2019 Global Media Format Report

2018 was another steady year of growth for cloud media processing as large on-premise processing workflows continued to migrate to cloud providers. The Encoding.com format report represents the collective media processing practices found within the largest media workflows in the US, Asia, Europe, and Latin America. Our aim is to provide the critical data, trends, and insights that will help shape and inform your own media processing strategy.

Cloud Storage
S3, Akamai, Azure, SWIFT, Google Cloud

Adaptive Bitrate Standards
HLS, DASH, MSS

Cloud Transit
SFTP, FTP, HTTP, UDP

Screen Resolutions
4K, 1080p, 720p, 480p

OTT Video Codes & Containers
H.264, VPP, FLV, H.265, AV1, WEBM

Digital Rights Management
Widelive, Apple Fairplay, PlayReady

OTT Market Data
Streaming Media Device & SmartTV OS Market Share

Closed Caption Formats
SCC, CEA-508, WebVTT, SRT, DXFP, JMSC1

Intermediate Video Codecs & Containers
Apple ProRes, DNxHD, JPEGL2000, RecCode

Audio Formats
AAC, AC3, EAC3, MP3, Atoms

HDR Formats
HDR10, HLG, HDR10+, Dolby Vision

Advanced Thumbnail Formats
WebMTP, Roku BIF
MOVING MEZZANINE ASSETS TO THE CLOUD

As mezzanine-quality, premium media content is migrated to cloud storage it facilitates sending higher resolutions and bit rate content to a cloud transcoding provider. Encoding.com’s total encoding volume (as measured by total petabytes of source content ingested) grew 64% in 2018 over the previous year.

GLOBAL PROCESSING CENTERS

18

GLOBAL PROCESSING CENTERS

We now operate our platform in 18 global processing centers on five continents. New regions added in 2018 include Stockholm, Beijing, and Ningbo with four more expected to come online in 2019. Bahrain, Cape Town, Hong Kong SAR, and Milan. Availability of our complete media processing suite in all major geographic markets allows our customers to choose a processing location on a per-job basis greatly reducing the geographic latency of content ingestion.

- Ohio
- Virginia
- California
- Oregon
- Canada
- Tokyo
- Seoul
- Mumbai
- Singapore
- Sydney
- Stockholm
- Beijing
- Ningbo
- Frankfurt
- Ireland
- London
- Paris
- São Paulo
2018 Data Set
CLOUD MEDIA PROCESSING AT SCALE

916,144
TOTAL INSTANCES MANAGED

19.3
PETABYTES OF SOURCE CONTENT INGESTED

5,992,641,223
API REQUESTS RECEIVED

Starting, stopping, monitoring, and intelligently assigning jobs to compute resources in multiple locations is a core piece of our intellectual property. In 2018 we managed almost a million instances across public and private cloud infrastructure.

The vast majority of our customers integrate our API into their existing media systems, which offers precise control over job parameters, job status, error handling, and usage statistics. In 2018 Encoding.com accepted and processed over almost 6 billion API requests, averaging just over 150 requests a second.
Cloud Storage

MOVING MEZZANINE ASSETS TO THE CLOUD

Amazon Web Service’s S3 service continues to be the most popular cloud storage location representing 81% of the total source location volume we ingested in 2018 — up from 72% in 2017. We continue to see large media and entertainment companies moving mezzanine storage to S3, which fuels the adoption of cloud media processing in the corresponding AWS availability zone. For the second year in a row, Akamai’s NetStorage edged out S3 in 2018 as the top destination to deliver transcoded and packaged output. The distant competitors include Microsoft Azure, OpenStack’s SWIFT and Google’s cloud storage offering, which showed signs of growth in 2018 for the first time in years.

AMAZON S3’S NEAR MONOPOLY
Amazon’s dominance continues as over 80% of Encoding.com’s total source content ingested is stored in an Amazon S3 bucket, up from 72% in 2017.

AKAMAI’S NETSTORAGE ADVANTAGE
Akamai’s content delivery network continues to dominate the media and entertainment sector, making its NetStorage product an obvious destination choice for cloud media processing. An optional Aspera to NetStorage egress workflow makes it ideal for secure, high-speed delivery of large files. Akamai’s NetStorage platform includes automatic replication (unlike S3) to a second region and there are currently 34 NetStorage regions globally (S3 has 18).

MICROSOFT AZURE’S DECLINE
Despite a mature and feature-rich cloud storage offering, Microsoft Azure slipped from 5% to 2% as a percentage of source or destination locations for new jobs sent to Encoding.com.

GOOGLE CLOUD SHOWS SIGNS OF LIFE
After several years of reporting Google Cloud in the low single digits and only 1% in 2017, we predicted that Google Cloud storage would not be included in this year’s report if they never gained in traction in the M&E market segment. We are happy to report that we saw substantive growth in Google Cloud for the first time in four years and they doubled from 1% to 2% in 2018.
Cloud Transit

CLOUD INGEST & EGRESS

Although many people consider our core value to be media processing, orchestration and monitoring of ingest and egress at scale is equally important and complex. A resilient and distributed ingest and egress platform is critical to moving a high volume of large media files around the public internet to cloud data centers. Optimizing the speed of a diverse set of transit protocols and automatically retrying errors is critical for the reliability of a cloud-based media processing workflow.

SFTP/FTP CONTINUES TO DECLINE

Due to its legacy ubiquity, FTP/SFTP has always been a strong percentage of ingest and egress. However, for the second successive year since we started tracking these statistics we saw the aging protocols decline in 2018.

UDP

UDP, particularly Aspera’s FASP protocol, makes up a significant portion of our transit to and from cloud processing data centers. It continues to grow because of its inherent speed and security, making it perfect for delivering high volume broadcast content. Aspera’s 2018 volume was bolstered further by the integration of Aspera with Akamai’s NetStorage platform, and many of our top M&E customers quickly adopted this as their default delivery method.
OTT Video Codecs & Containers

H.264 REMAINS THE GOLD STANDARD
H.264 remains a pillar of any direct-to-consumer VOD service. The codec grew slightly this year reflecting its device and browser-support ubiquity. H.264 is the most popular codec within the dominant adaptive bitrate standards of HLS and DASH. We believe its growth was bolstered in 2018 as many customers decided to adopt a dual manifest DASH/HLS MP4 HDR workflow before they explored any advanced codecs such as HEVC for OTT delivery.

HEVC SHOWS SOME SIGNS OF GROWTH
After a huge year of validation in 2018 which included native support on iOS, tvOS and OSx, dozens of connected TV and Smart TV support, and inclusion in the HLS spec, we expected to see strong growth driven by more production HEVC workflows. Last year the majority of the HEVC usage we reported was in testing and development; however, in 2018 we can report that HEVC has been promoted to many production workflows and we anticipate a very substantive increase in volume in 2019 driven by UHD HDR content at both premium HDR standards Dolby Vision and HDR10 map to the HEVC video format.

VP9 STEADY
We reported soft interest in VP9 last year primarily related to finalization of the CMAT spec and forward-looking experimenting with next generation AV1 codec. Interest in VP9 remained steady in 2018, bolstered by a few HLG specific HDR workflows.

FLASH IS NOW OFFICIALLY NEGLIGIBLE
While Flash is still seeing life for specific uses and edge cases such as online advertising and legacy browsers, we believe it is mostly present within workflows that have not been closely watched or maintained. Flash outputs continue to decrease year over year and this year dropped below one percent.

AV1 REMAINS A HOBBY
With extremely computationally complex algorithms resulting in long (expensive) encoding times, no ABR support, no HDR support, no DRM support, no major browser support (we don’t count disabled by default), and no chipset support, AV1 remains a codec waiting for a major hardware browser or media ecosystem company to give the next generation codec a day job. AV1 remains toward the bottom of a long list of media processing priorities for the content owners we service.
The global online television industry is maturing rapidly. While adoption of streaming media players is close to 40 percent, more than half of U.S. broadband households own a smart TV. In 2018, 70 percent of the overall TVs being sold worldwide were smart TVs, an increase from 55 percent in 2015.
Intermediate Video Codecs & Containers

Intermediate, Broadcast, Edit, and Archival Codecs in the Cloud

Encoding.com ingests and decodes a wide variety of broadcast or intermediate video codecs to create popular OTT video codecs and containers. However, over the past three years we have seen a substantive increase in creation of intermediate, edit, and broadcast formats for direct distribution to MSOs and MPD and Virtual MVPDs. 2019 marks the first year that Encoding.com reports on these codecs separately from the OTT codecs.

Derived from the legacy Digital Cinema Package (DCP), the IMF format is designed to store a single master set of file-based elements that can be assembled using multiple composition play lists, making it significantly easier to create downstream localized versions without the need to encode and store multiple mezzanine assets. The obvious storage benefit of a single mezzanine asset is compounded with the adoption of UHD resolutions and while early adopters like Netflix exclusively accept all of their UHD HDR content in the IMF format, we believe the broader media & entertainment sector will look to adopt IMF as a mezzanine standard in parallel with UHD and UHDTV workflows.
HDR Formats

THE HDR FORMAT WARS BEGIN

Although we don’t have a statistically significant data set to report on this year, in 2018 we were involved in a number of pre-production UHD HDR workflows in North America and Europe scheduled to go to production in 2019. This data set reflects HDR version deployment across these workflows.

HDR10 This remains the de facto standard with by far the broadest degree of mobile and smart TV manufacturer’s playback support globally. HDR10 serves as a fallback HDR format with static metadata for all planned deployments.

HLG This European standard backed by the BBC has a number of live sports broadcasts in market and is relatively easy to deploy in the VOD with static metadata within the VP9 delivery codec.

Dolby Vision With broad TV manufacturer support, mobile support by Apple and LG, and HDR libraries in iTunes, Netflix, and Amazon make Dolby Vision the premium HDR format with dynamic metadata.

HDR10+ A relatively new advanced HDR standard competes technically with Dolby Vision and was founded by Samsung, Panasonic, and 21st Century Fox. The format has a small amount of content in market with Amazon Prime Video. It also has limited hardware support from Panasonic and Samsung TVs. However, the recent announcement from Apple that they will natively support 4K iTunes Movies on Samsung’s Tizen platform implies that the iTunes library will be soon support HDR+ as well as Dolby Vision.

<table>
<thead>
<tr>
<th>HDR Format</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDR10</td>
<td>63%</td>
</tr>
<tr>
<td>Dolby Vision</td>
<td>29%</td>
</tr>
<tr>
<td>HLG</td>
<td>17%</td>
</tr>
<tr>
<td>HDR10+</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>
Adaptive Bitrate Standards

Dynamically adapting to network conditions

Adaptive packaging protocols serve as the industry standard for premium video publishers to improve the end-user video experience. ABR standards allow for uninterrupted playback across varying network conditions and support for a diverse set of playback devices. Although DASH has shown strong growth year over year, HLS remains the most popular adaptive bitrate protocol.

Repackaging on the rise

Encoding.com offers an intermediate processing workflow which breaks the ABR workflow into two distinct steps. The first step encodes the video into intermediate streams in the desired bitrates. The second step uses the streams as the source for an HLS/DASH packaging job request. A repackaging workflow will future-proof an ABR library by allowing fast and cost-efficient packaging without the need to re-encode assets.

Dual manifest FMP4 workflows

One of the biggest stand-out trends of 2018 was strong adoption of a dual manifest M3U8 and MPD workflow referencing a single set of FMP4 streams. This was made possible by the support of the FMP4 formats and allows publishers to greatly reduce encoding overhead by dropping the need to encode into transport streams.

MSS still declining

While we see some consistent MSS workflows, particularly from our OTT customers outside of North America, Microsoft’s participation in CMAF signals the likely depreciation of MSS and we are certainly not seeing any new workflow planning around the standard.

HLS not going anywhere soon

HLS remains the most popular adaptive bitrate standard for all content publishers. A strong combination of the specifications maturity, continued improvement, (FMP4 and HEVC/HLS), and the vast number of devices in market offering support for HLS (iOS + Android + OTT) make it the pillar of any adaptive bitrate media strategy.

DASH holding its own

DASH is growing into its own and is the standard of choice for many OTT devices and desktop browsers. 2018 saw some major HLS workflows bifurcate to a dual HLS / DASH workflow.

Under the hood of HLS

FMP4 12%

H.265 3%

MSS 4%

DASH 29%

HLS 67%

TS 88%

TS vs FMP4

Although we saw strong growth in 2018 of HLS migration from TS to FMP4, TS retains the majority of all HLS output.

H.264 vs H.265

The 2017 WWDC announcement support for H.265 HLS within the iOS and macOS ecosystem paved the way for the codec to target iOS 11 and later as well as the 4K Apple TV but we have yet to see widespread adoption.
Although the industry has been frothing over UHD for what feels like an eternity, the 4K resolution finally saw a substantive uptick in our total output resolutions from 8 percent to 12 percent in 2018 while 1080p still makes up about half. 720p remains the leading format for most mobile devices.
Digital Rights Management

As publishers deliver premium content to every device, secure encryption and DRM has become a vital yet equally fragmented component of the online video ecosystem.

### 2018 FairPlay Device Compatibility

<table>
<thead>
<tr>
<th>BROWSER</th>
<th>MOBILE</th>
<th>OTT DEVICE</th>
<th>SMART TV</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAFARI 8 / IOS 11.2+</td>
<td>IOS 6+</td>
<td>APPLE TV</td>
<td>(SAMSUNG TIZEN?)</td>
</tr>
</tbody>
</table>

### 2018 WideVine Device Compatibility

<table>
<thead>
<tr>
<th>BROWSER</th>
<th>MOBILE</th>
<th>OTT DEVICE</th>
<th>SMART TV</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHROME 35+</td>
<td>ANDROID 6+</td>
<td>CHROMECAST</td>
<td>SAMSUNG TIZEN (2017+)</td>
</tr>
<tr>
<td>FIREFOX 35+</td>
<td>ANDROID 4.4 - 5.1</td>
<td>ROKU</td>
<td>ANDROID TV</td>
</tr>
</tbody>
</table>

### 2018 PlayReady Device Compatibility

<table>
<thead>
<tr>
<th>BROWSER</th>
<th>MOBILE</th>
<th>OTT DEVICE</th>
<th>SMART TV</th>
</tr>
</thead>
<tbody>
<tr>
<td>MICROSOFT EDGE</td>
<td>WINDOWS 10+</td>
<td>XBOX</td>
<td>SAMSUNG TIZEN (2011+)</td>
</tr>
</tbody>
</table>

**WideVine**

WideVine remains the leading DRM framework within our data set. It is the only DRM framework to work natively on all major platforms, namely Chrome on Windows, Roku, Android and iOS. The WideVine DRM Framework remains a major player and present in almost all major DRM workflows.

**Apple FairPlay Grows**

Apple’s FairPlay continued to see strong adoption in 2018. Apple recently made a bold move by announcing that, for the first time, their currently FairPlay protected video library will be made available via an iTunes TV native app within the next generation Samsung Smart TVs. At the time of this report’s publishing, it remains to be seen if Samsung will move to support FairPlay or if Apple will move to support WideVine in an effort to back this initiative. Regardless of the outcome, this represents a major shift toward harmonized DRM frameworks and the first time the Apple content will be available on non-Apple hardware.

**DRM Encryption Mode Gap Closing**

The CMAF Framework takes a huge step toward a simple DRM OTT workflow by supporting multiple simultaneous DRM schemas. Significant fragmentation remains in the DRM ecosystem in respect to encryption types (Cipher Block Chaining (CBC) and Counter Mode (CTR)). While Apple’s FairPlay has always supported CBC, legacy CTR based DRM vendors such as WideVine and PlayReady have only recently announced support for CBC in 2017. Widespread device adoption of the PlayReady 4.0 and WideVine HLS with CMAF v2 frameworks needs to reach sufficient adoption before a single encryption type can be used for all media segments. This means that in 2018, adopting a CMAF compliant DRM workflow still requires generating and storing two versions of your media, which is still counter to the end goal of transcoding media one time into MP4 and referencing those segments with both your DASH and HLS manifests.
Closed Caption Formats

MAXIMUM ACCESSIBILITY

We are reporting strong growth in 2018 of the WebVTT and ISMC closed caption formats. WebVTT is part of both the HTML5 and CMAF guidelines and is generally easier to work with than other caption formats making it an obvious choice for MP4 DASH and HLS presentation. ISMC is also part of the CMAF as well as the W3C standards. ISMC supports a wide range of international character sets and scripts, as well as rich styling support for PNG subtitles.
The audio experience remains a critical component of the overall mobile and OTT video experience. Low-bitrate audio “fallback” streams, all the way up to high-bitrate surround sound living room audio experiences, are now commonplace within the same adaptive bitrate package. This ensures that the highest available experience is delivered to every device at every network speed.

**PCM Audio**

The raw, uncompressed audio format PCM is often found along with high-quality mezzanine sources. Along with channel mapping instructions, these audio files can be converted into compressed formats — for example, EAC3 or AC3 — to reduce file size considerably without any loss of quality.
Advanced Thumbnail Formats

SEEKING WITH THUMBNAIL SPRITES

Multiple thumbnails stitched together into a single image offer many performance benefits over presenting each thumbnail file individually. It also improves the user playback experience within media players by offering visual keys to navigate content within a player’s timeline. WebVTT and Roku BIF represent the two most important formats in their category and we believe virtually everyone is hoping the Roku platform will add support for WebVTT.