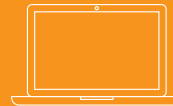


2017 was another year of explosive growth as large on-premise media processing workflows continued to migrate to cloud providers. The Encoding.com format report represents the collective media processing practices found within the largest media workflows in the US, Europe, and Latin America. Our aim is to provide the critical data, trends, and insights that will help shape and inform your media processing strategy.



Cloud Storage

S3, Akamai, Azure, SWIFT, Google Cloud



Transit

SFTP, FTP, HTTP, UDP



Video Codecs & Containers

H.264, VP9, FLV, HEVC, WEBM



Adaptive Bitrate Standards

HLS, DASH, MSS



Digital Rights Management

Widevine, Flash Access, Apple Fairplay, PlayReady



Screen Resolutions

4K, 1080p, 720p, 480p



Closed Caption Formats

SCC, CEA-608, WebVTT, SRT, DXFP



Audio Formats

AAC, AC3, EAC3, MP3

2017 by the Numbers

As mezzanine-quality, premium media content is migrated to cloud storage it facilitates sending higher resolutions and bitrate content to a cloud transcoding provider. Encoding.com's total encoding volume (as measured by total petabytes of source content ingested) grew 115% in 2017 over the previous year.



Ohio • Virginia • Northern California
Oregon • Tokyo • Seoul • Osaka • Mumbai
Singapore • Sydney • Beijing • Frankfurt
Ireland • London • Paris • San Puelo

2017 by the Numbers

16 Global Processing Centers

We now operate our platform in 16 global processing centers on five continents. 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.

766,190 Total Instances Managed

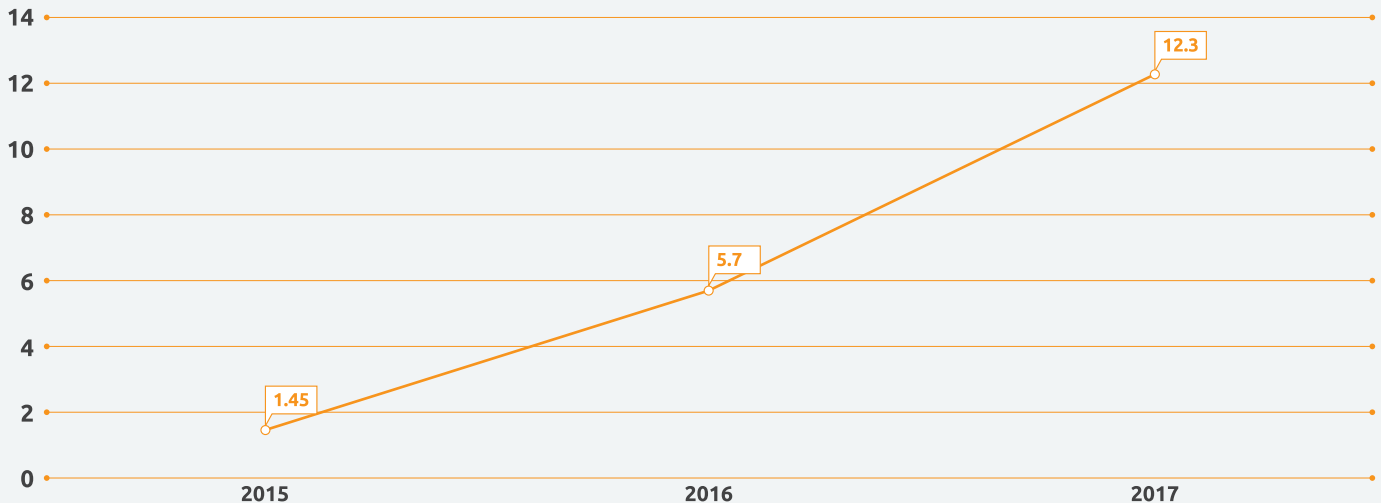
Total Instances Managed

Starting, stopping, monitoring, and intelligently assigning jobs to compute resources in multiple locations is a core piece of our intellectual property. In 2017 we managed almost three quarters of a million instances across public and private cloud infrastructure.

500,008,193 API Requests Received

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 2017 Encoding.com processed just over a half a billion API requests, averaging just over 20 requests a second.

12.3 Petabytes of Source Content Ingested



Cloud Storage

Amazon Increases Dominance

Amazon Web Service's S3 platform continues to be the most popular cloud storage location representing 72% of the total source location volume we ingested in 2017 — up from 68% in 2016. 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. Akamai's NetStorage edged out S3 in 2017 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 continues to struggle in the media processing market segment and has yet to break the 1% mark.

Amazon S3's Dominance

Amazon's dominance continues as almost 3/4 of Encoding.com's total source content ingested is stored in a Amazon S3 bucket.

Akamai's Origin Advantage

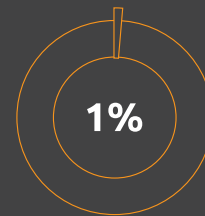
Akamai's content delivery network continues to dominate the media and entertainment sector making its NetStorage product an obvious destination choice for cloud media processing. Akamai's NetStorage platform includes automatic replication (unlike S3) to a second region and there are currently 34 NetStorage regions globally (S3 has 18).

Microsoft Azure's Slow Slip

Despite a mature and feature-rich cloud storage offering, Microsoft Azure slipped from 7% to 5% as a percentage of source or destination locations for new jobs sent to Encoding.com.

Waiting for Google Cloud to Show Up

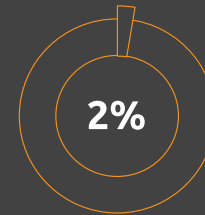
For the second year in a row, Google Cloud storage does not represent a significant source or destination location for media companies who have migrated to cloud media processing. We report on Google Cloud this year purely in the hope that someone in their cloud organization reads this and starts to put substantive resources behind this M&E market segment. If they don't show any increased traction in 2018 we won't have enough data to mention them in next year's report.



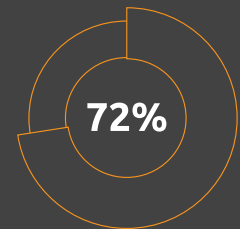
Google Cloud



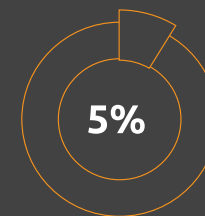
Akamai



SWIFT



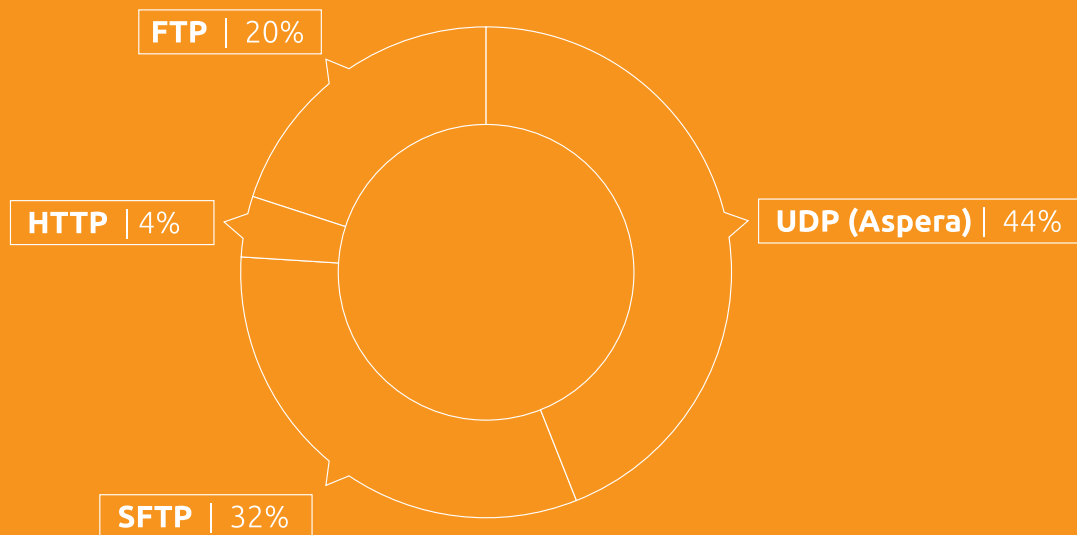
S3



Azure

Transit

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. 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 Starts to Decline

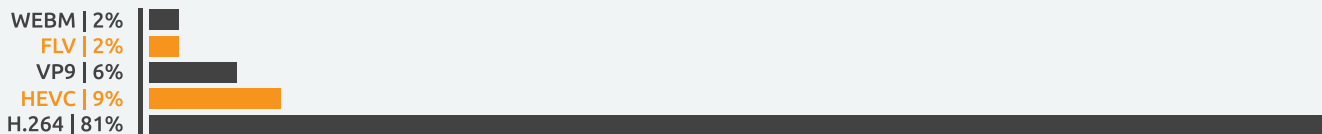
Due to its legacy ubiquity, FTP/SFTP has always been a strong percentage of ingest and egress. However; for the first time since we started tracking these statistics we saw the aging protocols decline in 2017.

FASP and Steady

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 2017 volume was bolstered further by the recent integration of Aspera with Akamai's NetStorage platform, and many of our top M&E customers quickly adopted this as their default delivery method.

Video Codecs & Containers

While we support virtually unlimited codec and container combinations supported by over 35 commercial and open source encoding engines, we highlight the top 5 most popular combinations and any significant codec movement in the statistics up or down.



H.264 is Defacto

H.264 has grown year over year since Encoding.com's inception. The codec grew slightly this year reflecting its device and browser support ubiquity. H.264 is the most popular codec within the dominate adaptive bitrate standards of HLS and DASH. And although fMP4 CMAF might represent the future, the requirement from publishers to support legacy devices — namely Android < 7.0, iOS < 11, OSX < High Sierra, and Windows < Windows 10 — most publisher are unlikely to abandon the old HLS/H.264/TS workflows anytime soon.

VP9 Softens

We added support for the VP9 codec in 2016 which was followed by some market interest in VP9 as an alternative to H.264. With the finalization of the CMAF spec allowing only H.264 and HEVC along with the impending finalization of the next generation AV1 codec, interest in VP9 has softened considerably in 2017 and we expect that to continue in 2018.

HEVC Receives its Validation

After the next generation codec declined in our report from 2015 to 2016, HEVC was validated with the announcement by Apple at WWDC17 that iOS, tvOS and OSX would natively support HEVC. Although we are reporting an uptick in usage of the HEVC codec related to this announcement, the majority of the usage remains in testing and development as opposed to production workflows and we anticipate a very substantive increase in volume in 2018 as content libraries begin the transition.

Flash Deprecation Continues

While Flash is still being used for specific uses and edge cases such as online advertising and legacy browsers, its days are numbered. Flash outputs continue to decrease year over year, and we expect to see the Flash video codec disappear completely from our report within 12 months. The 2017 M56 Chrome release requires a one-time user action to re-enable Flash on a web page, otherwise Flash is automatically disabled by default.

CMAF is Ratified

Although not a codec or a container, the long awaited CMAF (Common Media Application Format) guidelines were published in 2017 and ratified in early 2018. The joint support from unlikely collaborators Microsoft and Apple offers a set of specifications for how the fMP4 container should be organized. With HLS's support of fMP4, CMAF represents the next step of alignment between the dominant DASH and HLS standards.

Key CMAF Components

- Supports either AVC or HEVC Video Codecs
- fMP4 container only signaling the overdue departure from TS Transport Stream protocol that was originally intended for single bitrate (non switching) based broadcast cable transport
- CENC Common Encryption Support of multiple concurrent DRM schemas by encrypting media payload and headers separately
- Requires unmuxed audio and video streams
- Provides audio in stereo AAC (and optionally in multi-channel)
- Provides captions in both WebVTT and ISMC1 formats
- Supported by HLS .m3u8 and DASH .mpd manifests

Adaptive Bitrate Standards

Adaptive packaging protocols serve as the industry standard for premium video publishers to improve the end user video experience 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.



HLS the Gold Standard

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 + tvOS + OSX + Android + OTT) make it the pillar of any adaptive bitrate media strategy.

DASH Grows

DASH is growing into its own and is the standard of choice for many OTT devices and desktop browsers. 2017 saw some major HLS workflows bifurcate to a dual HLS / DASH workflow. See table: 2018 ABR Device Mapping

MSS not part of any forward looking plans

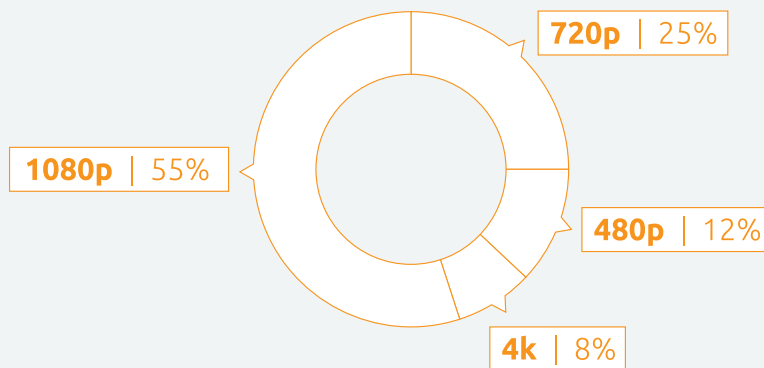
While we see some consistent MSS workflows, particularly from our OTT customers outside of North America, Microsoft's participation in CMAF signals the likely depreciation of MSS and we are certainly not seeing any new workflow planning around the standard.

2018 ABR Device Mapping

| DEVICE | FORMAT | CODEC/ CONTAINER | HIGH/LOW RESOLUTION | ENCRYPTION MODE | DRM |
|--------------------|--------|---------------------|------------------------|--------------------|------------------------|
| Apple TV | HLS | H.264/TS | 1920x1080/640x360 | CBC | FairPlay |
| iPad | | | 960x540/416x234 | | |
| iPhone | | | 1280x720/416x234 | | |
| Android OTT | HLS | H.264/TS | 1920x1080/640x360 | CTR | PlayReady/ Widevine |
| Android Smartphone | | | 960x540/416x234 | | |
| Android Tablet | | | 1280x720/416x234 | | |
| Chromecast | DASH | H.264/fMP4 | 1920x1080/640x360 | CTR | PlayReady/ Widevine |
| Roku | | | 1920x1080/640x360 | | |
| XBox | | | 1920x1080/640x360 | | |
| Samsung TV | | | 1920x1080/640x360 | | |
| Desktop Browser | | | 1280x720/416x234 | | |

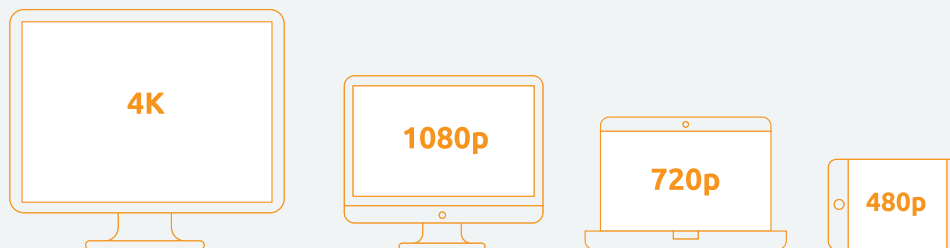
Screen Resolutions

Despite the industry excitement about 4K, the resolution makes up only 8% (down from 10% last year) of our total output resolutions while 1080p makes up about half. 720p remains the leading format for most mobile devices. We anticipate a big year for 4K resolutions in 2018 as publishers add it to their new HEVC/HLS workflow.



Mobile Devices

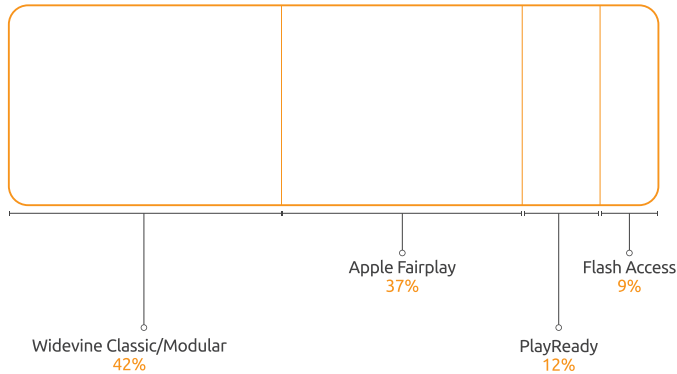
While most current smartphones support 1080p, 720p remains the leading resolution for top-end streams as video publishers balance quality, playability, and delivery costs.



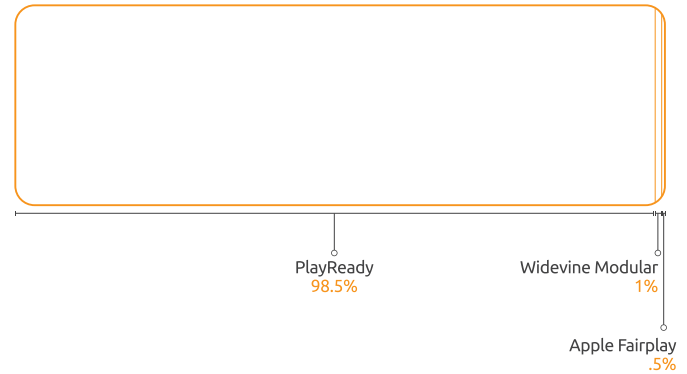
Digital Rights Management

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. This year we expanded our DRM data set and perspective by including data from a leading KMS provider, BuyDRM.

Encoding.com 2017 Stats



BuyDRM 2017 Stats



Apple FairPlay Surges

After explosive growth in 2016, Apple's FairPlay continued to see strong adoption in 2017. FairPlay remains a default choice for top video publishers to deliver premium content to the Apple ecosystem iOS, tvOS, and OSX. Apple has made some progress expanding and improving their FairPlay licensing program but its strict requirements for publishers to license directly with Apple has limited its growth significantly.

Flash Access Declining Rapidly

Despite some large publishers still using Adobe's Primetime framework for DAI, Flash Access as a standalone DRM framework has little forward-looking compatibility other than the Desktop (Firefox and legacy browsers). Adobe has now replaced Flash Access offering with a third party Multi DRM — ExpressPlay / Intertrust.

DRM Encryption Mode Fragmented

The CMAF framework takes a huge step toward a single 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 FMP4 and referencing those segments with both your DASH and HLS manifests.

Closed Caption Formats

We are reporting strong growth in 2017 of the WebVTT closed caption format — from 21% to 31% of total caption volume. 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 fMP4 DASH and HLS presentation. WebVTT can be analyzed in plain text without third party software, can be prepared once and easily added to any stream within a manifest, and requires no muxing software. WebVTT is also more reliable with non Latin language character sets such as Arabic, Russian, or Japanese.

Audio Formats

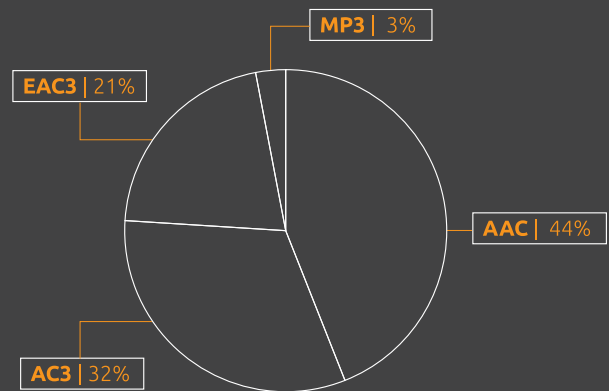
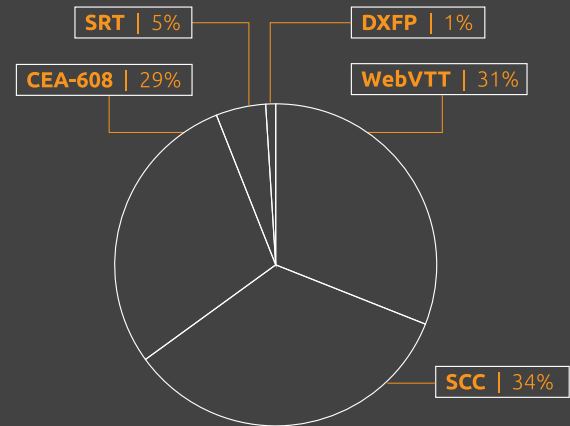
The audio experience remains a critical component of the overall mobile and OTT video experience. Low-bitrate audio “fallback” streams all the way up to high-bitrate surround sound living room audio experiences are now commonplace within the same adaptive bitrate package. This ensures that the highest available experience is delivered to every device at every network speed.

Multi Channel Audio Surges for OTT

The Dolby Digital (AC3) and Dolby Digital Plus (EAC3) audio codecs grew significantly over 2016 aggregate data. The 5.1 and 7.1 codecs are gaining mobile device compatibility in the market, and the codecs are often used within the premium audio channel of the HLS spec which allows 192kbps 5.1 streams to be paired with 1080p high-bitrate video streams. This audio video combination offers a premium experience for connected televisions such as the Apple TV and Roku that are connected to surround sound compatible receivers.

ACC Delivers

The AAC and Dolby HE-AAC codecs remain popular audio codecs with broad compatibility across desktop and mobile devices. The HE-AAC codec is especially popular within the HLS adaptive bitrate standard as it performs exceptionally well at the low 64k audio-only bitrate required in Apple’s HLS specification.



Improve quality and efficiency while saving money by optimizing your media workflow in the cloud.

Contact us

sales@encoding.com

+1 800 513 1740

546 Bryant Street
San Francisco, CA 94107

