Optimizing live video feeds to the cloud and consumer

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Discovery
Scale
It is a scary world...

- Player bandwidth fluctuates
- Infrastructure disruption on packager
- Infrastructure disruption on encoder
- Network connectivity on contribution
- Field network or cameras
Ingest the live feed and transcodes into multiple bitrate HLS → AWS Elemental MediaLive → Just-In-Time package of the MediaLive output into HLS, DASH and MSS → AWS Elemental MediaPackage → Amazon CloudFront → Global Distribution for the HLS, DASH and MSS versions of the live stream → Multiple OTT Devices

Playback for the live stream supported on multiple devices
AWS Elemental MediaConnect

- Robust and flexible video transport to, within, and from AWS
- Securely share content between accounts
- Easily manage high-value live broadcasts with visibility into metrics and alerts
- Enables low-cost, high-quality contribution over IP
Network resilience
Ingest the live feed and transcodes into multiple bitrate HLS

AWS Elemental
MediaLive
Live Video
Processing

Just-In-Time package of the Medialive output into HLS, DASH and MSS

AWS Elemental
MediaPackage
Origination and JIT Packaging

Global Distribution for the HLS, DASH and MSS versions of the live stream

Amazon CloudFront
Content Delivery Network

Multiple OTT Devices
Playback for the live stream supported on multiple devices
Output locking
Redundant inputs
Scalable origin
Adaptive bitrates
Quality-defined variable bitrate control (QVBR)
AWS Elemental Next Generation AV1 Encoder
Ultra Low Bitrate Accelerated VOD Transcoding
Now playing: Mozart in the Jungle 720p at 376 Kbps
AWS Elemental AV1 with QVBR
AVC
FIVB Volleyball World Cup workflow

Broadcast Stream

AWS Cloud

AWS Direct Connect

AWS Elemental MediaStore

Amazon CloudFront

Data Center

Broadcast Playout

Videon EdgeCaster

TV

Web Browser

Broadcast Stream

2nd Screen Stream (CMAF-ULL)
Live Feed → Videon EdgeCaster Encoder (ABR Encoding and Packaging) → AWS Elemental MediaStore (Media-Optimized Storage and Origin) → Amazon CloudFront (Global content delivery network) → VisualOn Player
Encoding

Videon EdgeCaster—Providing low-latency encoding and DASH CMAF packaging with delivery to AWS Elemental MediaStore in a low-power, small form factor footprint
Opportunity:

- Global growth of DTC offerings by enabling distribution channels to use and re-use live and VOD content to suit their target audiences no matter the origin of the content.

- Discovery content has worldwide brand value that translates well across cultures and languages. Technical experience in broadcast technologies and in the first OTT offerings can be leveraged to build a best of breed global DTC solution.
Food Network Kitchen

Live Cooking Classes

Up to 10 classes a day 7 days a week

Glass to Glass Control

Studio & remote production sites

Amazon Alexa Control/Interaction

FireTV & Echo Show

10 Weeks from idea to launch
Eurosport ES Player

- 52 markets
- Simulcast channels
- Live event channels
- End-to-end delivery—Contribution feed to consumer
- Streaming up to 1500 hours a day
- Event long DVR
- Automated Live to VOD
- +6m views in 1st month
- 6 months development to launch
Create an in-house digital video processing pipeline, integrated with our broadcast workflows to deliver all metadata/video/media to all of our Direct to Consumer products and customers as the single point of truth for digital.
ES Player—Deliver 87 streaming channels and event metadata (33 simulcast, 55 event channels)

FNK—Deliver a flexible digital channel (multiple sources) to stream live classes across US
Key Technologies—Contribution and Feed Tracking

- Metadata aggregator to single DB—All asset/event catalog
- Advanced Erasure Coding Techniques to reliably ingest data into the Cloud
- AWS MediaConnect—Multiple sources to single stream
Key Technologies—Transcoding and Origination

- AWS MediaLive—Encoding and source switching
- AWS MediaPackage—Multiple formats supported (HLS, DASH & Smooth)
- Instantaneous Full Event Replays
- Segment Harvesting—Delivering DVR/ FER 14hrs
- Encryption on all channels & event based DRM
- Live Event Manager—Event channel management slating/start & stop
Key Technologies—Delivery

- Origin Shield
- Multiple CDNs with Switching
High-Level Technical System—ES Player
Discovery: Eurosport Digital Video Architecture
Multi region full redundancy
Discovery: FNK Digital Video Architecture

Multi region full redundancy
Monitoring and Operations Console

Key to smooth running of the platform has been creating tools to manage streams in real time.
Creation of digital 24/7 Operations team

• CDN switching
• Security level switching on playback URL
• Starting/Stopping channel components
• Resiliency with automated in region switching
• Regional resiliency via manual operator change
• Amazon CloudWatch and MSAM monitoring and alerting
• Alerts to third-party operational tools
• Video metrics monitoring
Operational Console
MSAM Tile Monitor
Video Metrics Monitoring

**Real-Time Overview**

- **Playback Failures by CCV**: 0.6%
- **Exits Before Video Start by CCV**: 0.3%
- **Current Concurrent Viewers (CCV)**: 1.37k
- **Current Rebuffering Percentage**: 22.9%
- **Video Startup Time**: 1.03 sec (median from last 1 min)

**Top Titles by CCV**

- UK Championship | Jack Lisowski - David Lilley: 375
- UK Championship: 271
- UK Championship | Round 1: 122
- UK Championship | York | Tisch 1: 94
- UK Championship | Yan Bingtao - Igor Figueiredo: 84
- UK Championship | J. Lisowski - D. Lilley: 35
- Ruhpolding | Relais dames: 17
- UK Championship Final | Ronnie O'Sullivan - Mark Allen: 16
- UK Championship | York | Tisch 2: 16
- Campeonato del Reino Unido | J. Lisowski - D. Lilley: 14
- UK Championship | Bord 1: 14
- Coppa del Mondo, Wisla: 13
Success

Two successful launches with minimal technical issues
- ES Player 6 months
- FNK in 10 weeks

New features on platform
- Instantaneous Full Event Replays (FER) 1sec after using time-shifted URL
- Live to VOD workflows automated
- Segment harvesting via MediaPackage allowing event long DVR windows
- Encryption on all channels & event-based DRM
- Event channel management
  - Scheduling
  - Starting/stopping digital channel
  - Slating
  - Missing
  - Adding graphics
Lessons Learned

• AWS event team—Support and issues resolution
• MediaConnect needs to be kept open to avoid operational configuration on prem
• Redundant regions need to be manually failed over and user will see break in stream
• Intermittent packet loss hard to monitor and does not force automated in-region streams (AWS upgrade networking equipment to solve packet loss issue)
• Lambda scaling challenges—Requirements to pre-warm and scale to keep acceptable response latency
Future Plans

Server-side ad insertion (MediaTailor)

Low latency

UHD/4K HDR content

Using adaptive bitrates across all feeds

VOD stitching to generate virtual linear channels

Machine learning:
- Metadata enrichment
- Automated clip/highlight creation
- Automated subtitles and audio commentary on live feeds
Related sessions

MDS306-R: Building resilient live streaming video workflows
   Monday 2:30-3:30pm & Tuesday 4:00-5:00pm | Chalk Talk

MDS311-R1: Migrating live television distribution to the cloud, featuring FOX
   Tuesday 2:30-3:30pm | Session

MDS313-R & R1: Hotstar: Live streaming at record scale
   Wednesday 11:30am-12:30pm & Thursday 2:30-3:30pm | Session

MDS201: Latest Media & Entertainment industry news from AWS
   Thursday 4:00-5:00pm | Session
Learn media services with AWS Training and Certification

Resources created by AWS experts to help you create professional-quality media experiences

Learn from AWS media experts to advance your skills in streaming and monetizing live and on-demand video

20+ free digital media services courses and hands-on labs built by AWS experts, including Introduction to AWS Media Services and Setting Up and Configuring MediaConvert

Visit aws.amazon.com/training/path-mediaservices/
Thank you!

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