

AWS re:Invent

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NET312

HBO Max achieves scale and performance with Amazon CloudFront

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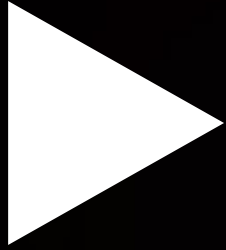


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Agenda

- Amazon CloudFront network for a high Quality of Experience
 - Optimize your delivery configuration
 - Test your media delivery settings
 - Live Event and premiere release support
- HBO Max journey with Amazon CloudFront
 - HBO Max multi-CDN traffic management
 - HBO Max House of the Dragon ready for scale
 - HBO Max - what's next?

60 years of the Play button...



The user Quality of Experience factors

- Video Start Success rate
- Continuous Video Play Success Rate
- Player Buffer rate Errors



_____ 1960's



_____ 1980's



_____ 1990's



_____ 2000's



_____ 2020's

Global edge locations

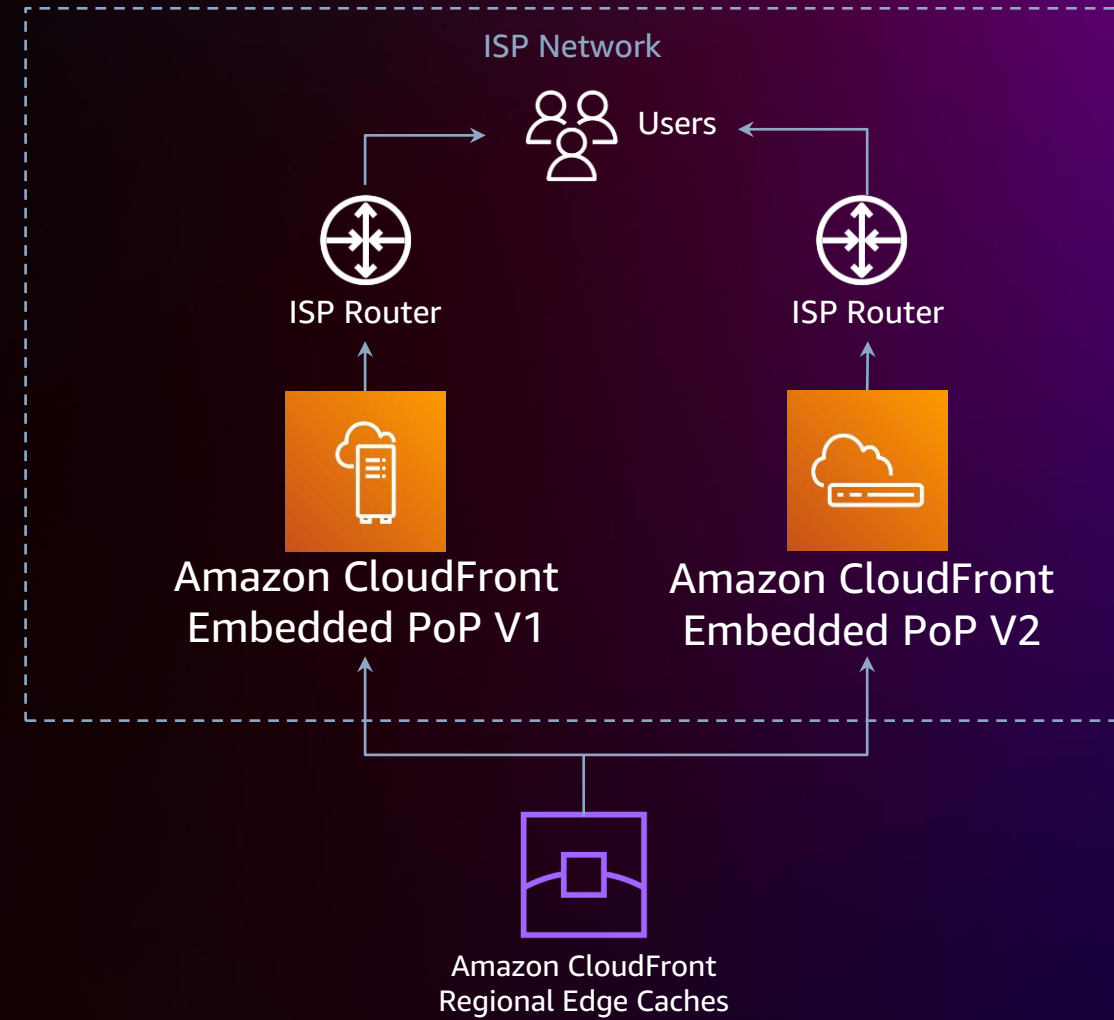
Amazon CloudFront has over
450 points of presence,
13 regional edge caches across
90+ cities in 48 countries



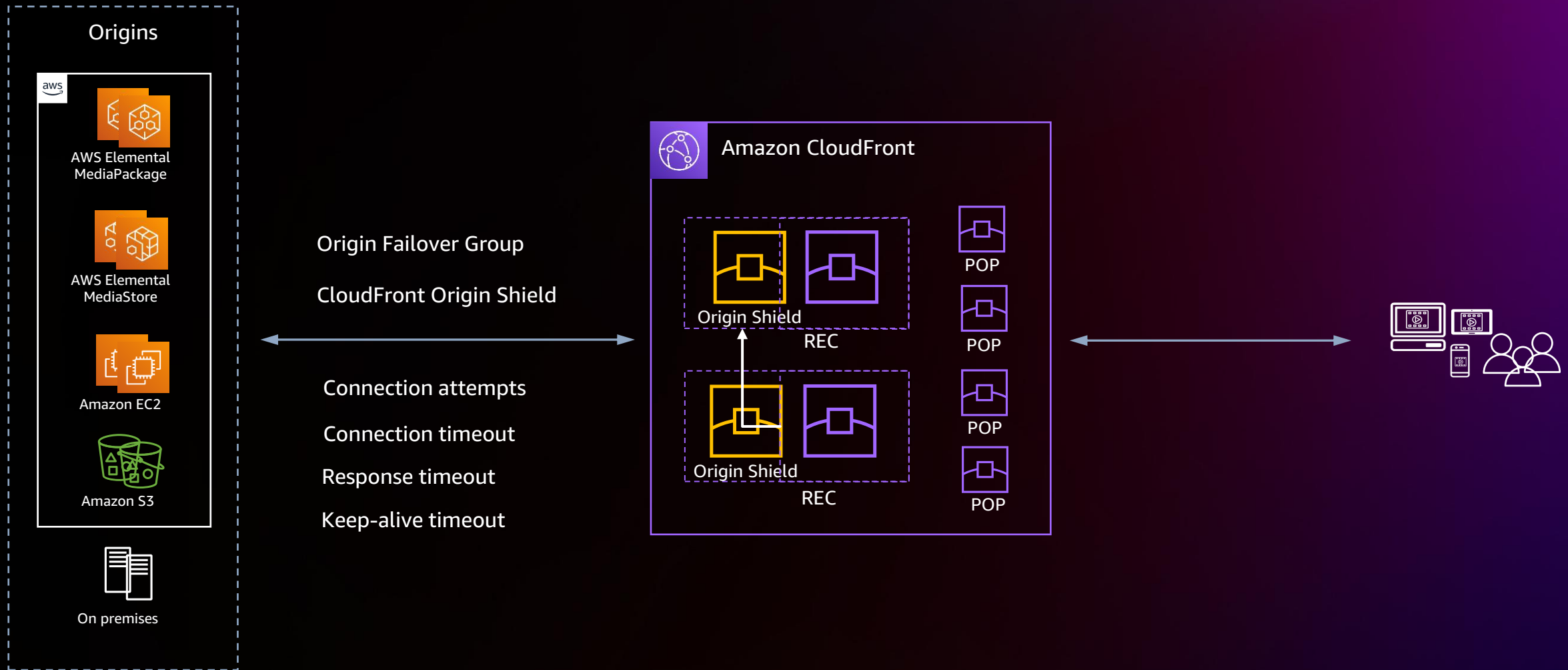
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Closer to your viewers with embedded PoP V2

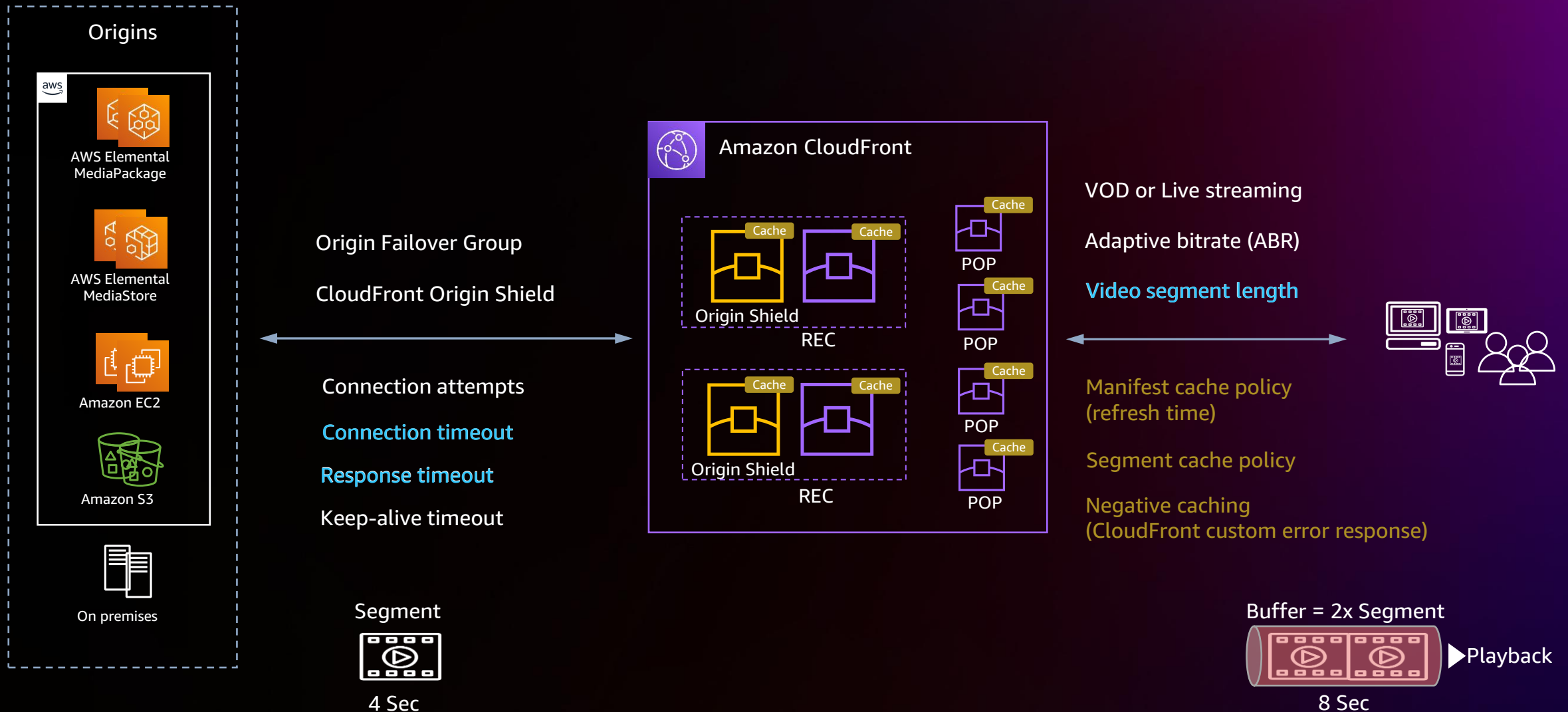
- Increased Scale
 - Launched 220+ CloudFront Embedded PoPs V2
- Improved Performance
 - Improvement in First Byte Latency
- Improved traffic offload
 - Extended footprint across ISPs
 - Peak traffic live streaming, game download, popular VOD



Configure for end-to-end high availability



Optimize delivery for high quality of experience



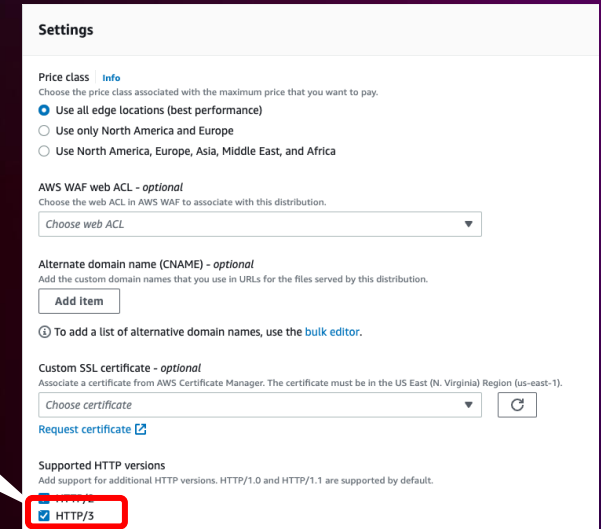
Lower latency streaming over HTTP/3 and QUIC

- HTTP/3 – the third major version of the HTTP standard
- Uses Quick UDP Internet Connections (QUIC) transport protocol

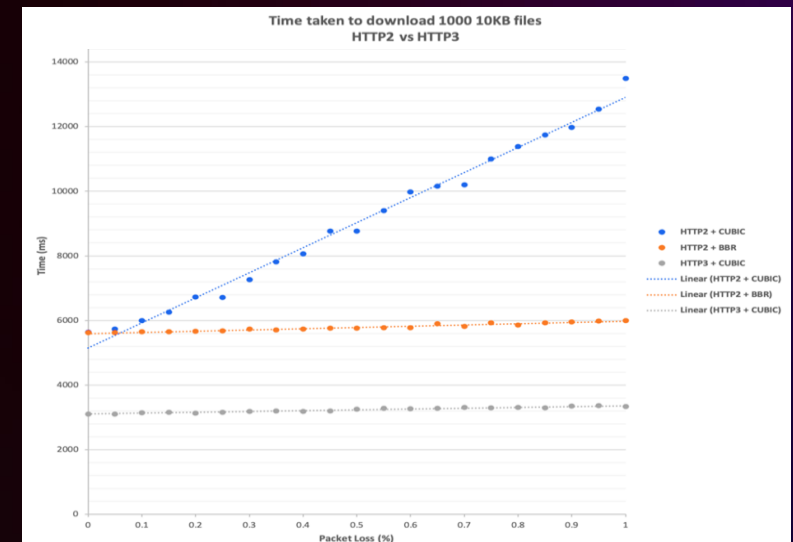
Performance benefits:

- Faster connection setup (Lower latency)
- Improved packet loss recovery (less re-buffer)
- Multiplexed streams
- Connection migration (Video streaming on the go)
- Encrypted – TLS 1.3

Enable HTTP/3 in your CloudFront Distribution Settings



The screenshot shows the 'Settings' tab for a CloudFront distribution. Under 'Supported HTTP versions', the 'HTTP/3' checkbox is checked and highlighted with a red box. Other settings visible include 'Price class' set to 'Use all edge locations (best performance)', 'AWS WAF web ACL' set to 'Choose web ACL', and 'Alternate domain name (CNAME)' set to 'Add item'.



Edge compute for media delivery workflows



Lambda@Edge

For complex, longer running functions

- **Streaming manifest manipulation**
 - Insert ads into a manifest or secure streams by adding security tokens to segments creating a personalized manifest for each viewer
- **Invoke transcoding jobs**
 - Call AWS Elemental MediaConvert API to initiate a transcoding job
- **Send client side player metrics to traffic analysis system**
 - Parse client side metrics from request headers or query strings and send to traffic logging/analysis system



CloudFront Functions

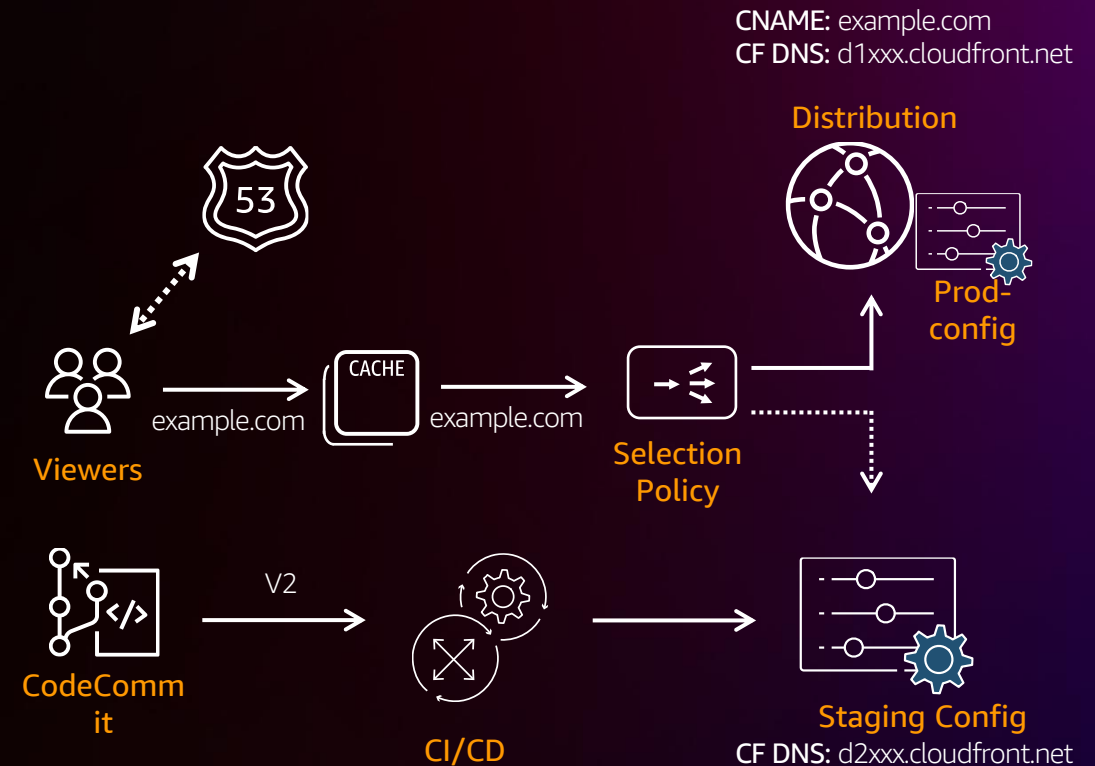
For latency-sensitive functions

- **Viewer request token validation**
 - Validate access token based on claims correlated to request parameters and expiry
- **Obfuscate content URL (rewrite)**
 - Rewrite URL to correlate viewers to specific content, and hide actual url to origin
- **HTTP header manipulation based on content type**
 - Configure security headers, CORS etc. to be sent downstream
- **Redirects at the edge**
 - Manage large volume of HTTP 301/302 responses to provide operational simplicity

Test your configuration for optimal delivery

- Use production CNAME and/or CloudFront DNS name (dname) to route requests to staging.
- Rules to split traffic: e.g. header, client IP or % traffic
- Promote staging distribution to production – no severed viewer connection, no changes to DNS, no loss of cache
- View & compare same reports and metrics using CloudWatch. Metrics include error rates, latency, and traffic split.

Continuous deployment on Amazon CloudFront

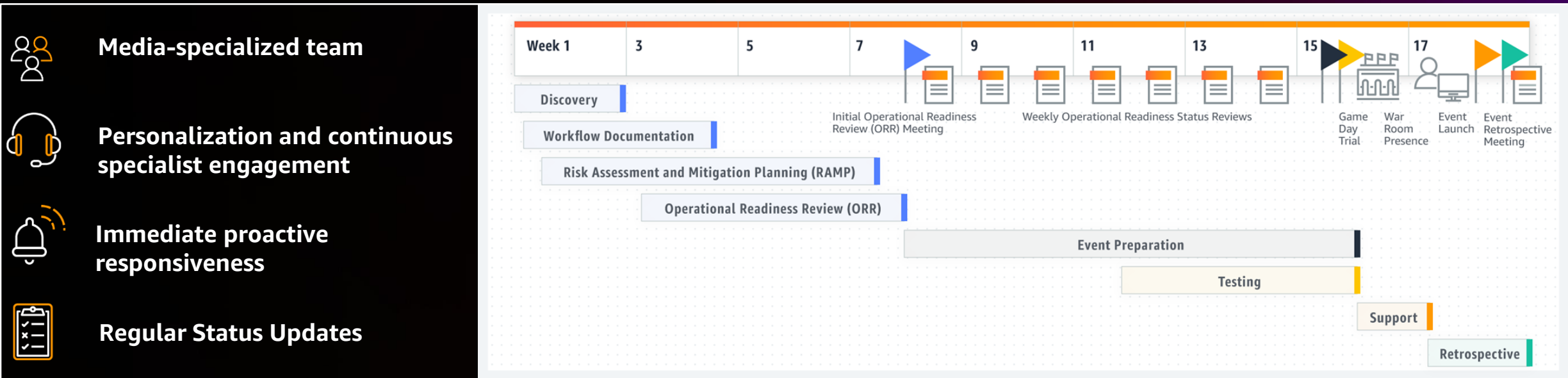


Non-routable configuration:

Not known to the routing-plane but known to the Caching data plane

Live events and premieres release support

- Large scale live streaming events (100K+ concurrent viewers - e.g., Super Bowl)
- Multi-day live events or event series (e.g., Sports Seasons or Olympics)
- High-visibility VOD/OTT launches or premieres
- Major 24x7 channel launches



Learn more: <https://aws.amazon.com/media-services/resources/mem/>



Welcome back HBO Max team

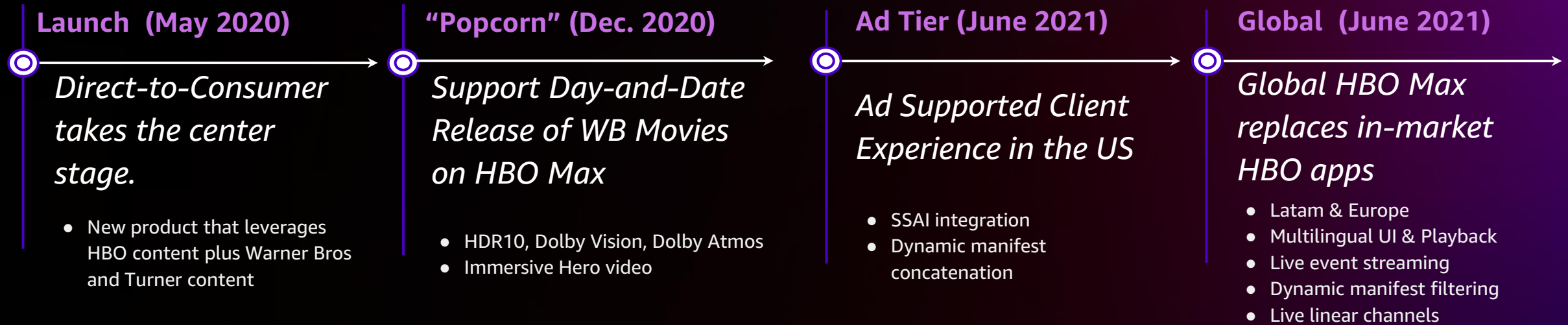
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One of the leading streaming services

- Premium User Experience
- 94.9M subscribers
(Q3 2022 - combined HBO/HBO Max & discovery+)
- Ad-supported and Ad-free tiers
- 61 countries
- VOD & Live Streaming
- More than 13,000 hours of programming

HBO Max – From launch to leader



This rapid product growth and expansion required a resilient and extensible CDN strategy . . .

HBO Max – Content delivery at scale

Multi-CDN strategy

- Spikey traffic
- Accelerated subscriber growth
- Continued global expansion efforts

Why Amazon CloudFront?

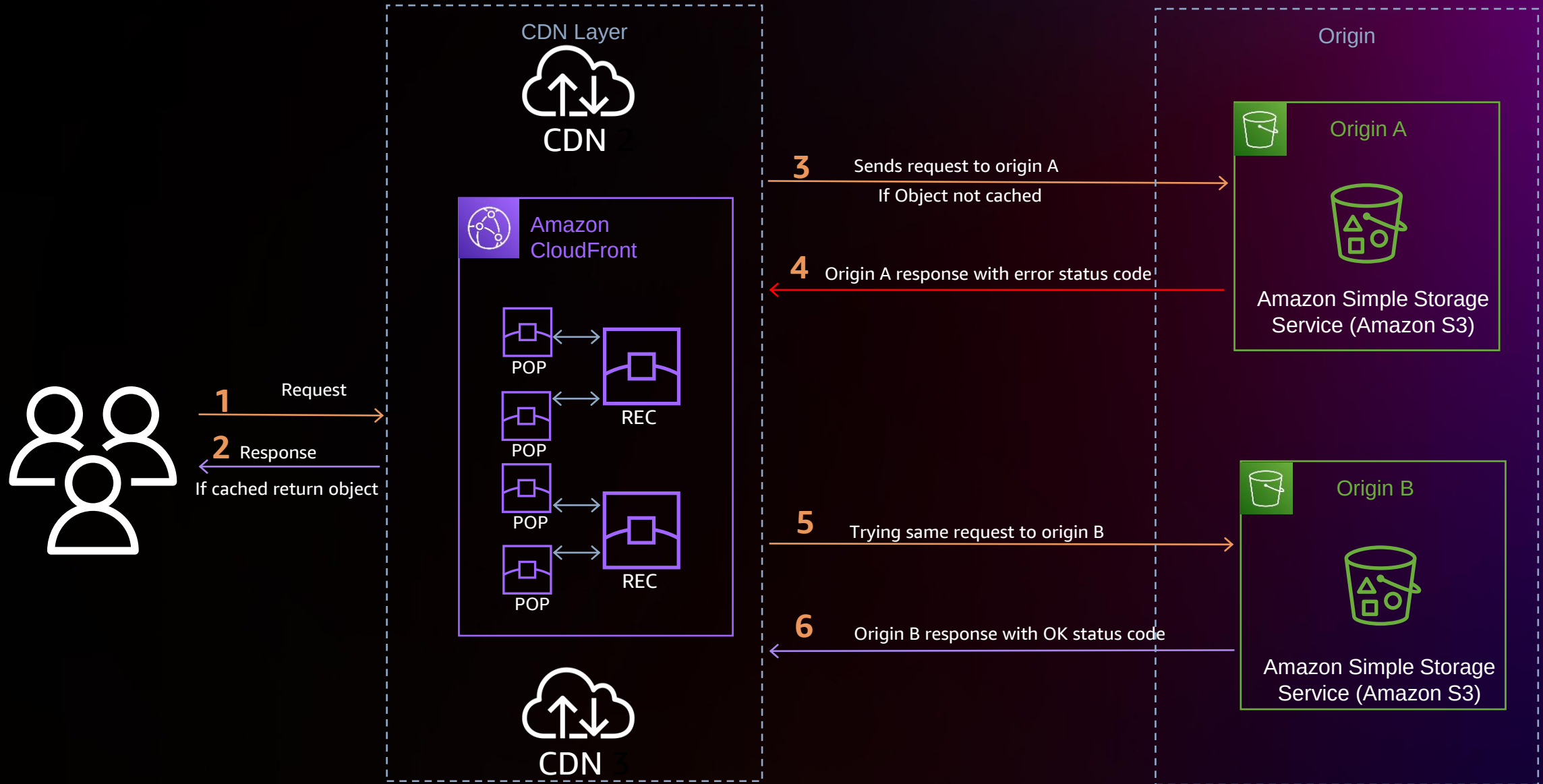
- Global footprint
- Increased / necessary capacity
- Premium support / operational excellence

Amazon CloudFront is a strategic partner

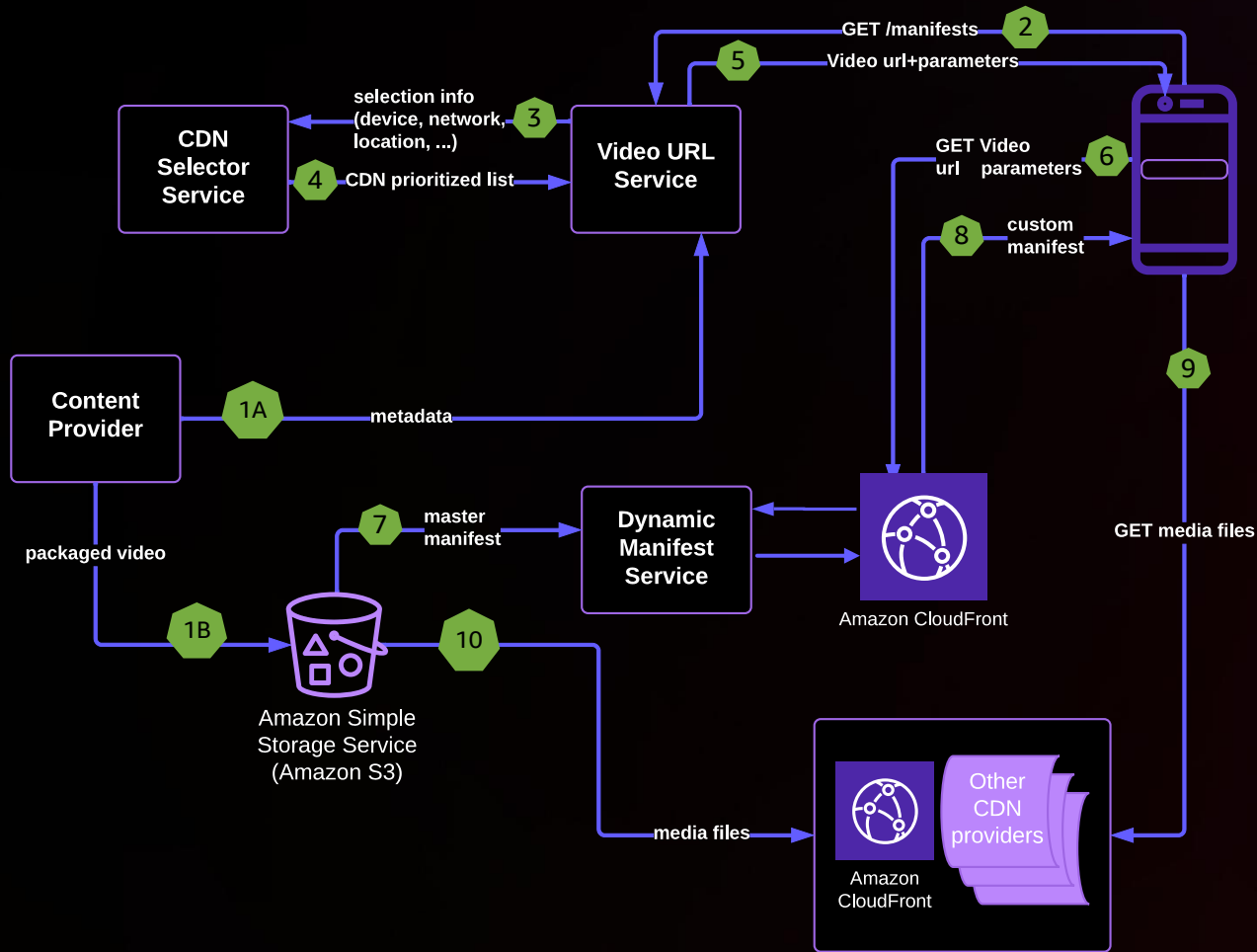
- Grown to become one of the top performing CDNs used by HBO Max



HBO Max global content delivery network



HBO Max video delivery



Ensure a premium user experience

- Device capabilities
- CDN selection
- User network

Dynamic Manifests

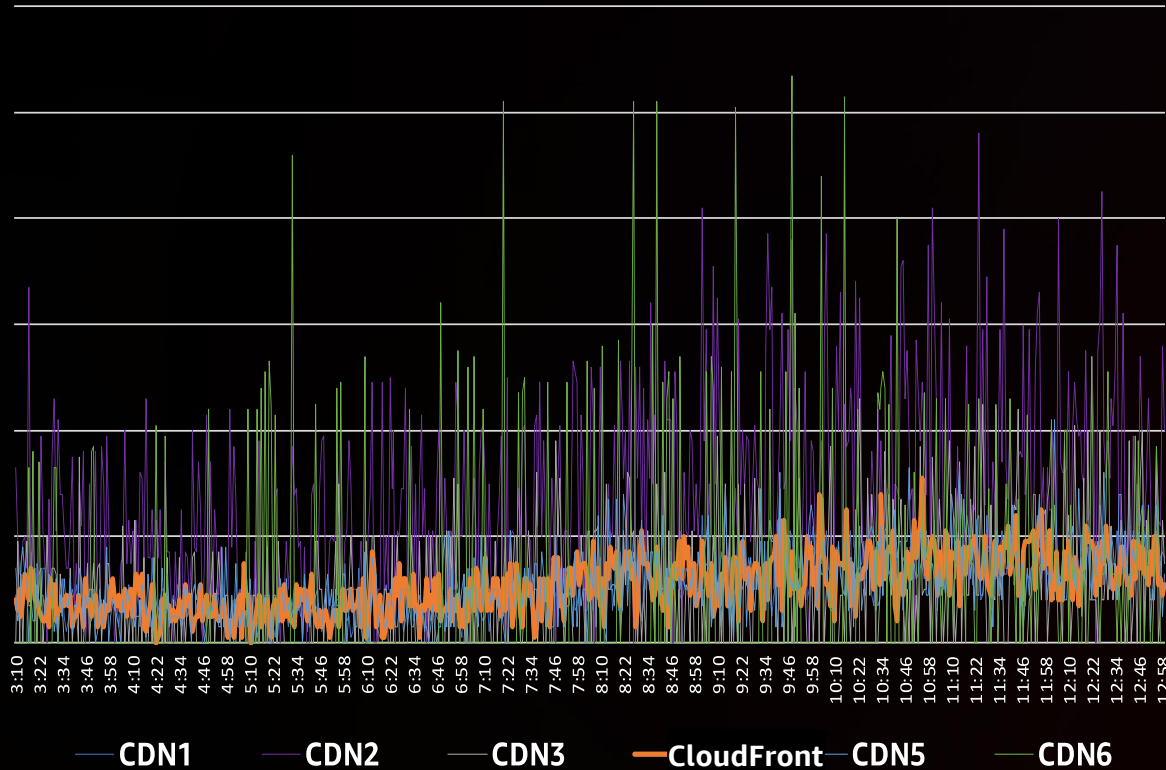
- Master manifest with all DRM, codecs, bitrates and languages
- Customized manifest for each user request

Amazon CloudFront dynamic manifest fronting

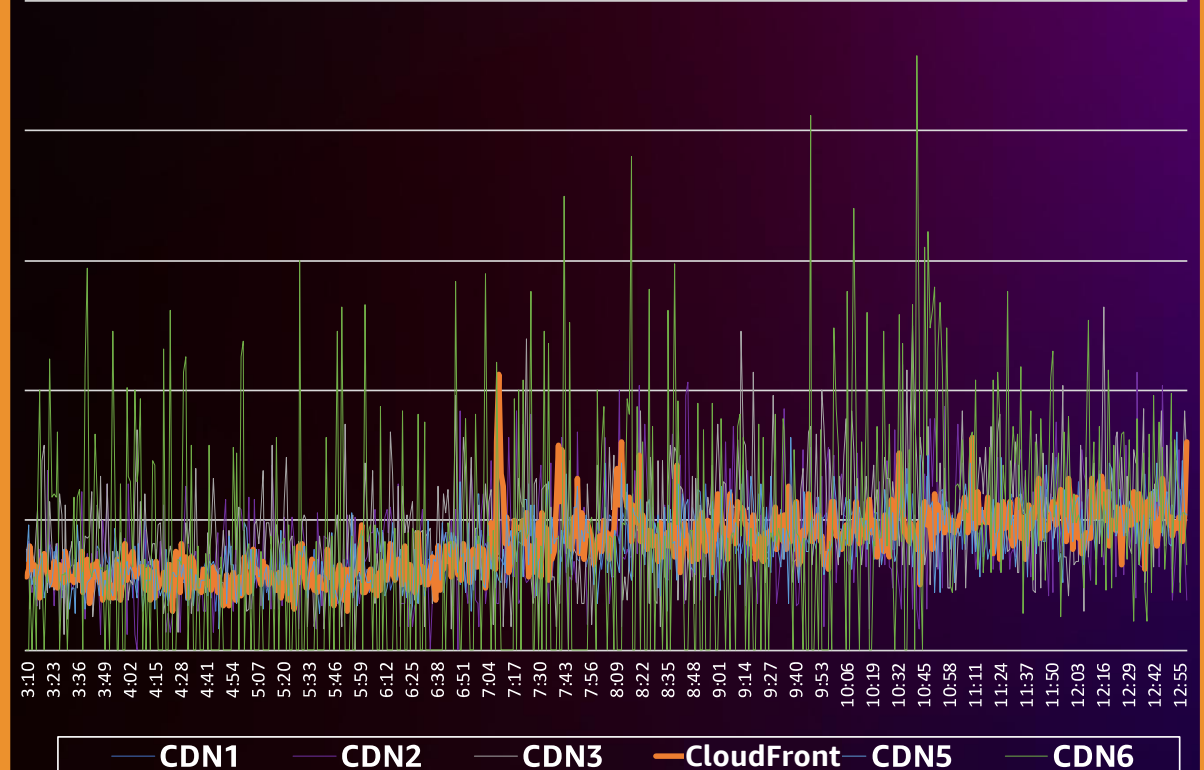
- 97+% cache hit

Performance & resiliency strategy - QoE KPI's

Video Start Failure

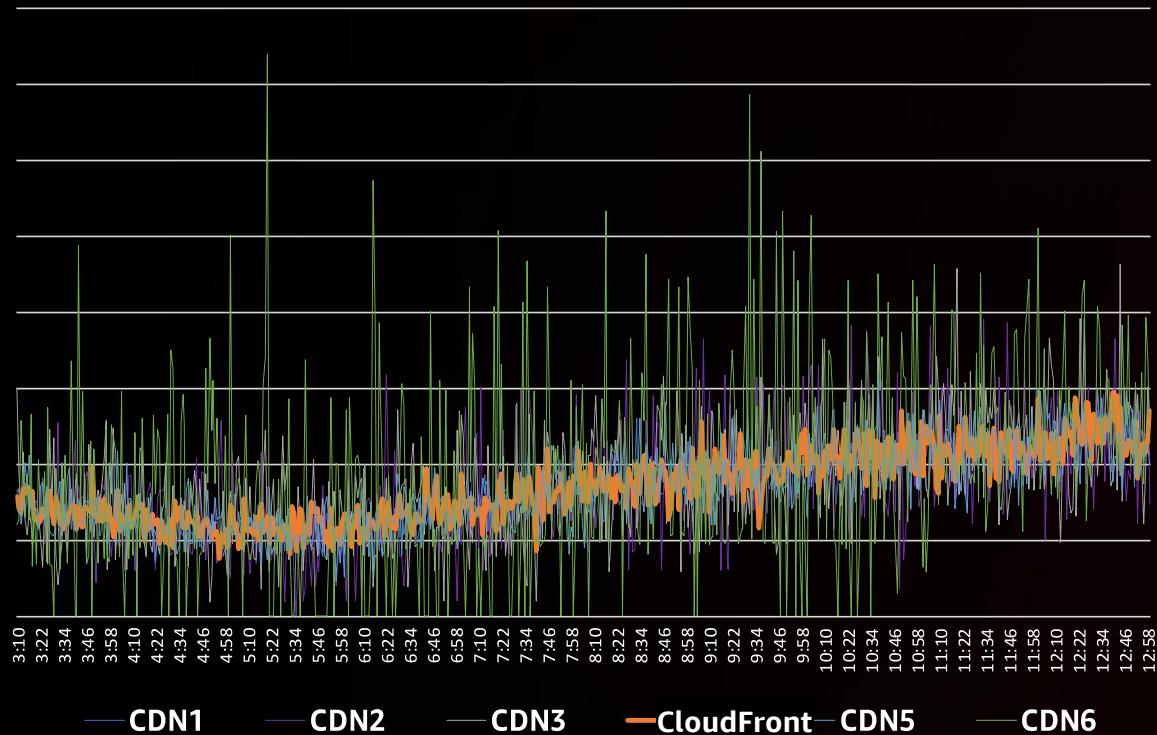


Video Playback Failure

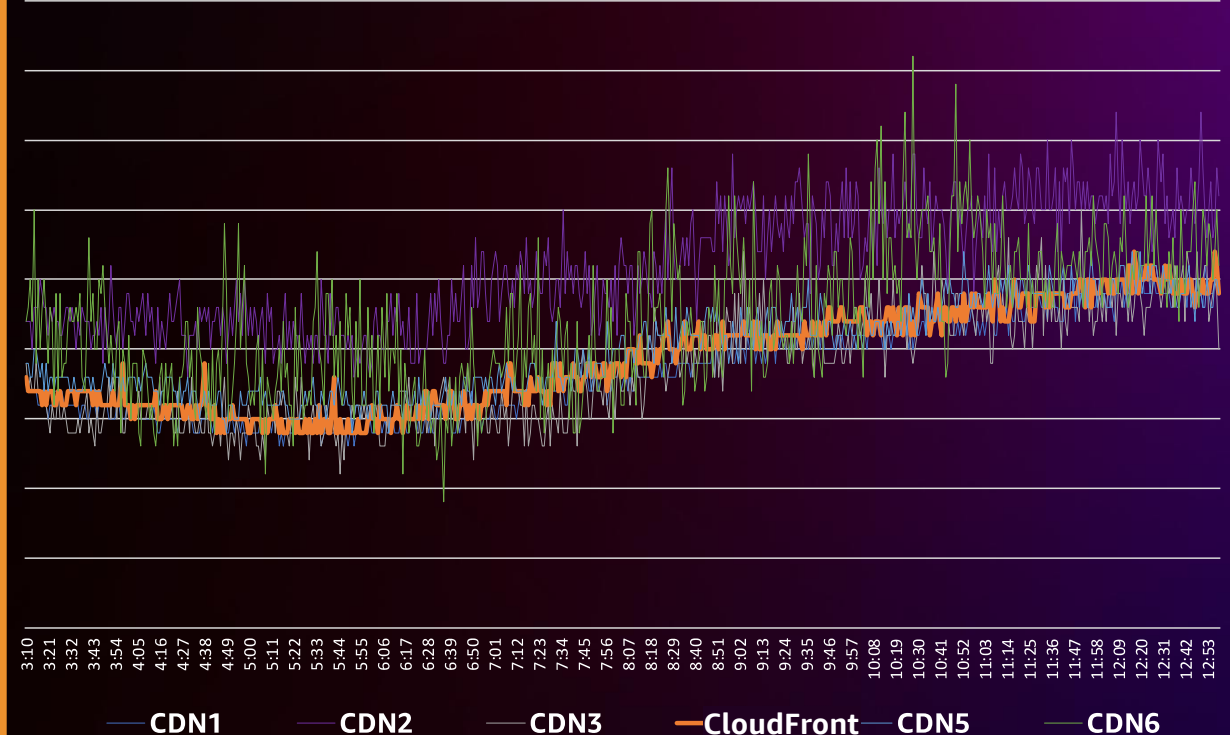


Performance & resiliency strategy - QoE KPI's

Exit Before Video Start

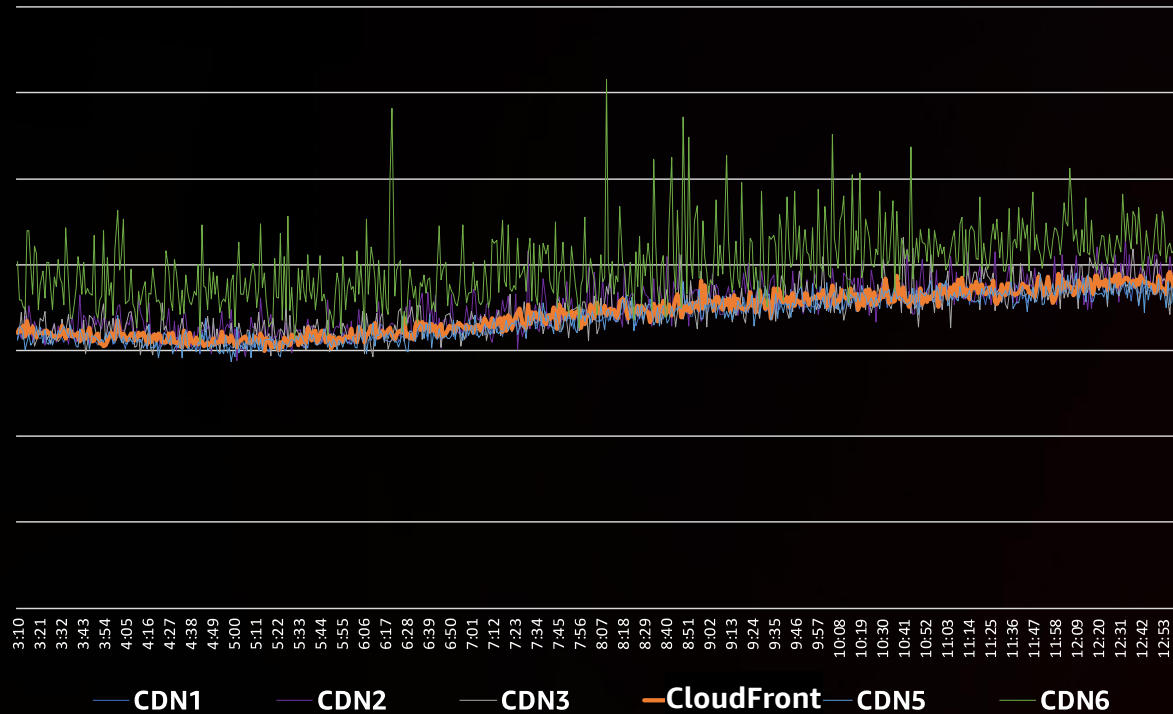


Rebuffering Video

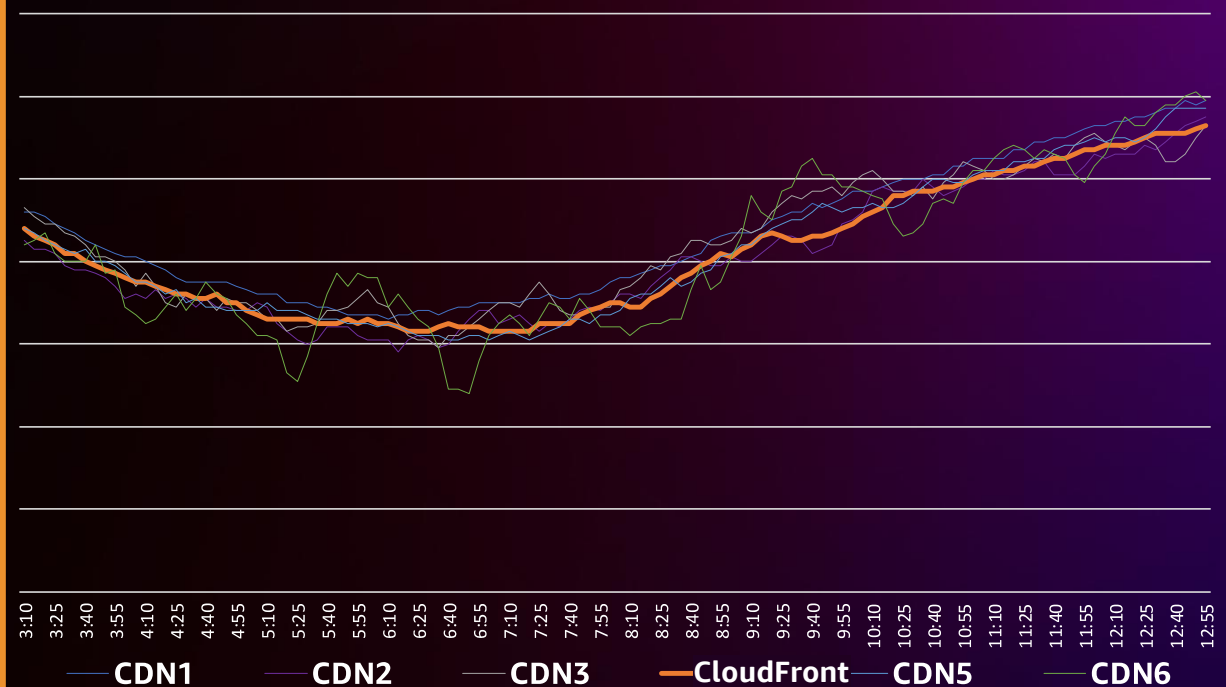


Performance & resiliency strategy - QoE KPI's

Video Startup Time



Average Bitrate

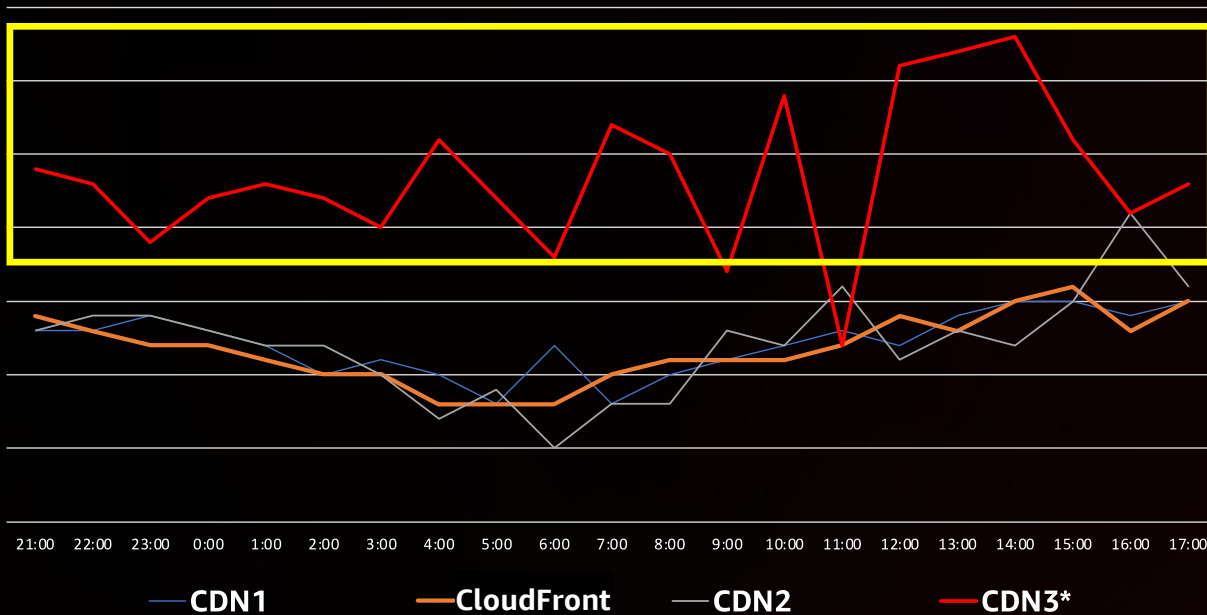


Performance & resiliency strategy - QUIC

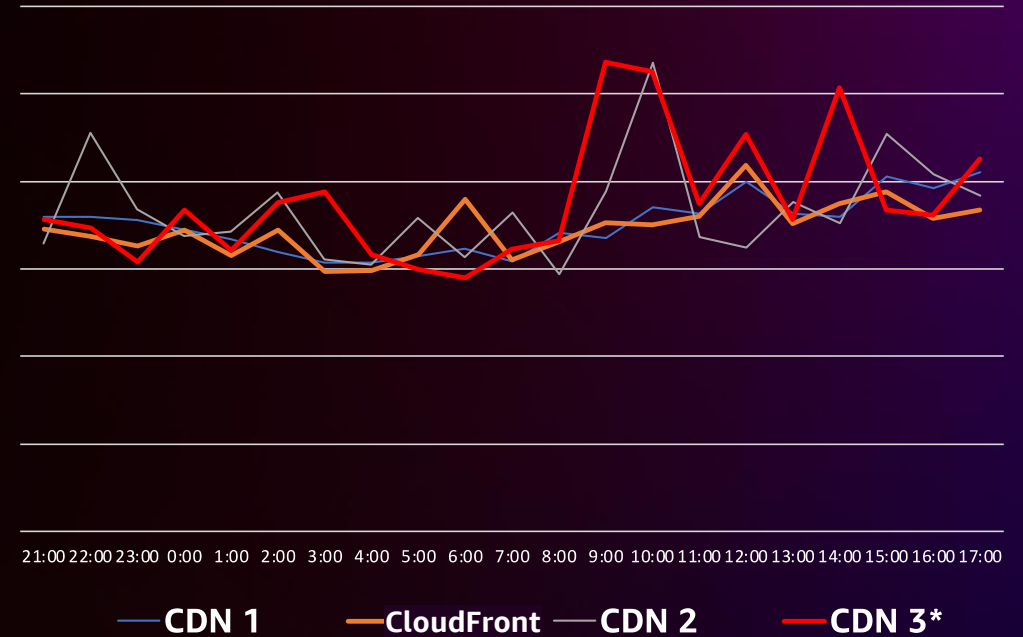
QUIC implementation

- Launch partner
- ~10% adoption rate
- Improved rebuffering and video start times

Rebuffering Ratio



Video Start Time

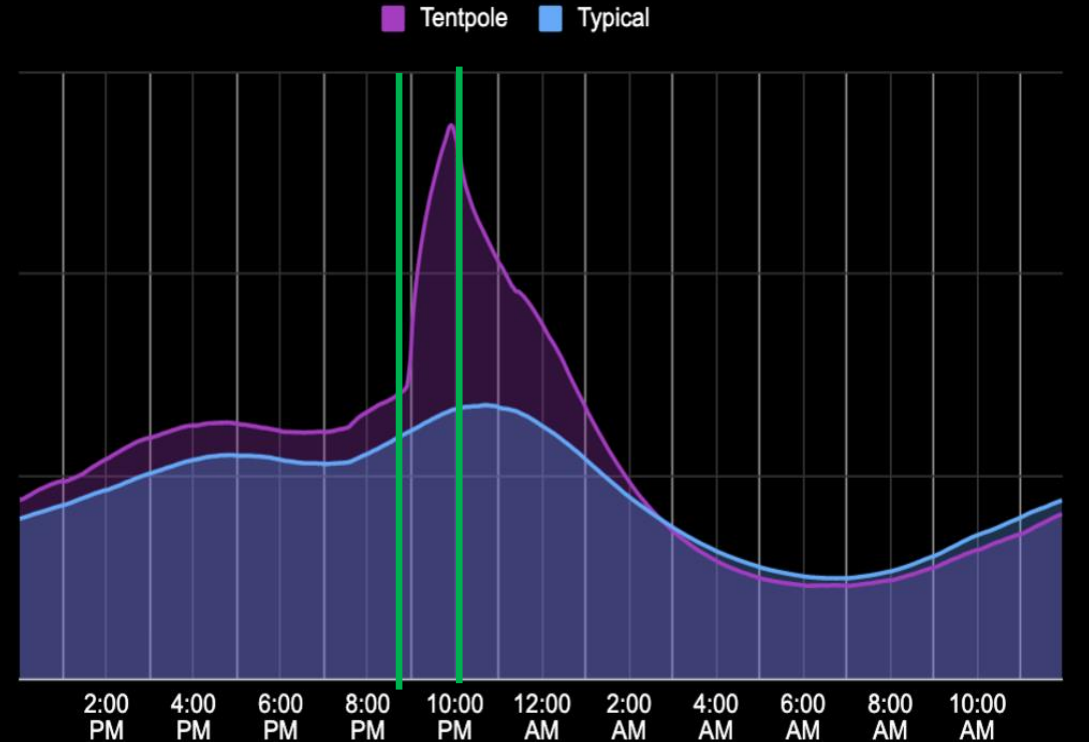
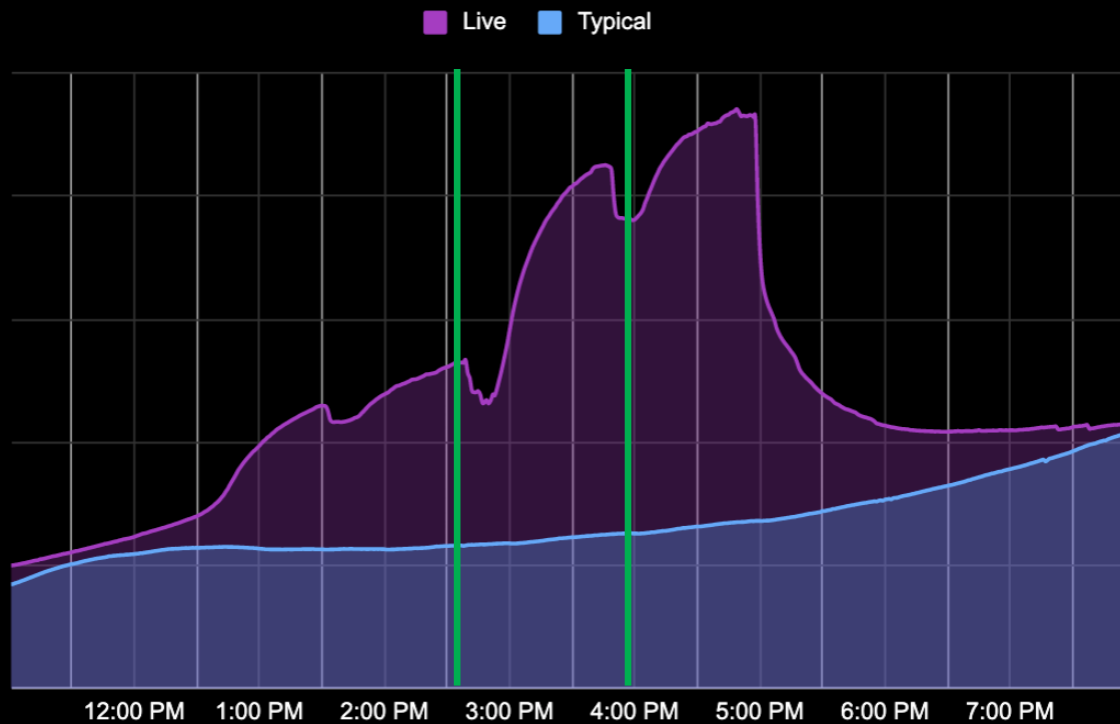


*** No QUIC Protocol Enabled**

HBO Max traffic patterns

Traffic patterns can vary greatly on any given day

- Live Sports Events (LATAM)
- Tent Pole Events (Episodic release , movie release)



Event management & strategy

For these events, HBO Max uses a “war room” operational approach for monitoring and collaboration with AWS

- Capacity planning
- Pre-scaling and pre-warming
- Operational monitoring
- AWS Infrastructure Event Management (IEM)
- AWS Elemental Media Event Management (MEM)



Looking forward

- **Amazon CloudFront Blue Green Deployment**
 - Ability to test before applying any configuration change simplifies configuration management of updates
- **Bringing HBO Max and Discovery+ content together in an enhanced streaming platform**
 - Coming in 2023
- **Continued global expansion of the enhanced platform**
- **So what's next on HBO Max?**





To learn more about using CloudFront for your media delivery:

<https://aws.amazon.com/cloudfront/media/>



Thank you!



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