

# AWS re:Invent

NOV. 28 – DEC. 2, 2022 | LAS VEGAS, NV



NET312

# HBO Max achieves scale and performance with Amazon CloudFront

Vikrant Kelkar

Staff Software Engineer  
Warner Bros. Discovery

Jay Boisseranc

Director of Video Engineering  
Warner Bros. Discovery

Tal Shalom

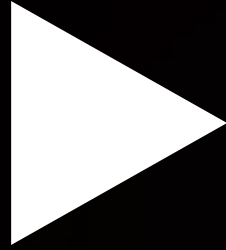
Principal Product Manager  
CloudFront, AWS



# Agenda

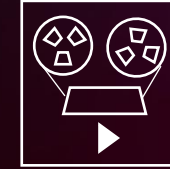
- Amazon CloudFront network for a high Quality of Experience
  - Optimize your delivery configuration
  - Test your media delivery settings
  - Live Event and premiere release support
- HBO Max journey with Amazon CloudFront
  - HBO Max multi-CDN traffic management
  - HBO Max House of the Dragon ready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



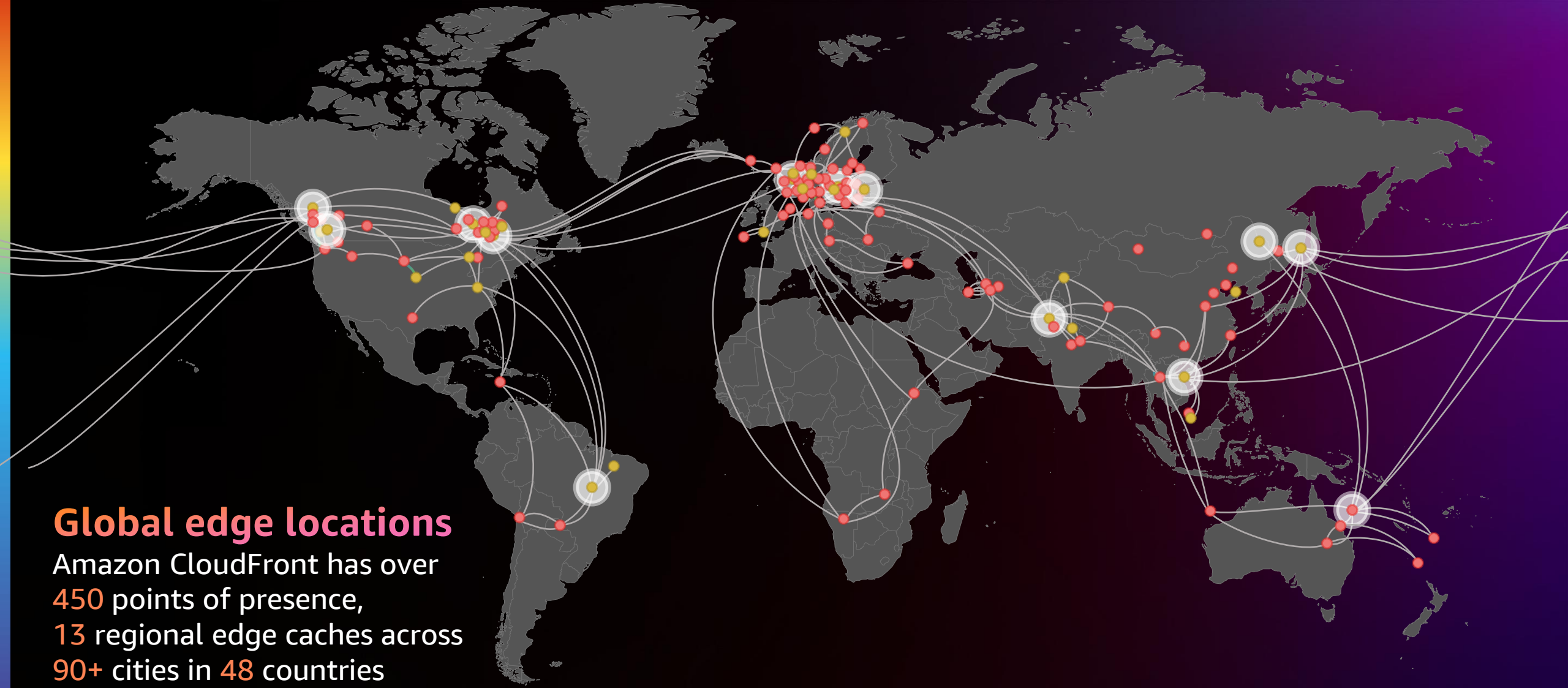
1990's



2000's



2020's



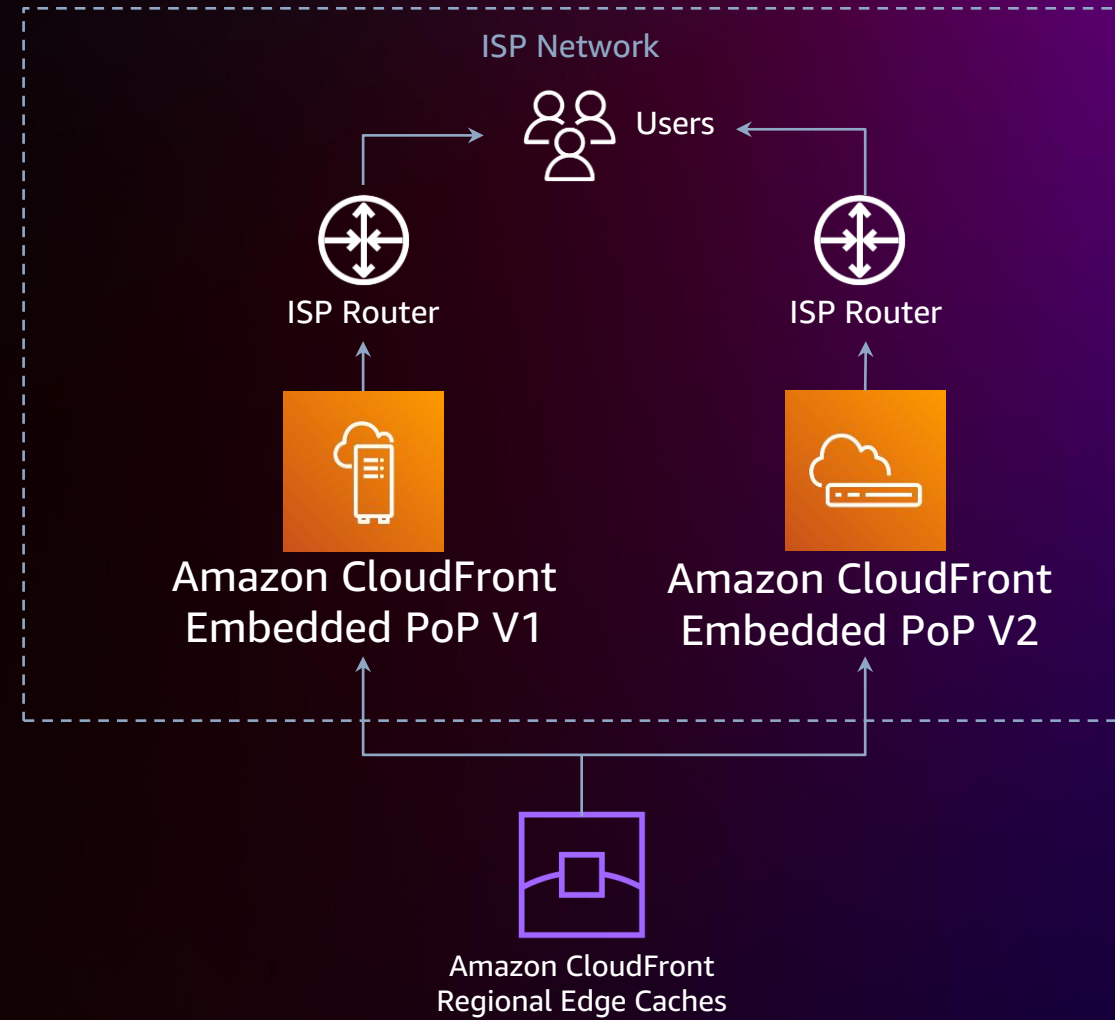
## Global edge locations

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

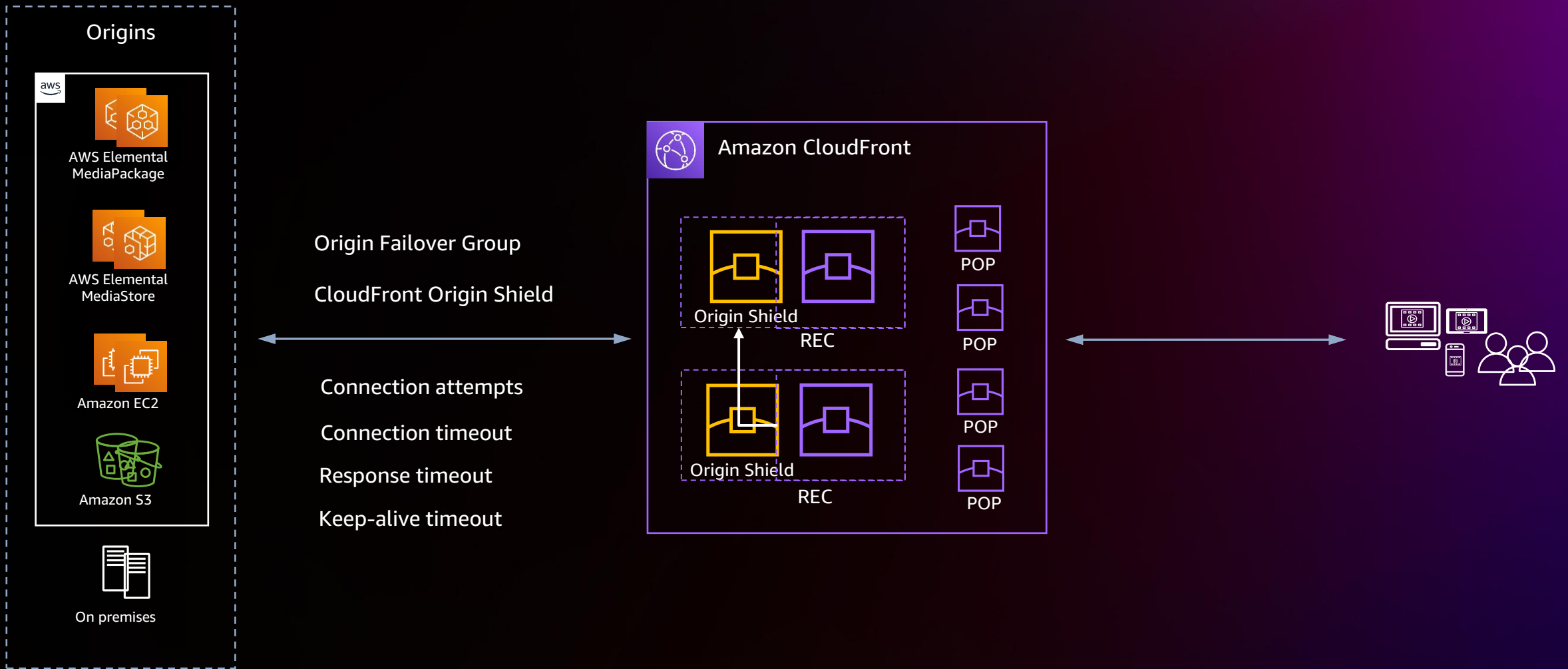


# Closer to your viewers with embedded PoP V2

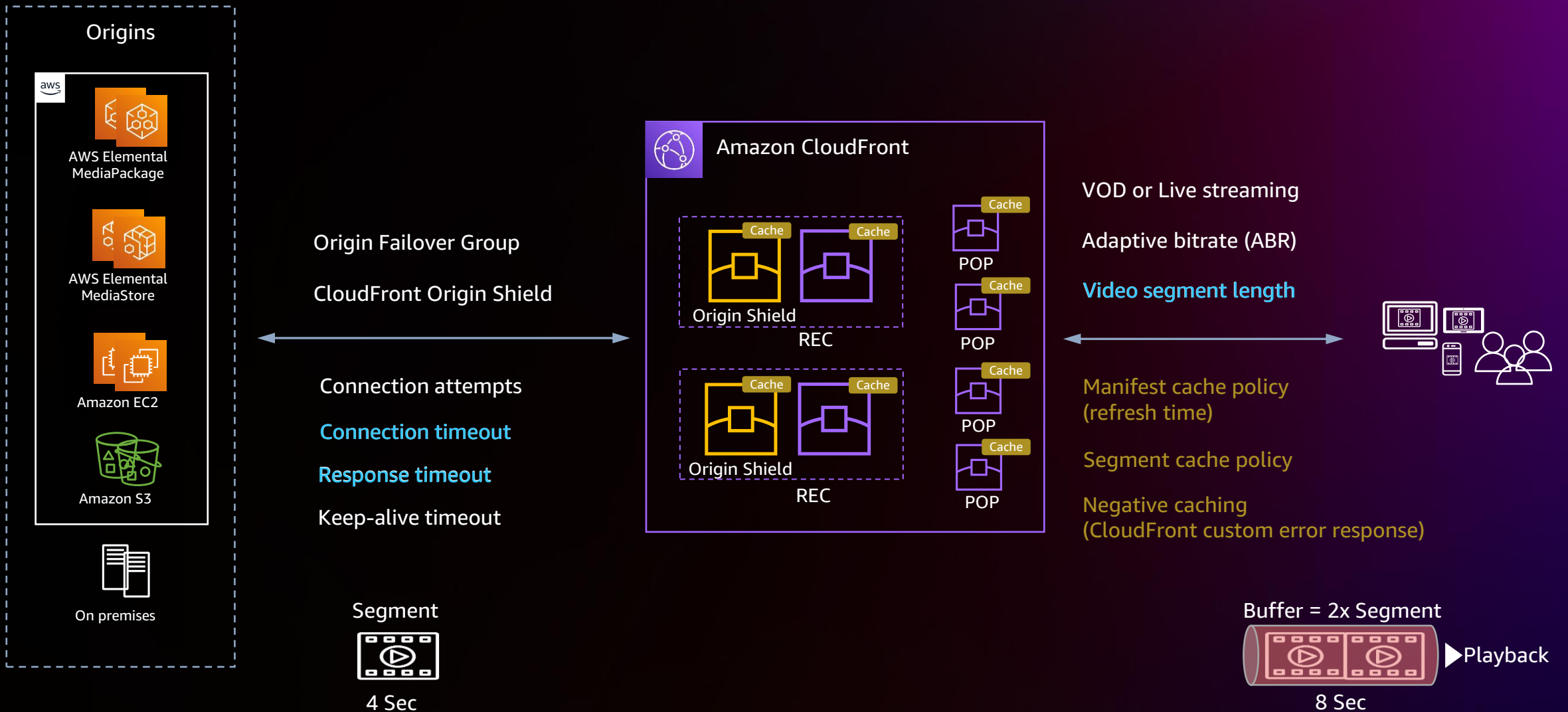
- Increased Scale
  - Launched 220+ CloudFront Embedded PoPs V2
- Improved Performance
  - Improvement in First Byte Latency
- Improved traffic offload
  - Extended footprint across ISPs
  - Peak traffic live streaming, game download, popular VOD



# Configure for end-to-end high availability



# Optimize delivery for high quality of experience



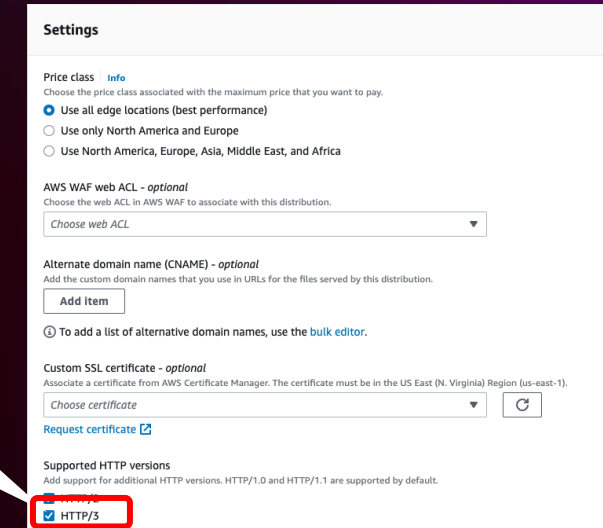
# Lower latency streaming over HTTP/3 and QUIC

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

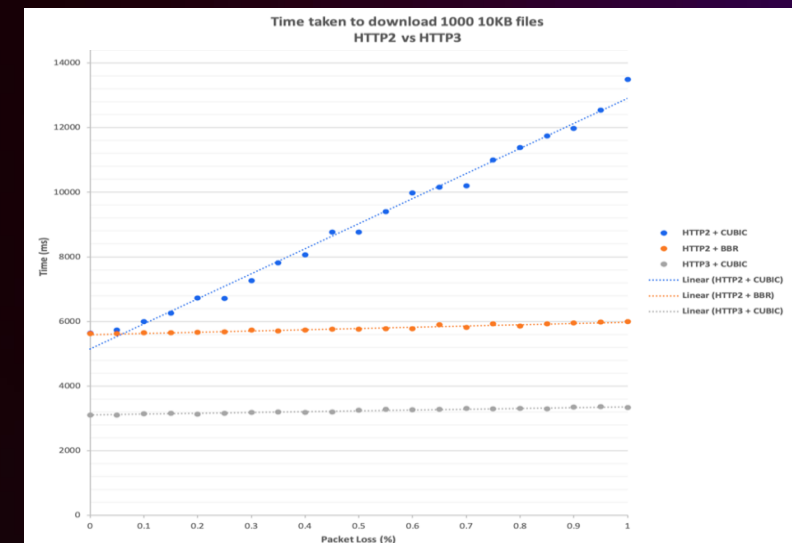
## Performance benefits:

- 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' page for a CloudFront distribution. The 'Supported HTTP versions' section is highlighted with a red box, and the 'HTTP/3' checkbox is checked. Other settings include 'Price class' (set to 'Use all edge locations (best performance)'), 'AWS WAF web ACL', 'Alternate domain name (CNAME)', and 'Custom SSL certificate'.



# 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

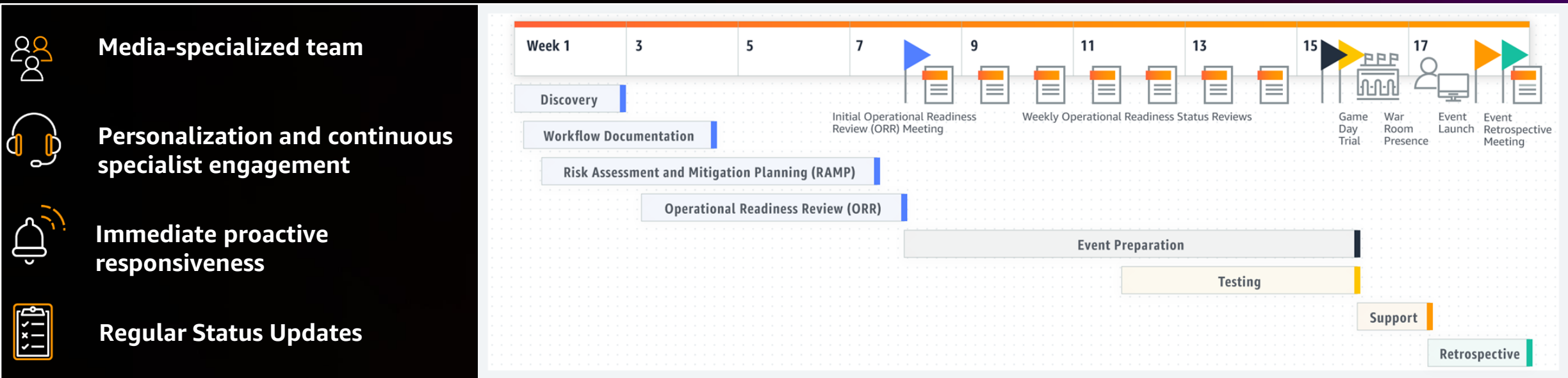
For latency-sensitive functions

- **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



# 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

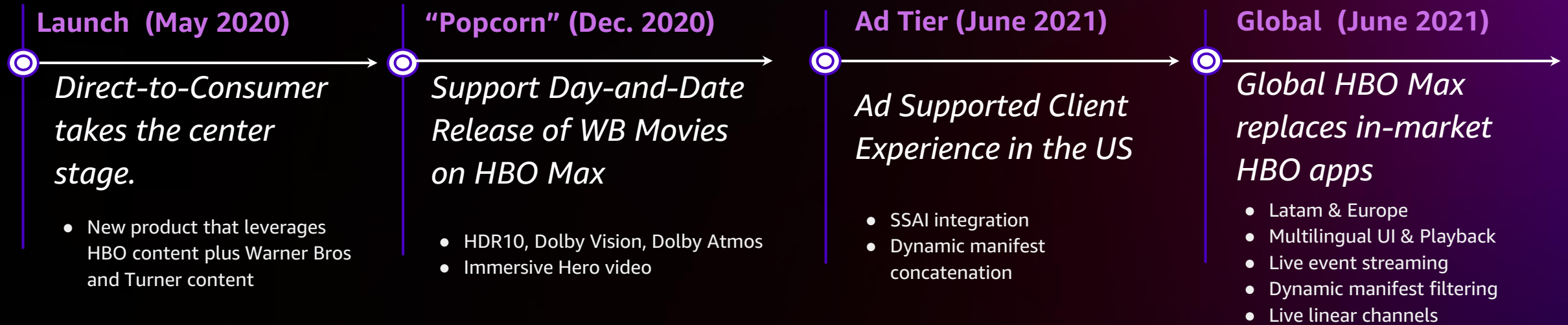
- Amazon CloudFront network for a high Quality of Experience
  - Optimize your delivery configuration
  - Test your media delivery settings
  - Live Event and premiere release support
- HBO Max journey with Amazon CloudFront
  - HBO Max multi-CDN traffic management
  - HBO Max House of the Dragon ready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

The HBOmax logo is displayed in white on a dark purple background. The letters 'HBO' are in a bold, sans-serif font, while 'max' is in a lowercase, rounded, sans-serif font. A small trademark symbol (TM) is located at the top right of the 'X'.

## 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?

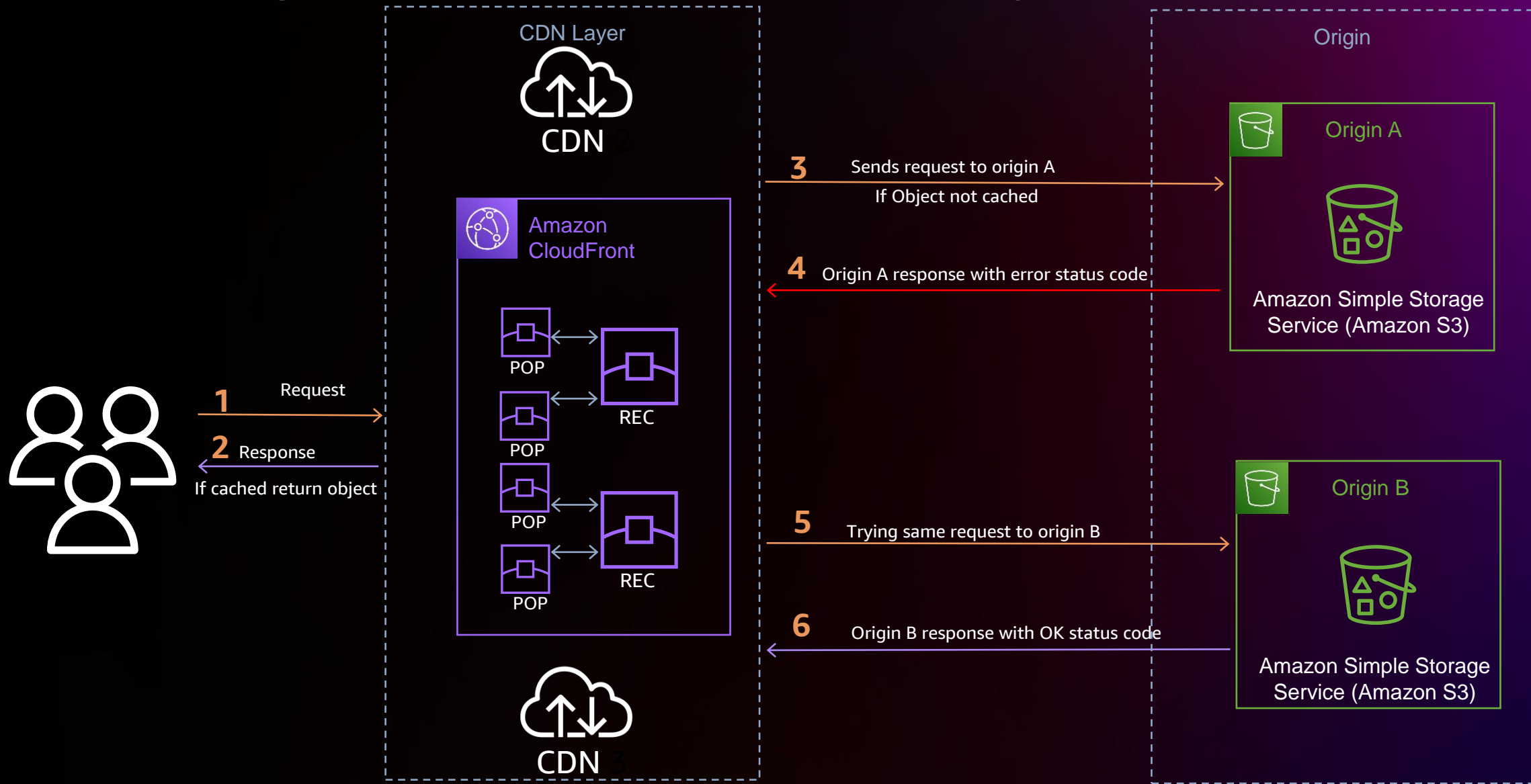
- Global footprint
- Increased / necessary capacity
- Premium support / operational excellence

## Amazon CloudFront is a strategic partner

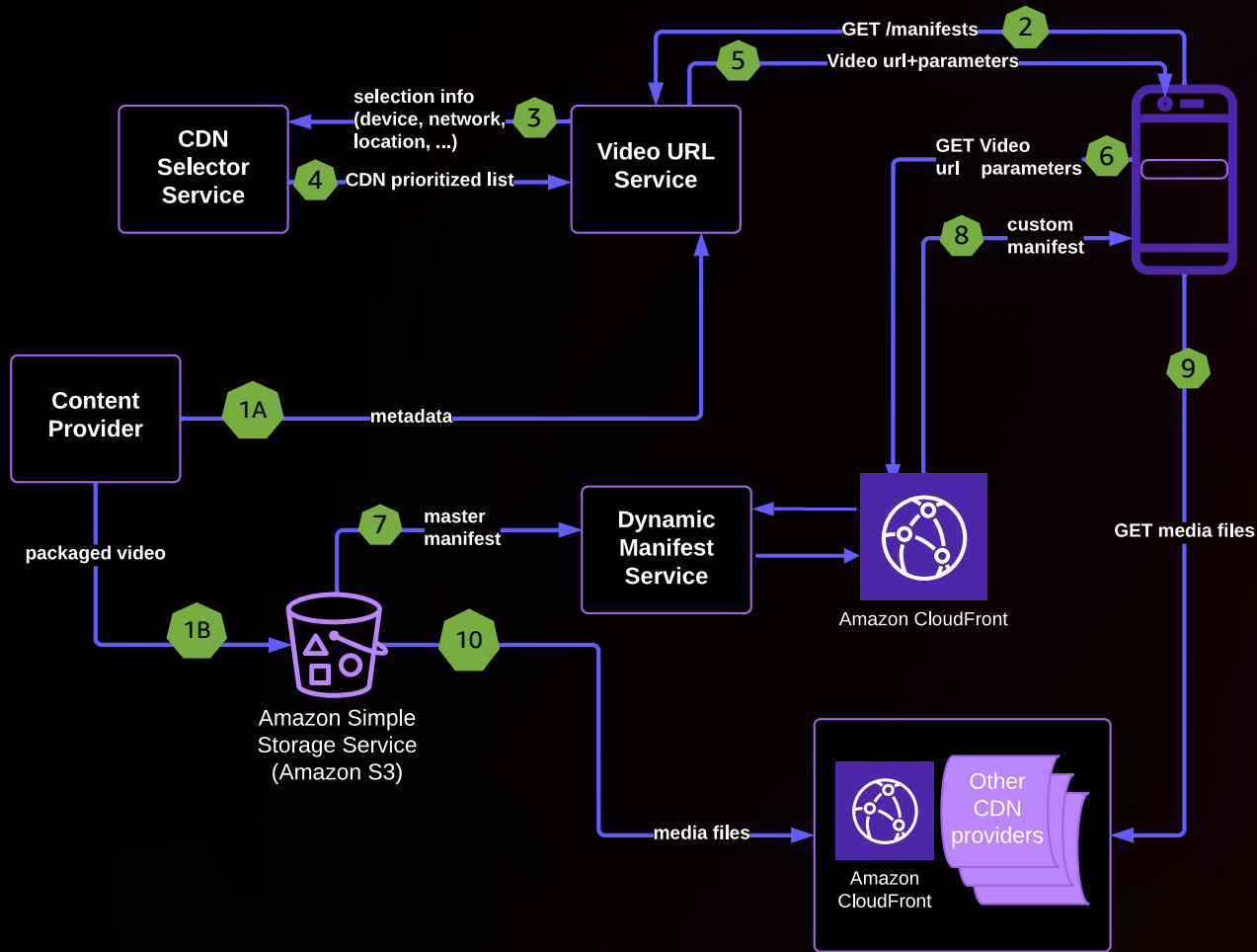
- Grown to become one of the top performing CDNs used by HBO Max



# HBO Max global content delivery network



# HBO Max video delivery



## Ensure a premium user experience

- Device capabilities
- CDN selection
- User network

## Dynamic Manifests

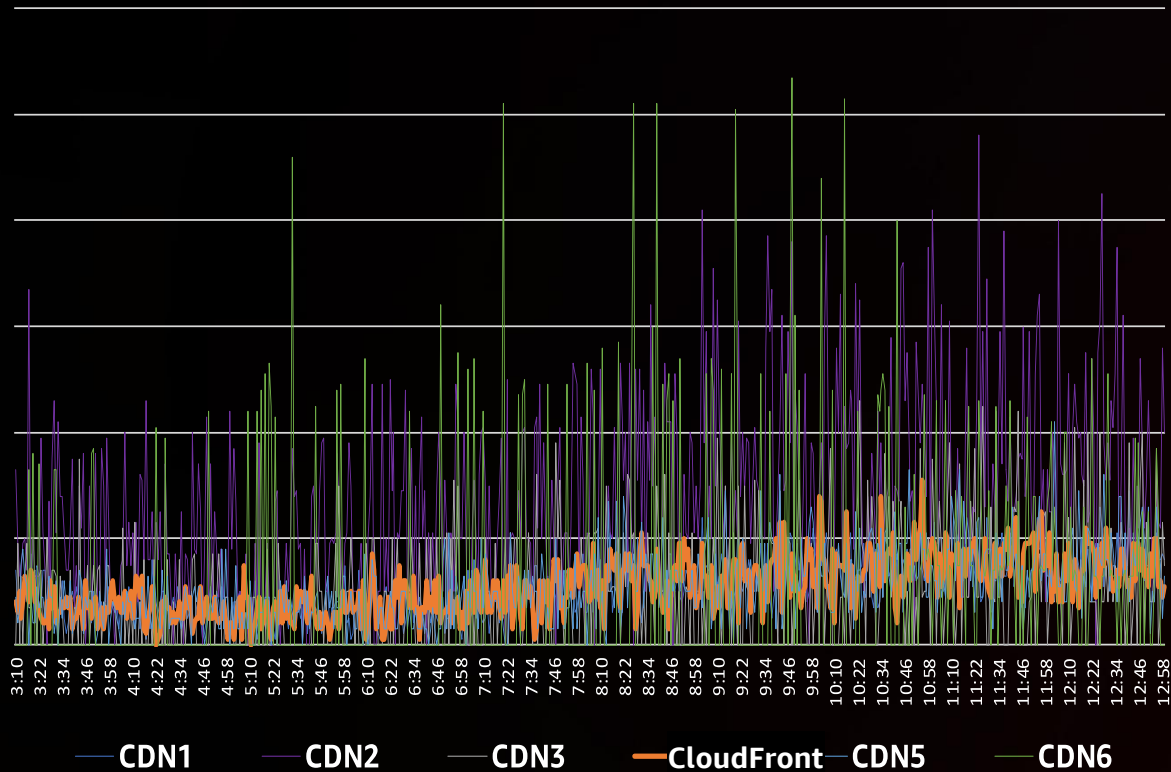
- Master manifest with all DRM, codecs, bitrates and languages
- Customized manifest for each user request

## Amazon CloudFront dynamic manifest fronting

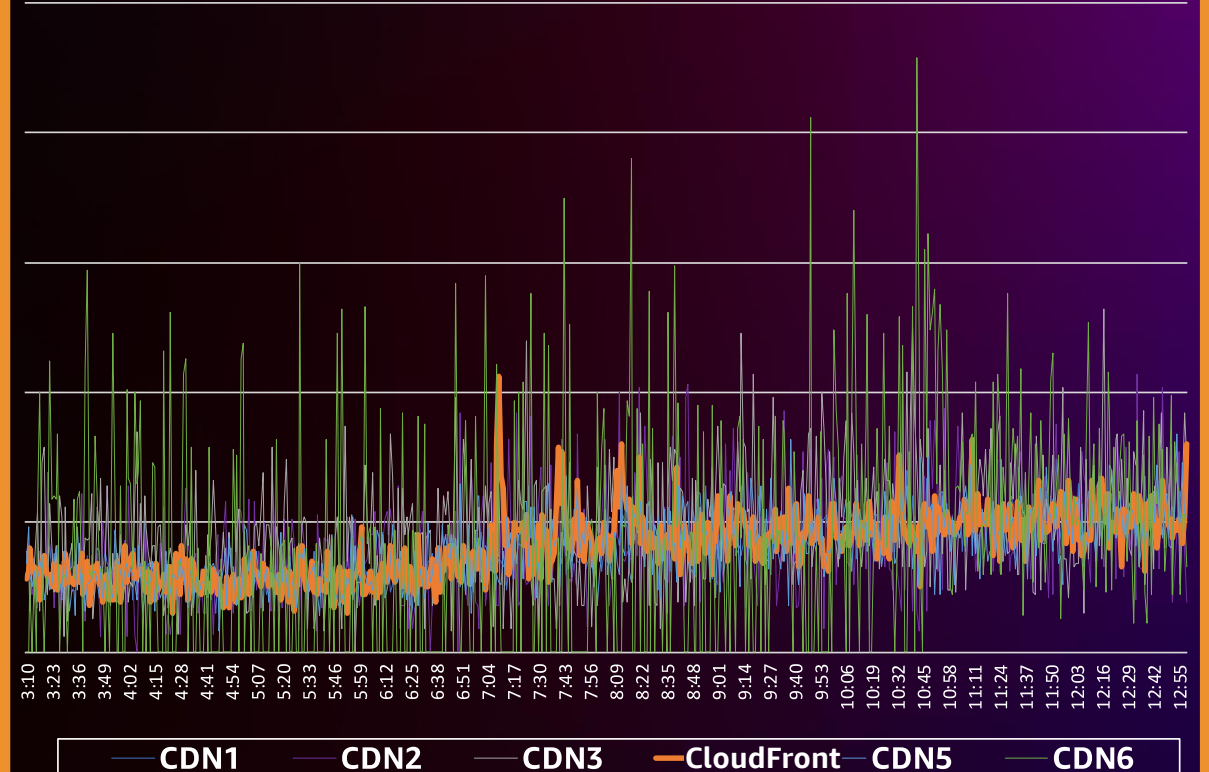
- 97+% cache hit

# Performance & resiliency strategy - QoE KPI's

## Video Start Failure

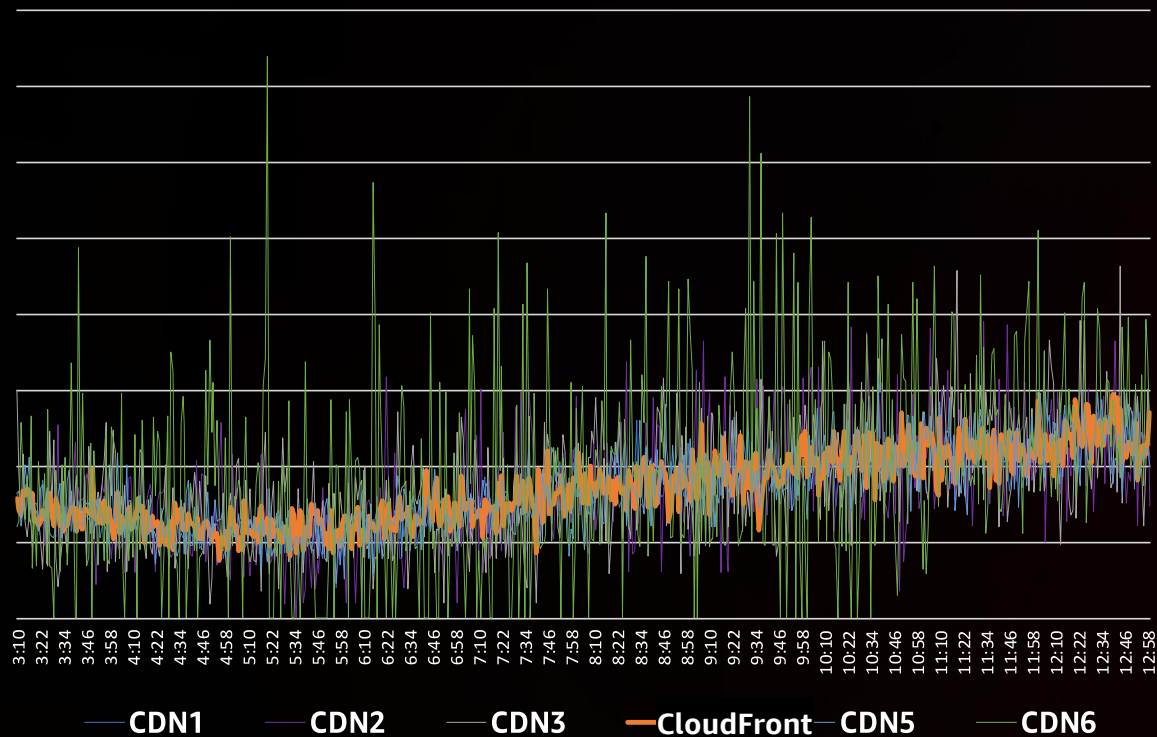


## Video Playback Failure

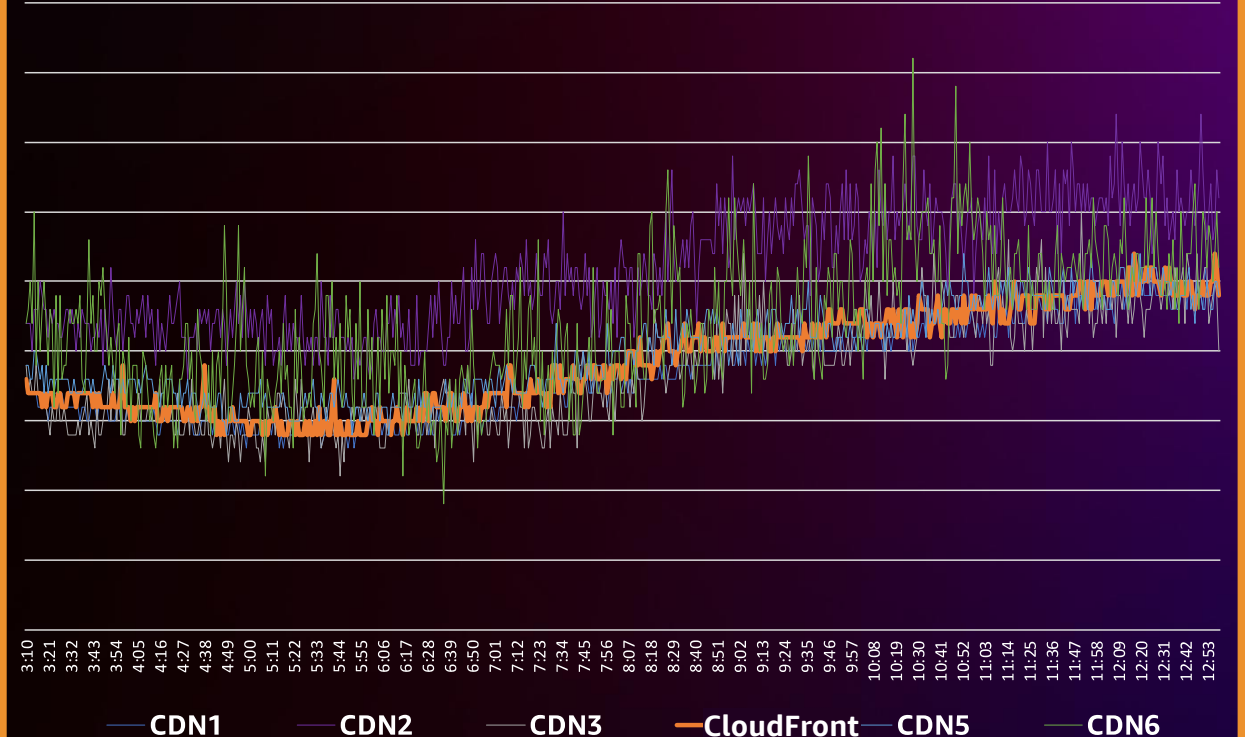


# Performance & resiliency strategy - QoE KPI's

## Exit Before Video Start

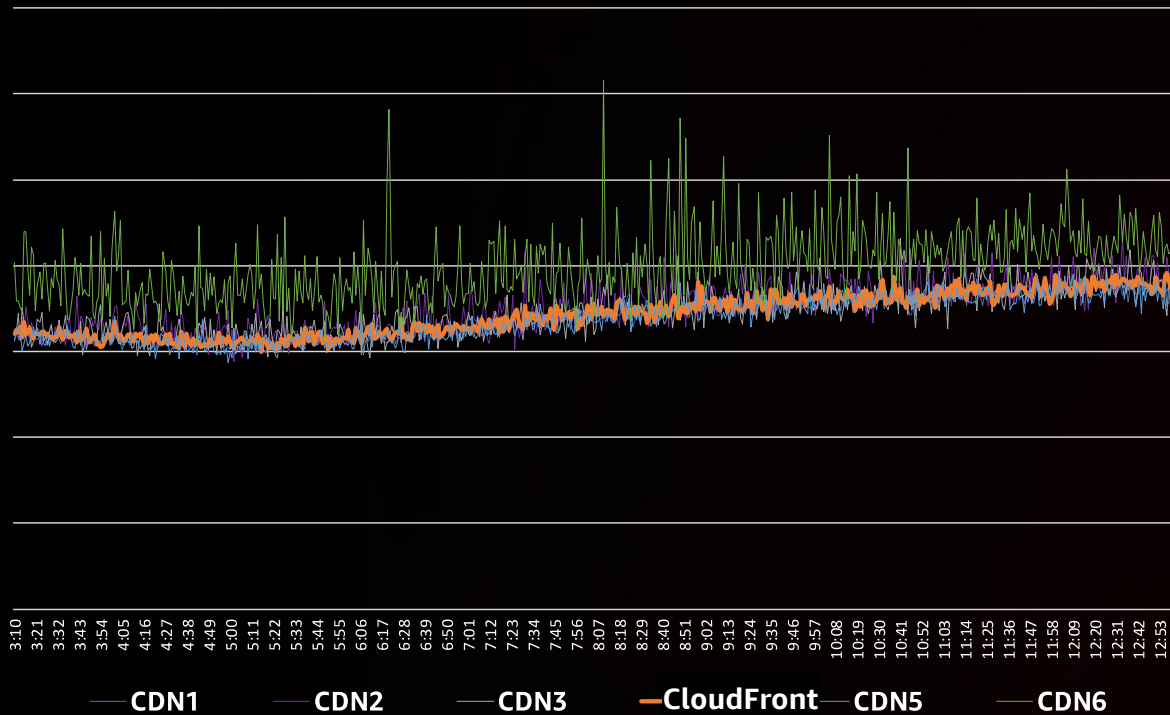


## Rebuffering Video

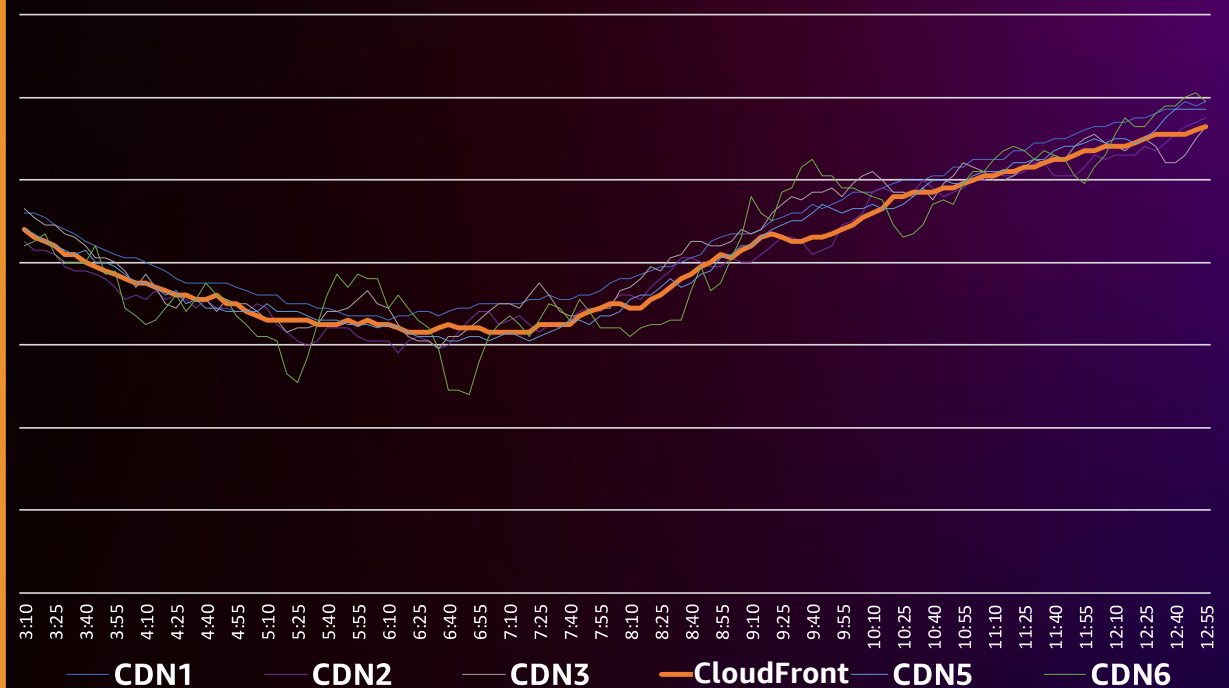


# Performance & resiliency strategy - QoE KPI's

## Video Startup Time



## Average Bitrate

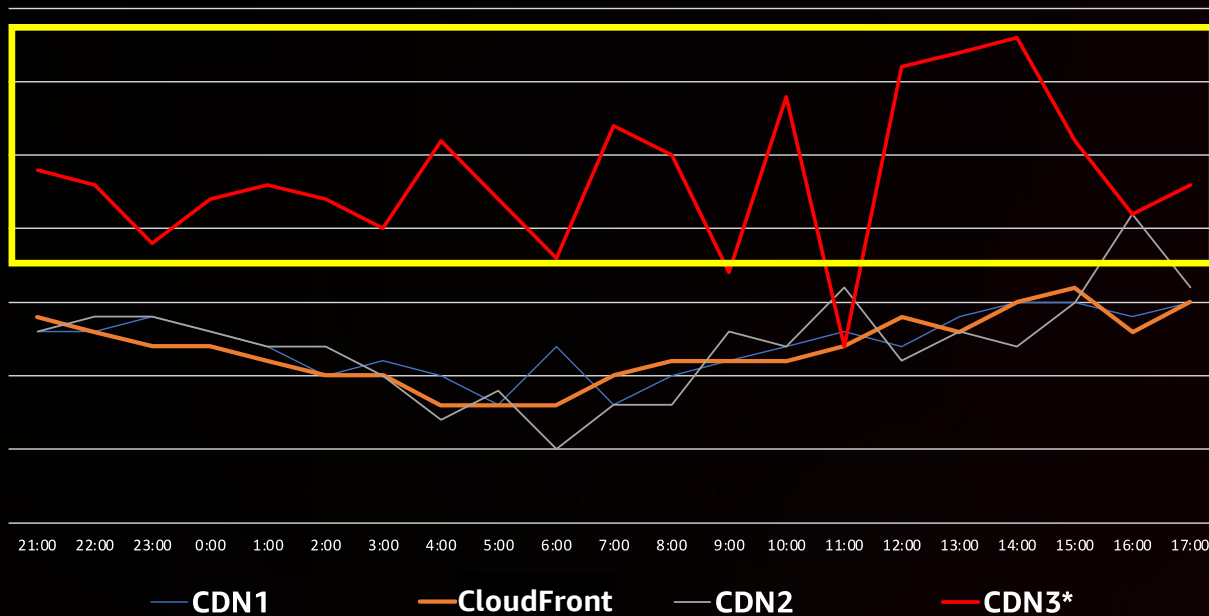


# Performance & resiliency strategy - QUIC

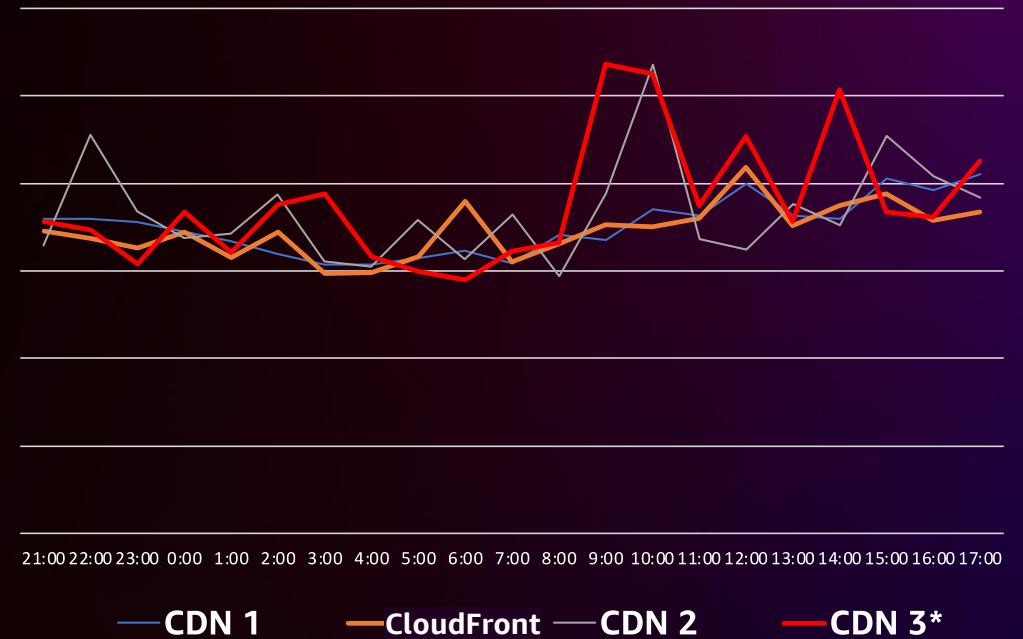
## QUIC implementation

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

Rebuffering Ratio



Video Start Time



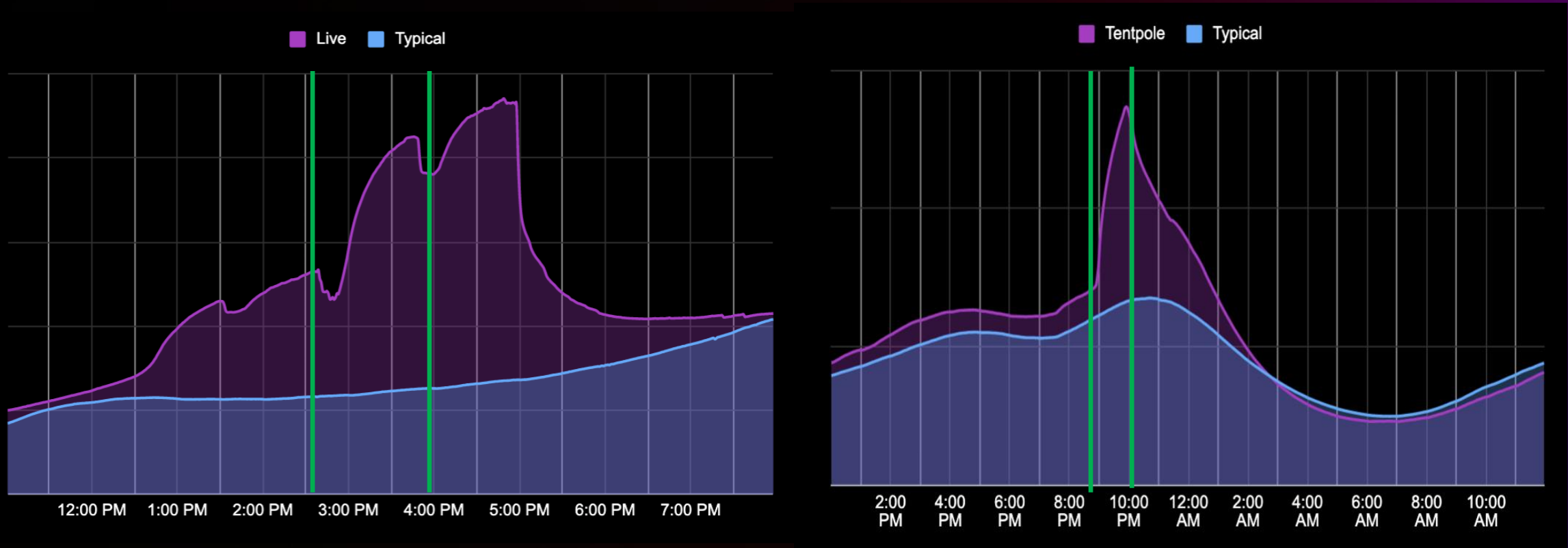
**\* No QUIC Protocol Enabled**



# 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!



Please complete the session survey in the **mobile app**

