segment Size)

ABR segment size affects buffer, communication, and processing delays. Longer segments increase the delays in the workflow.

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Reducing Stream Latency for Live Video

Taking a Balanced Approach
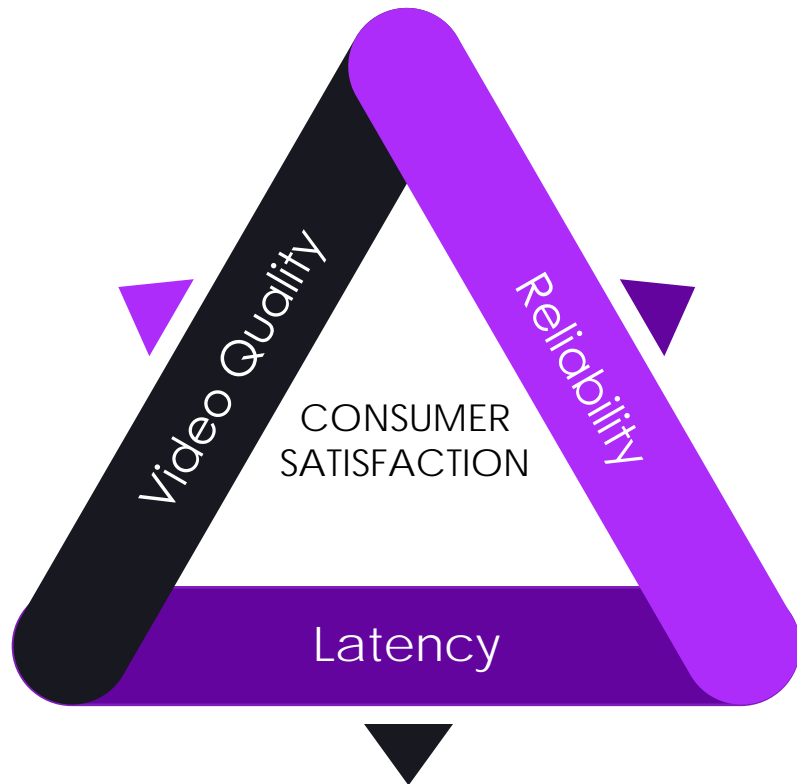
- Reducing latency means carefully tuning each component in the content delivery workflow.

- A balanced approach is required to improve stream latency for live HTTP ABR content.

- Reducing stream latency can have a negative effect on video quality and stream reliability.

- Consumer satisfaction is highest when all three factors are optimized in harmony.

ULL-CMAF: Leveraging CMAF to enable Low-Latency
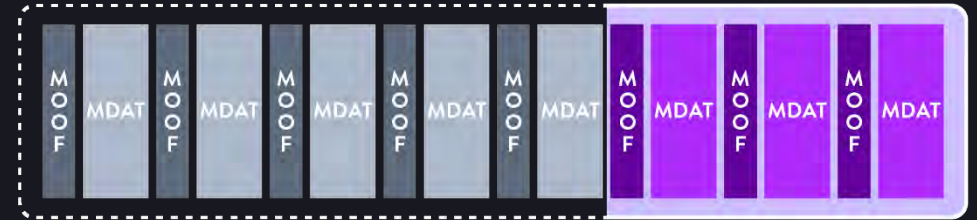
CMAF: traditional Fragmented MP4 Segment
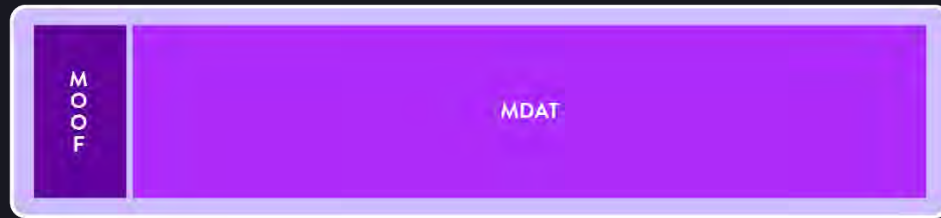
Each workflow element waits until the full segment is complete before relaying it downstream.

Workflow from encoder to video player

Ultra-Low Latency CMAF: Chunked CMAF Segment
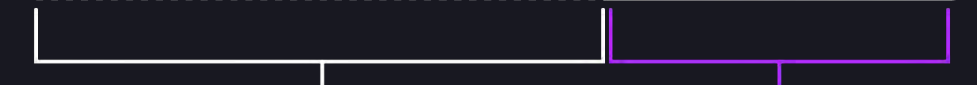
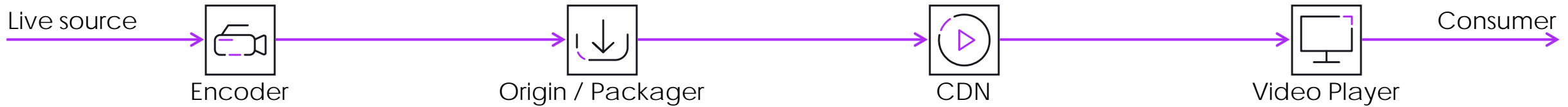Chunks not yet encoded   Encoded chunks

Workflow from encoder to video player

Ultra-low Latency CMAF enables one asset to support every consumer device

Compatible with MPEG-DASH & HLS formats + UHD latest standards (4K, HDR)

ULL-CMAF: key deployment considerations

Live source → [Encoder] → [Origin / Packager] → [CDN] → [Video Player] → Consumer

Practical issues for live sports

- CDN scalability – based on existing delivery architectures for HTTP ABR

- CDN caching efficiency - inherits the caching capabilities for video delivery efficiency and network protection

A holistic approach

The drive to decrease content delivery latency needs to take account of requirements of other key workflows:

- Content Protection (DRM)

- Monetising via programmatic TV advertising

Multi-vendor ecosystems

Interoperability and flexibility

- CMAF is defined by MPEG and HTTP 1.1

  – It does not rely upon custom protocols or proprietary systems of encoders and players

- Video technical standards allow business evolution while maintaining interoperability and flexibility in an **open multi-vendor ecosystem**

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Adoption of ULL amongst webinar registrants

Ultra-low Latency is already a priority in the industry

Already migrated 20%

Not yet 34%

Planning to migrate 46%
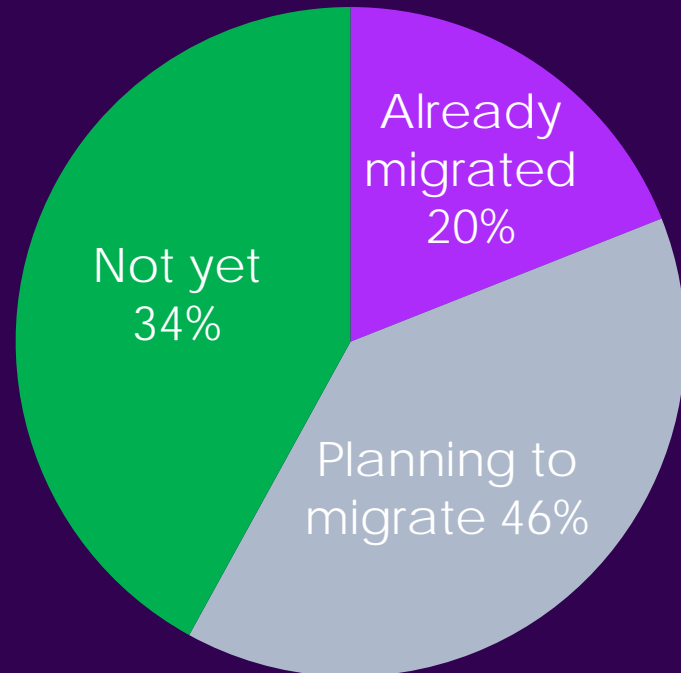
Data excludes 'Not applicable' registrants

"High delay compared to traditional broadcast sources can prevent many consumers from accessing live streaming."

Khin Sandi Lynn
ABI Research

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Elasticity for Peak Demand

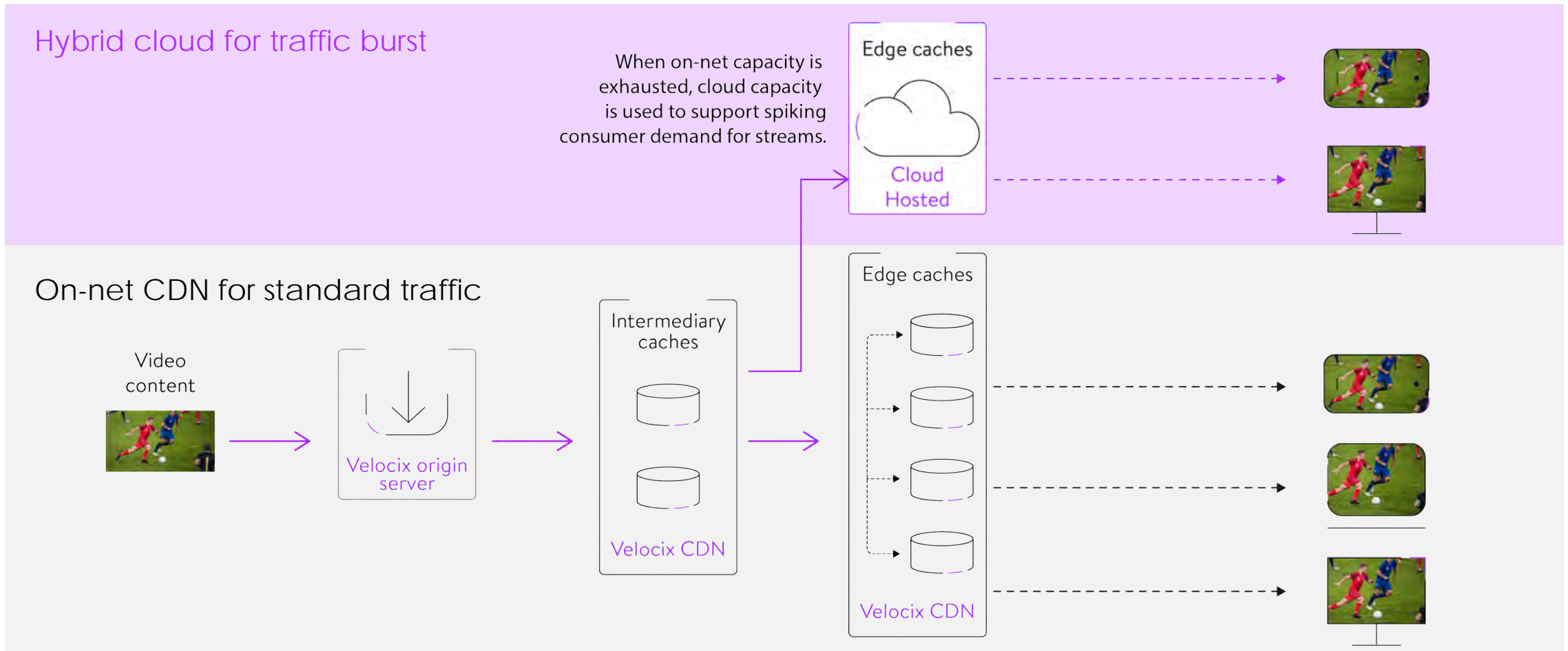## Hybrid CDNs for scaling needs

Delivering quality viewing

Even during peaks of maximum demand

- Major live events can cause unexpected traffic demands that far exceed normal traffic levels

- If operators do not have enough CDN capacity to match the bursts, there can be unfulfilled requests and poor performance

- Unfortunately, these failures can be very high profile, and also lead to subscriber churn
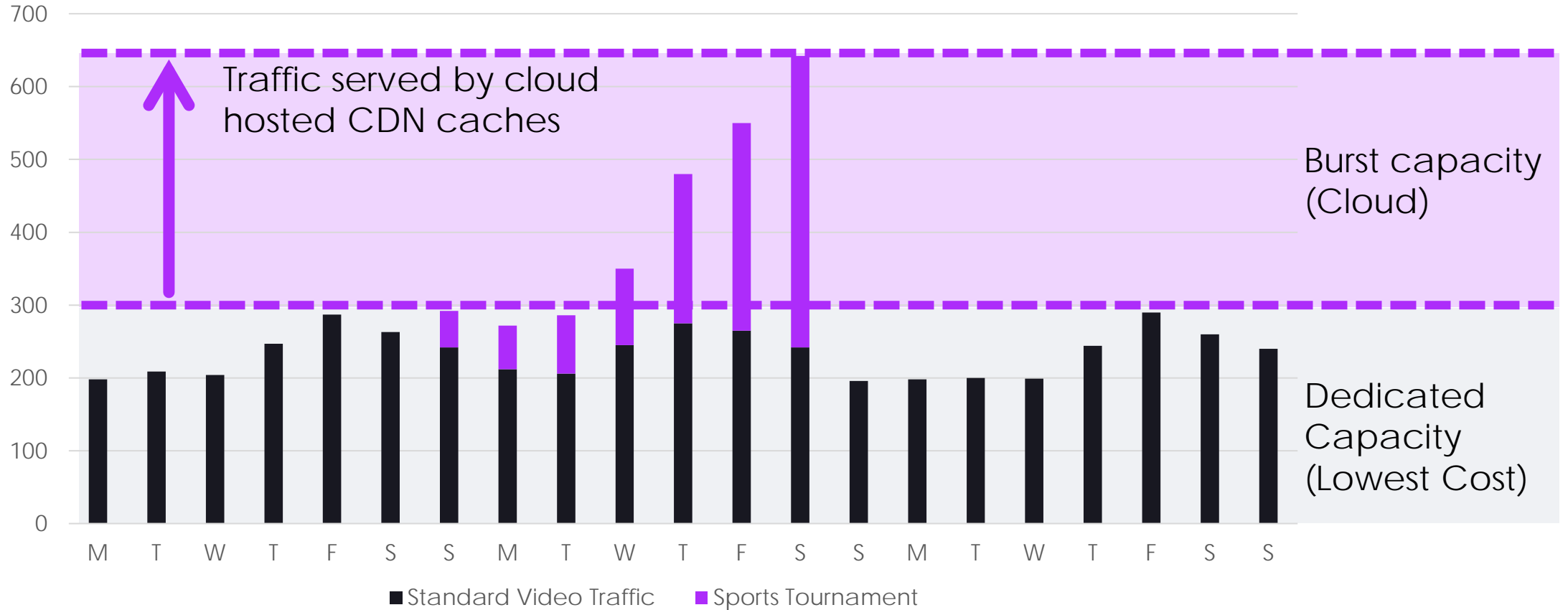
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Elastic scaling with hybrid cloud architectures

## Use case: streaming live events

Hybrid cloud for traffic burst

When on-net capacity is exhausted, cloud capacity is used to support spiking consumer demand for streams.

Edge caches

Cloud Hosted

On-net CDN for standard traffic

Video content

Velocix origin server

Intermediary caches

Velocix CDN

Edge caches

Velocix CDN

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Hybrid cloud

Scaling out for live events according to business rules

Traffic served by cloud hosted CDN caches

Burst capacity (Cloud)

Dedicated Capacity (Lowest Cost)

■ Standard Video Traffic   ■ Sports Tournament

Elastic CDN

Dynamic resource allocation to meet demand

- As subscribers increase, an orchestrator spins up more caches based on CDN headroom
- Additional capacity is activated before the max capacity is reached

Orchestration

Headroom API

Delivery PoP

70% capacity

Cache load

amazon
web services
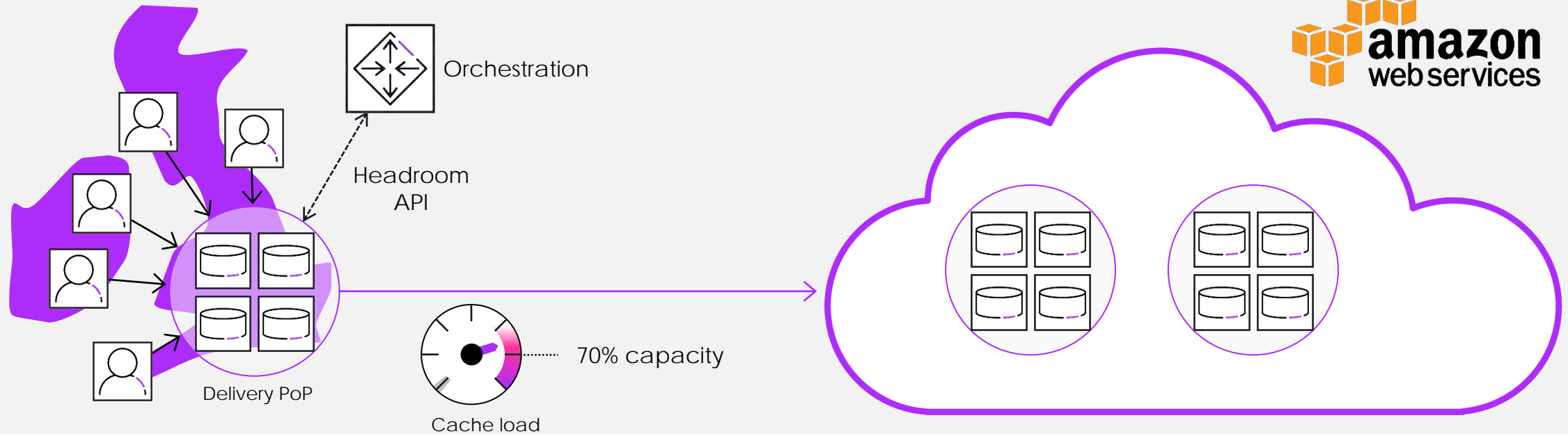
Elastic CDN allocates capacity dynamically
to meet peaks in traffic demand

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Auto-scaling hybrid cloud CDNs

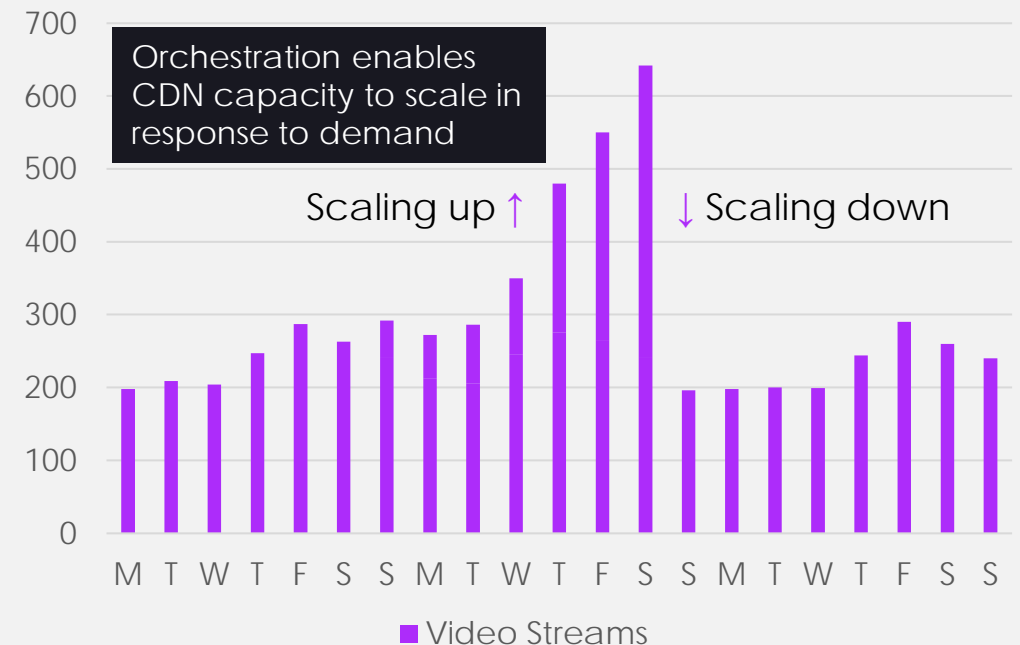## Orchestrating containers with Kubernetes

- Kubernetes is an open-source platform for managing containerized workloads & services
- Automates the processes involved in deploying, managing, and scaling containerised applications

Features

- Orchestrates containers across multiple hosts
- Maximises utilisation of hardware resources and balances load
- Scales containerised applications and resources on-demand
- Monitors software health and self-heals apps

### Daily Peak Stream Demand
Sports Event Finals

Orchestration enables CDN capacity to scale in response to demand

Scaling up ↑   ↓ Scaling down

■ Video Streams

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Safeguarding video network quality

Event-based monitoring and managed services

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Safeguarding quality

Optimising fan's viewing experiences

- Live sports events are very high profile – everyone is watching.
  - Stream quality must be flawless.

- **Event-based Monitoring** is an insurance policy to protect against streaming issues.

- Managed services experts can help operators before, during, and after live events to safeguard the video network.

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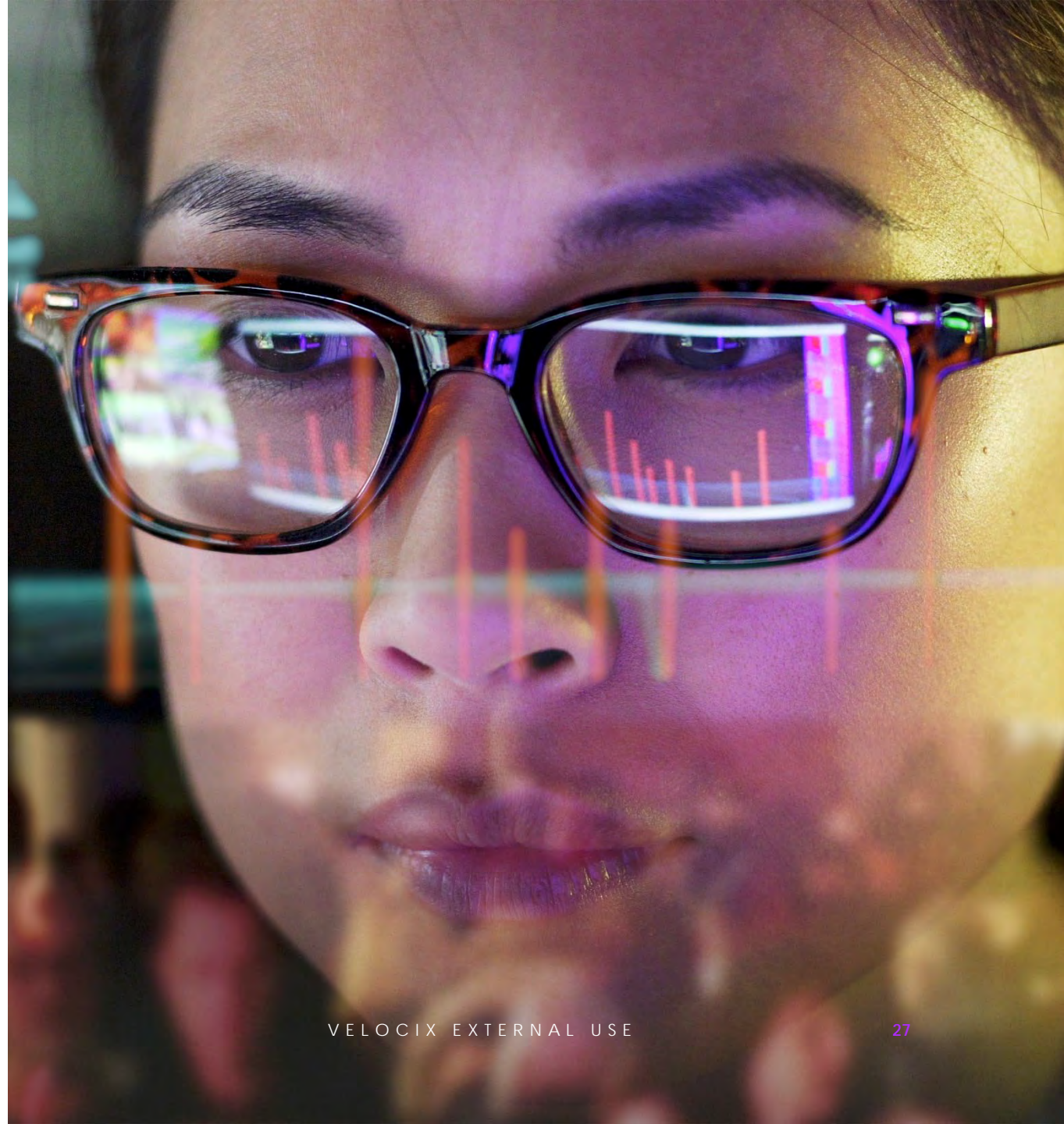
Higher QoS
and Lower Risk

Expert attention around the clock

Prevent issues from occurring

- Data-driven analysis

- Proactive health checks

- Anticipation and mitigation of potential problems

Reduce issue resolution times

- Expert-level attention

- Constant analysis of your network

- Rapid response teams

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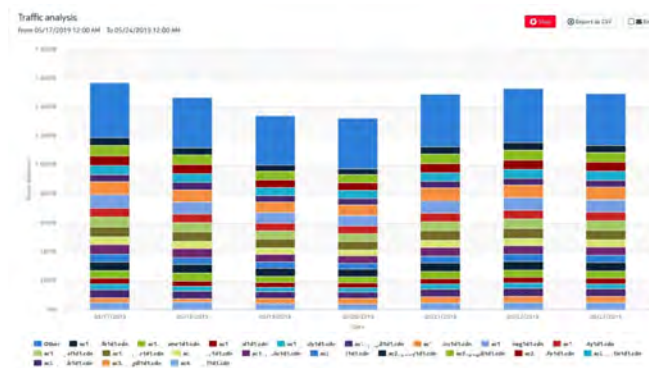# Strengthen QoS and gather business intelligence

Capacity analysis

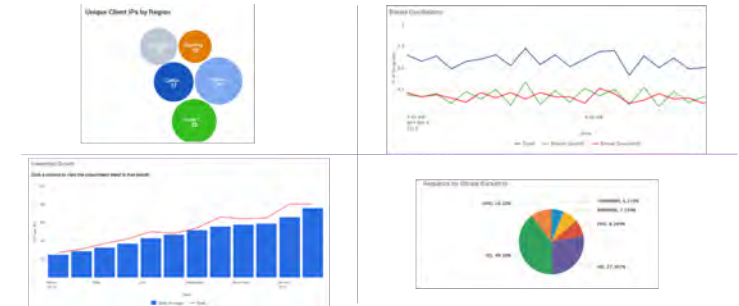Sophisticated real-time analysis of capacity requirement prevents bottlenecks

Traffic analysis

Traffic trends monitored to maintain network balance & ensure QoS

Subscriber analysis

Bitrate variation metrics identify quality problems

Device & platform stats deliver insights for commercial teams

Before live event

Predictive Maintenance

- Headroom Analysis for standard traffic
- Forecast reqs/sec spike around start - effect of channel change at the beginning & commercial breaks
- Assigning resources to scale out on demand

Proactive Maintenance

- Focused Request Routing configurations for fine tuning system for traffic burst
- Apply more conservative cache efficiency settings to better handle req/sec - without saturating origin, using tiered caching architectures
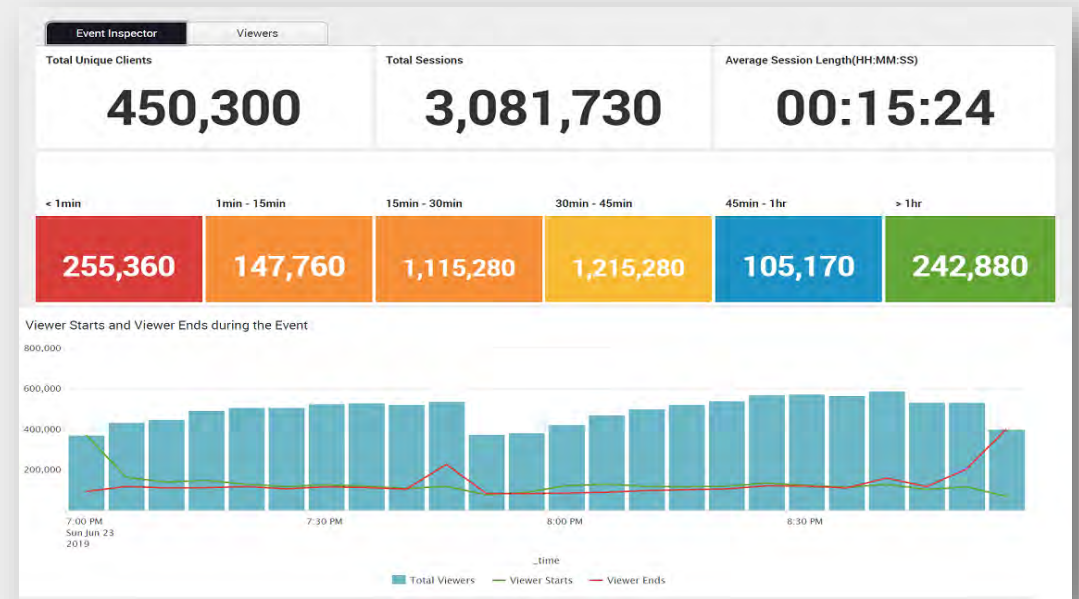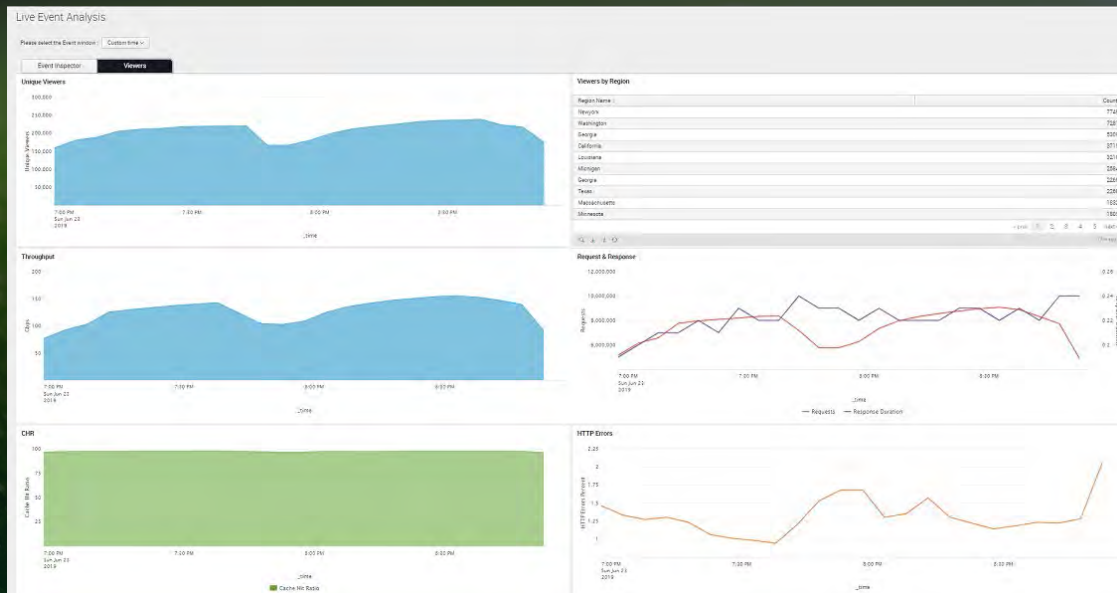- For burst capacity, "pre-warm" system

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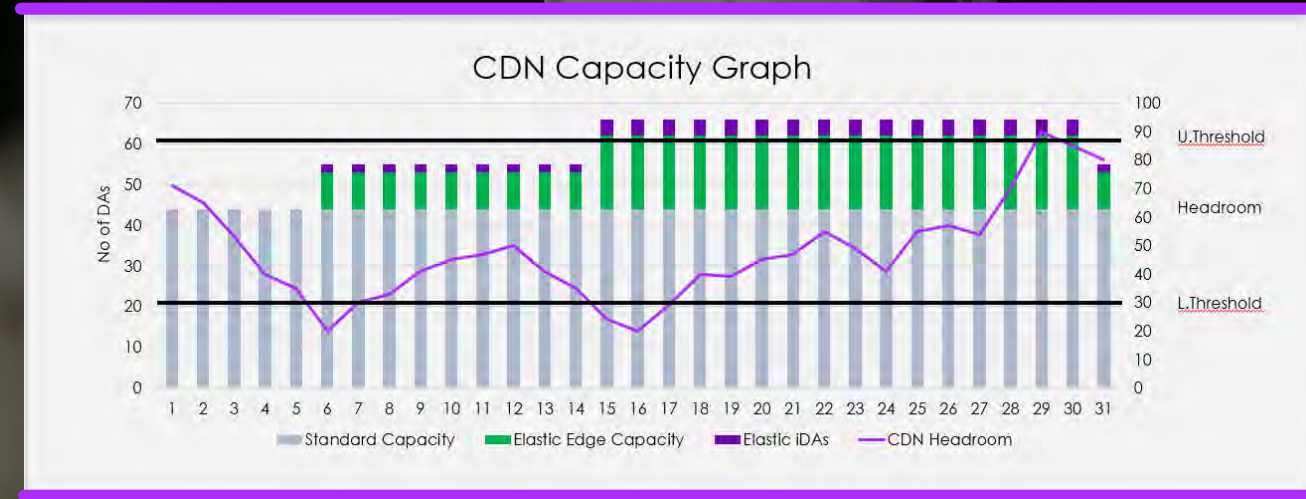
During live event

- Monitor 24 x 7 and provide expedited responses in the event of issue
- Developers on-call
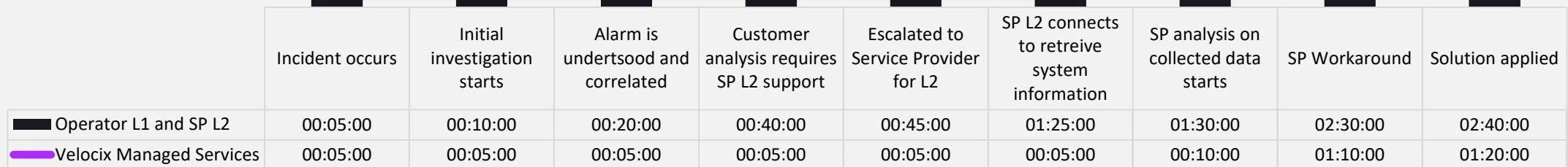
After live event

- Reports provided summarising viewership metrics, utilisation & encountered issues
- Recommendations provided for future events

Cut incident resolution **in half** with event-based monitoring

Get immediate access to technical experts

CUMULATIVE TIME

	Incident occurs	Initial investigation starts	Alarm is undertsood and correlated	Customer analysis requires SP L2 support	Escalated to Service Provider for L2	SP L2 connects to retreive system information	SP analysis on collected data starts	SP Workaround	Solution applied
Operator L1 and SP L2	00:05:00	00:10:00	00:20:00	00:40:00	00:45:00	01:25:00	01:30:00	02:30:00	02:40:00
Velocix Managed Services	00:05:00	00:05:00	00:05:00	00:05:00	00:05:00	00:05:00	00:10:00	01:10:00	01:20:00

Important takeaways

Preparing CDNs for a resurgence of live sports

Preparing CDNs for a resurgence of live sports

- Transitioning to ultra-low latency can boost the fan experience and deliver a powerful competitive edge as social connectivity grows in importance.

- Hybrid cloud CDN solutions can offer cost-effective, elastic scaling for live events while controlling on-going costs.

- Event-based monitoring can be critical for showpiece events to anticipate and address issues before they escalate – ensuring consumers receive the best quality service.

V E L O C I X ™

Thank you

andre.rosado@velocix.com