streamflow
by CDN77

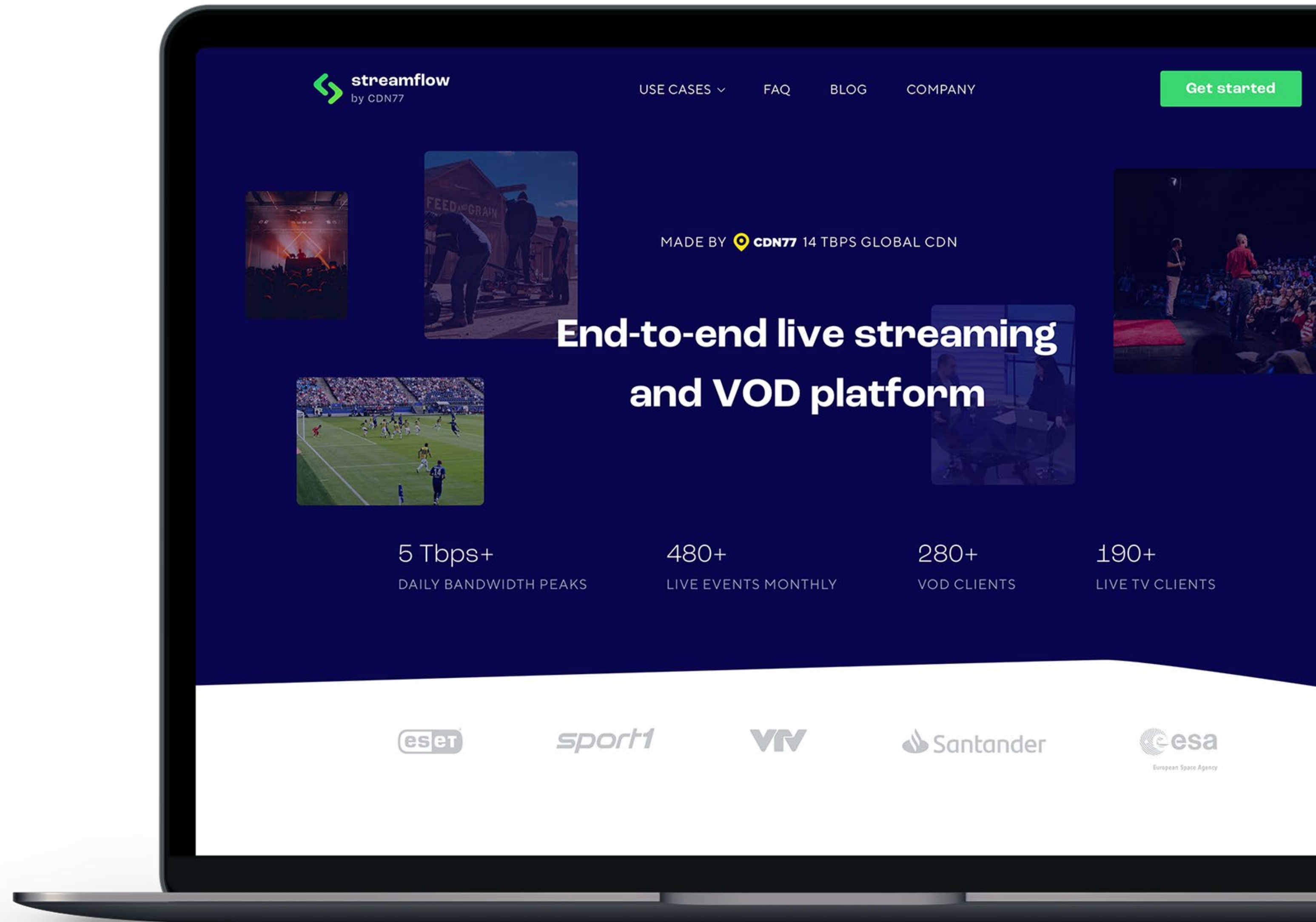# INTEGRATING CMAF INTO A VOD WORKFLOW

Tomas Bacik — Product Development

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streamflow
by CDN77
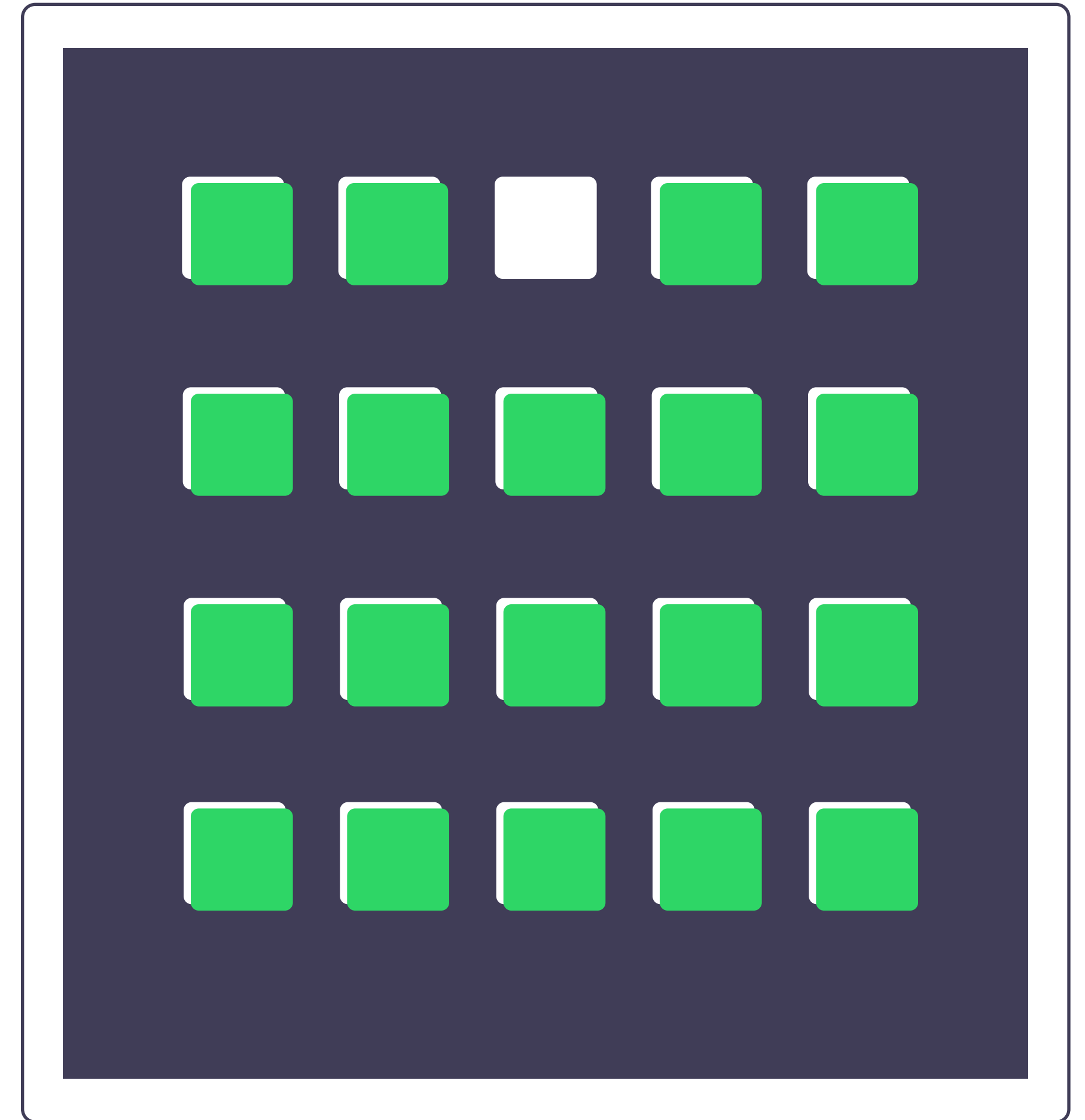
- Live and VOD platform
- Processing – Delivery - Playback
- 15 Tbps+ network
- Powered by CDN77

Outline

– CMAF Explained

– HTTP Adaptive Streaming

– VOD Workflow Scenarios

– Cost Saving and Performance
  Benefits of CMAF in VOD

– CMAF and Encryption

– Challenges

– Future of CMAF

CMAF - What is it

- CMAF – Common Media Application Format

- Utilizes a universal fragmented mp4 container (ISOBMFF /fmp4)

- Proposed by Apple and Microsoft in 2016

- Standardized in 2018 (ISO/IEC 23000-19:2018)
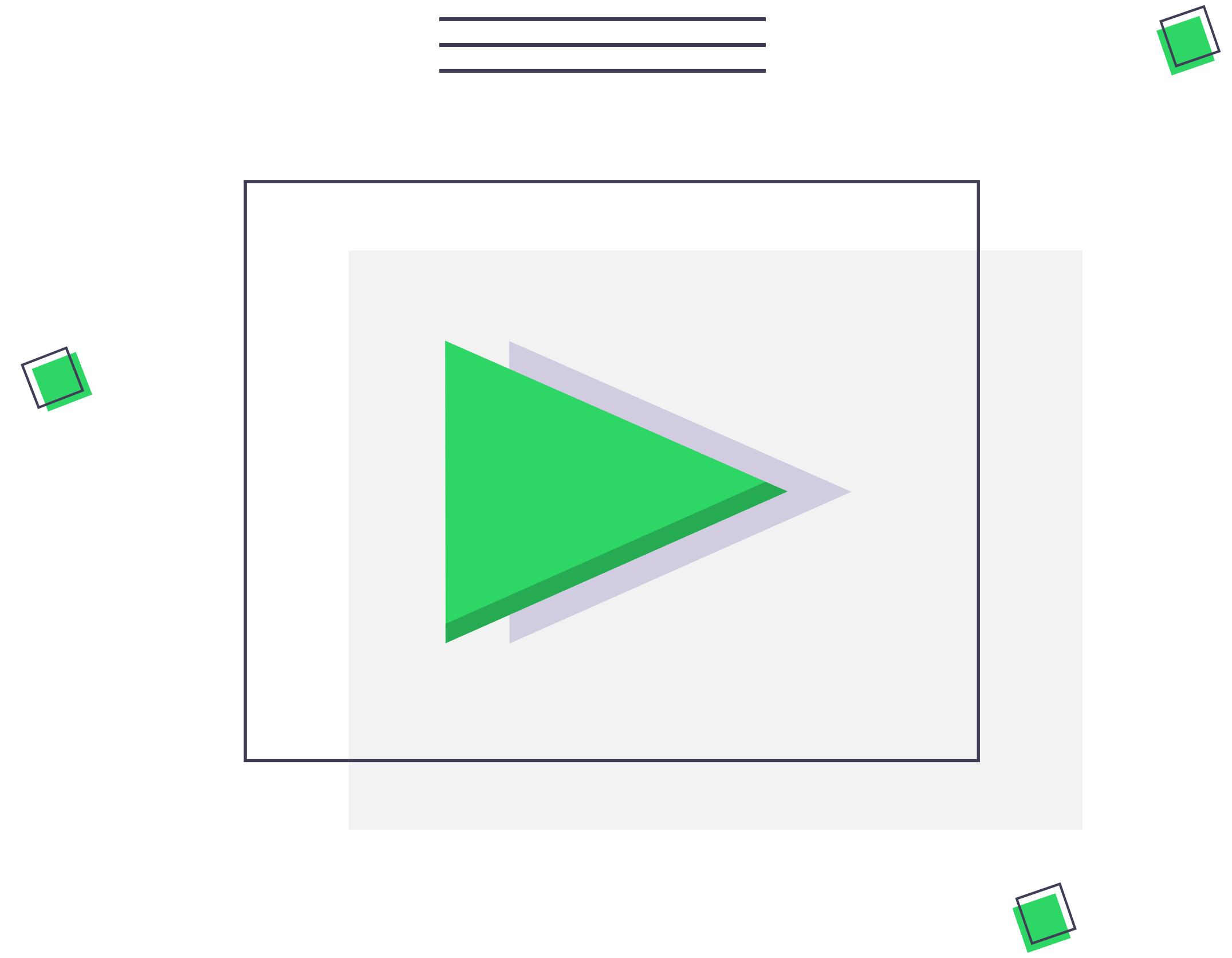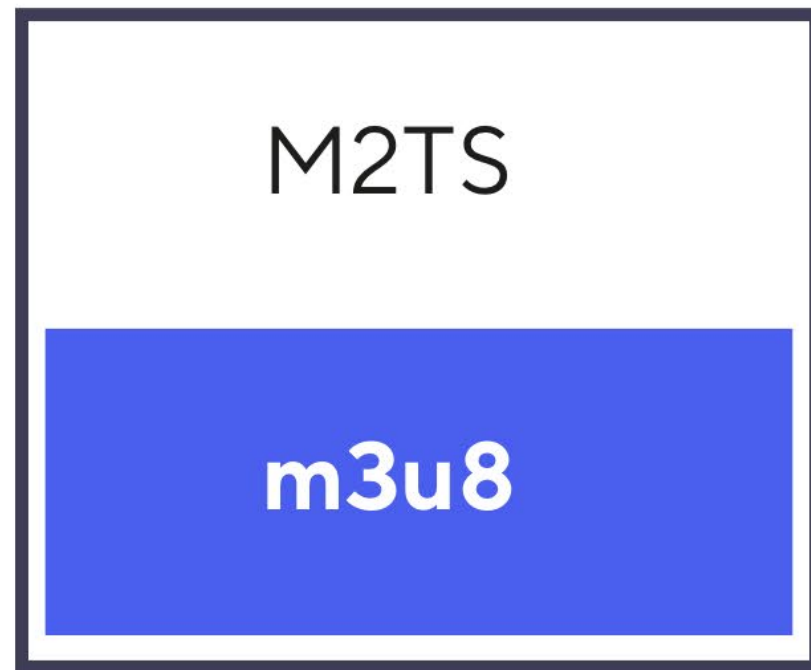
Key benefits of CMAF

- Manifest agnostic

- Cut cost of Storage and encoding

- Improves cache efficiency

- A significant step toward unified encryption

- Allows for low latency live streaming
  (chunked encoded – chunked transferred CMAF)

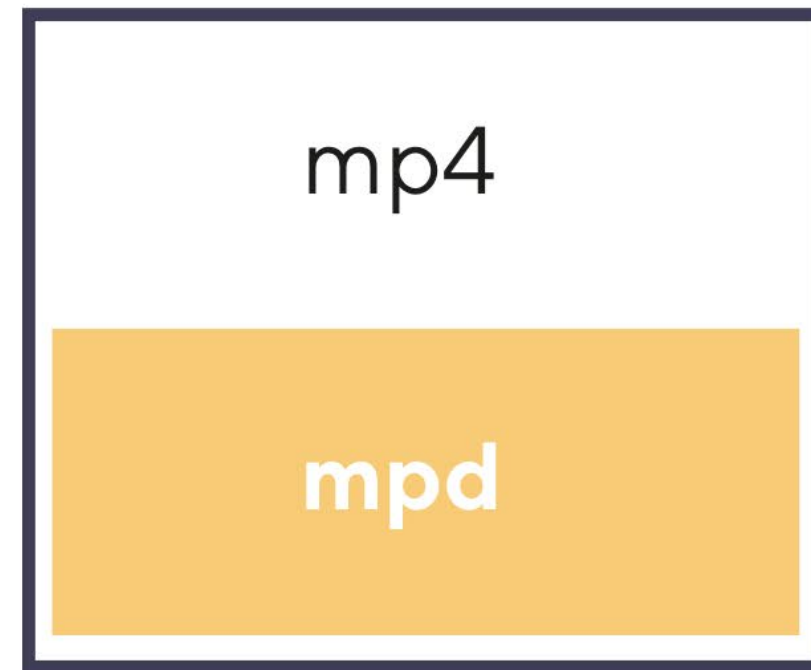- A solid base for further industry cooperation
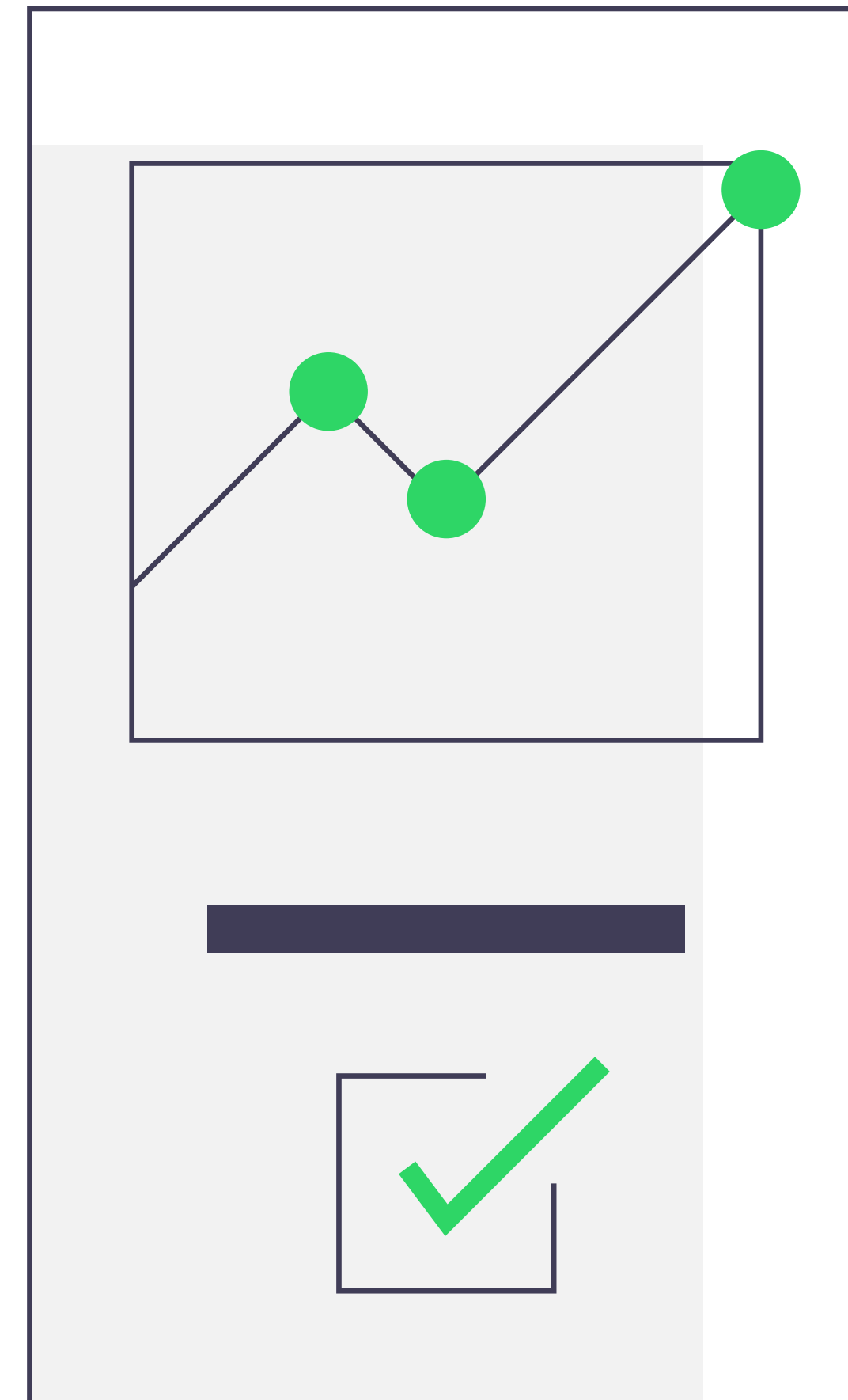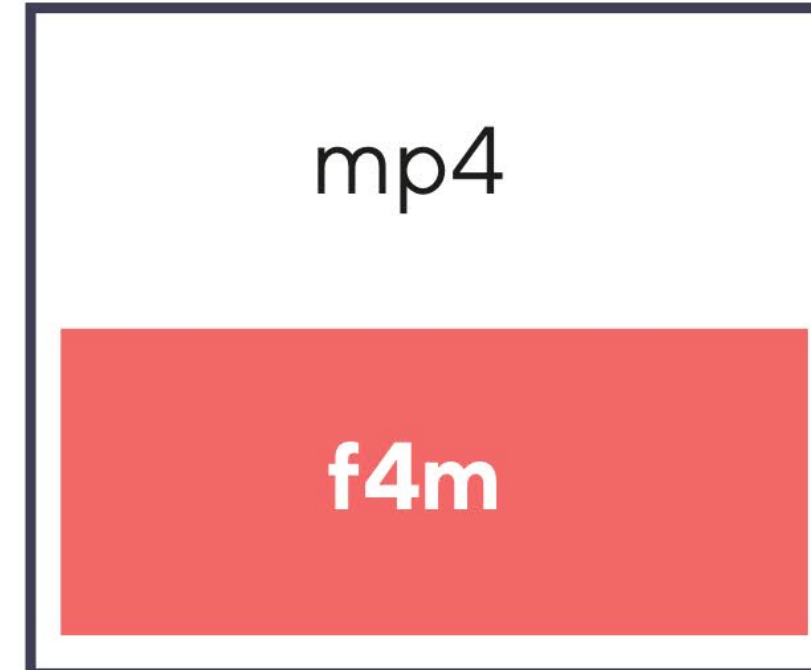
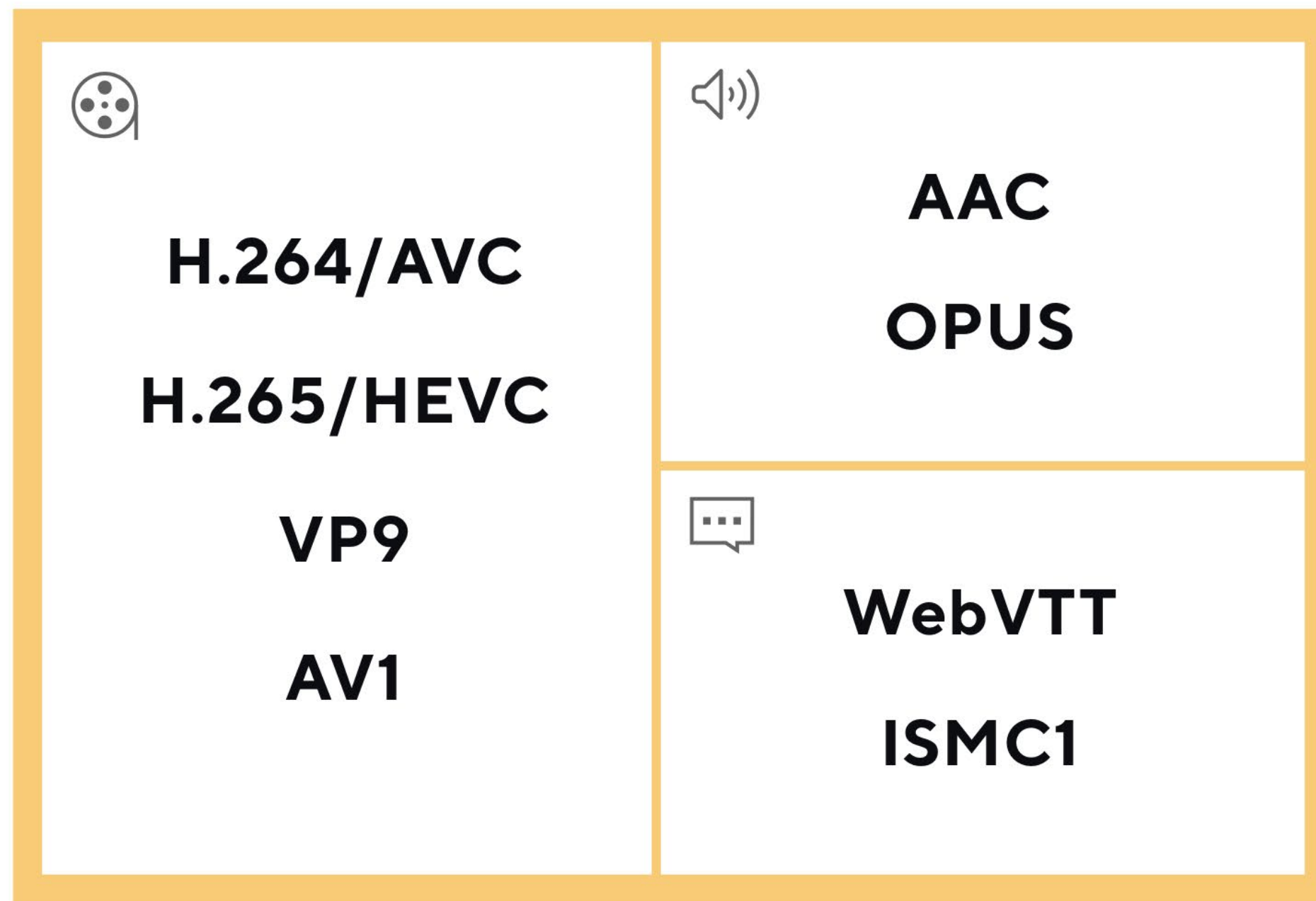# HTTP Adaptive streaming

Protocol overview

HLS	MPEG-DASH	HDS	Microsoft Smooth Streaming
M2TS	mp4	mp4	mp4
m3u8	**mpd**	**f4m**	**isml**

HLS & MPEG-DASH

MPEG-DASH — mp4 container

H.264/AVC

H.265/HEVC

VP9

AV1

AAC

OPUS

WebVTT

ISMC1

HLS — M2TS container

H.264/AVC

AAC

OPUS

WebVTT

ISMC1

CMAF

HLS	MPEG-DASH
.m3u8	.mpd

CMAF — FMP4
container

| H.264/AVC H.265/HEVC VP9 AV1 | AAC OPUS |
| | WebVTT ISMC1 |

Vod Workflow
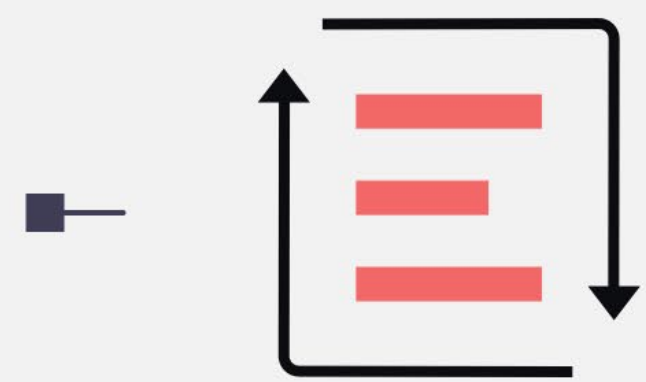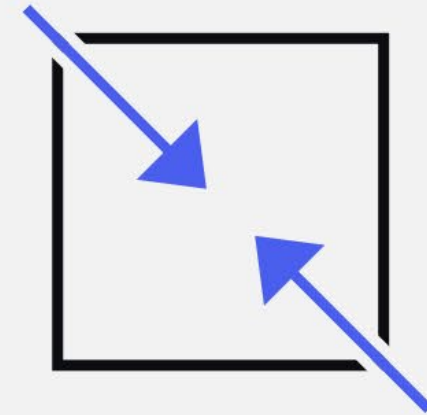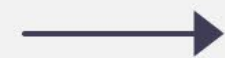
Transcoding   **Packaging**   **Storage**   **CDN**   **Playback**
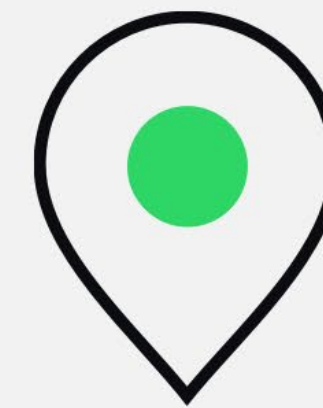
Vod Workflow
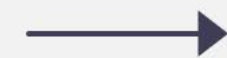
Transcoding **Packaging** **Storage** **CDN** **Playback**
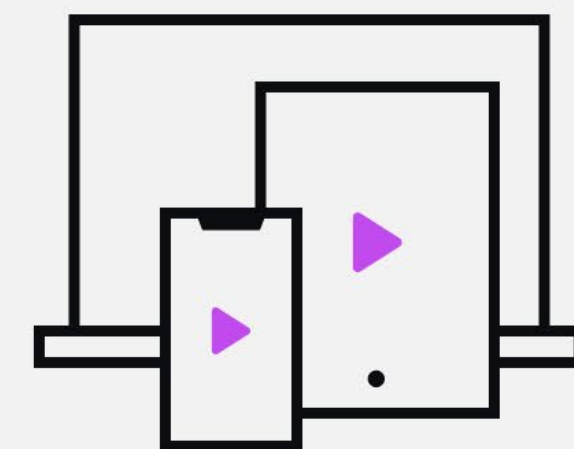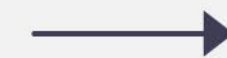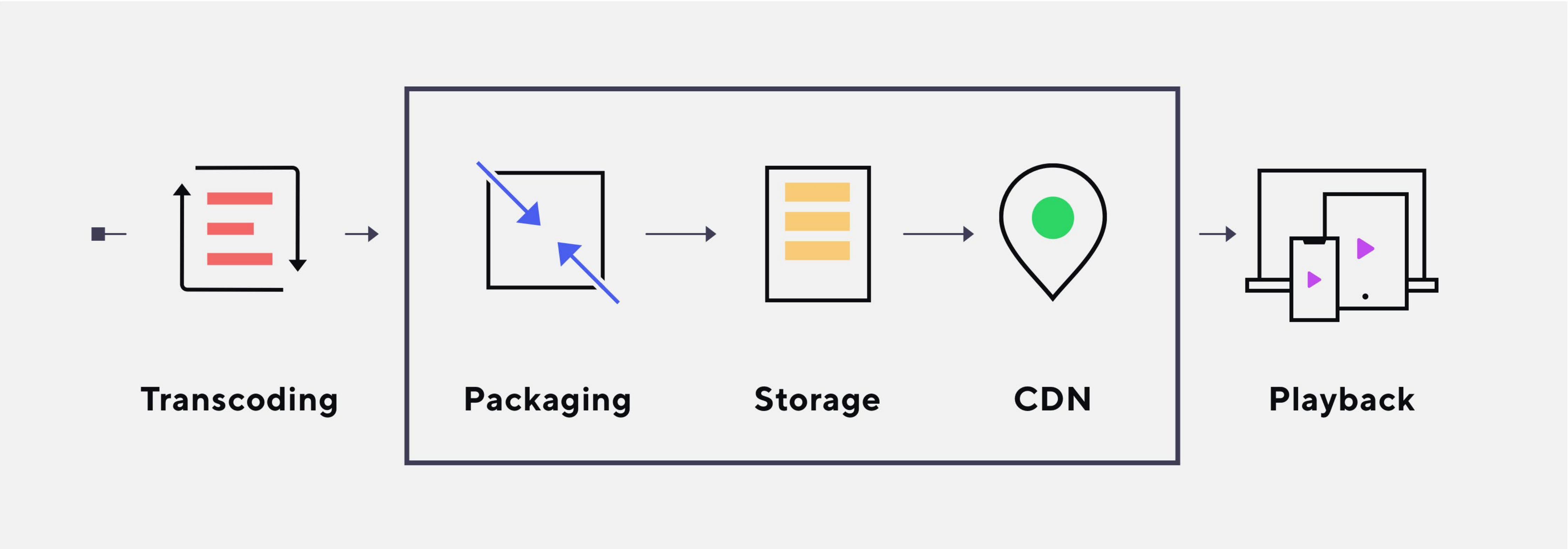
HLS + DASH – static packaging

Transcoding /packaging

Storage

CDN PoPs

End users

GPU/CPU NVENC
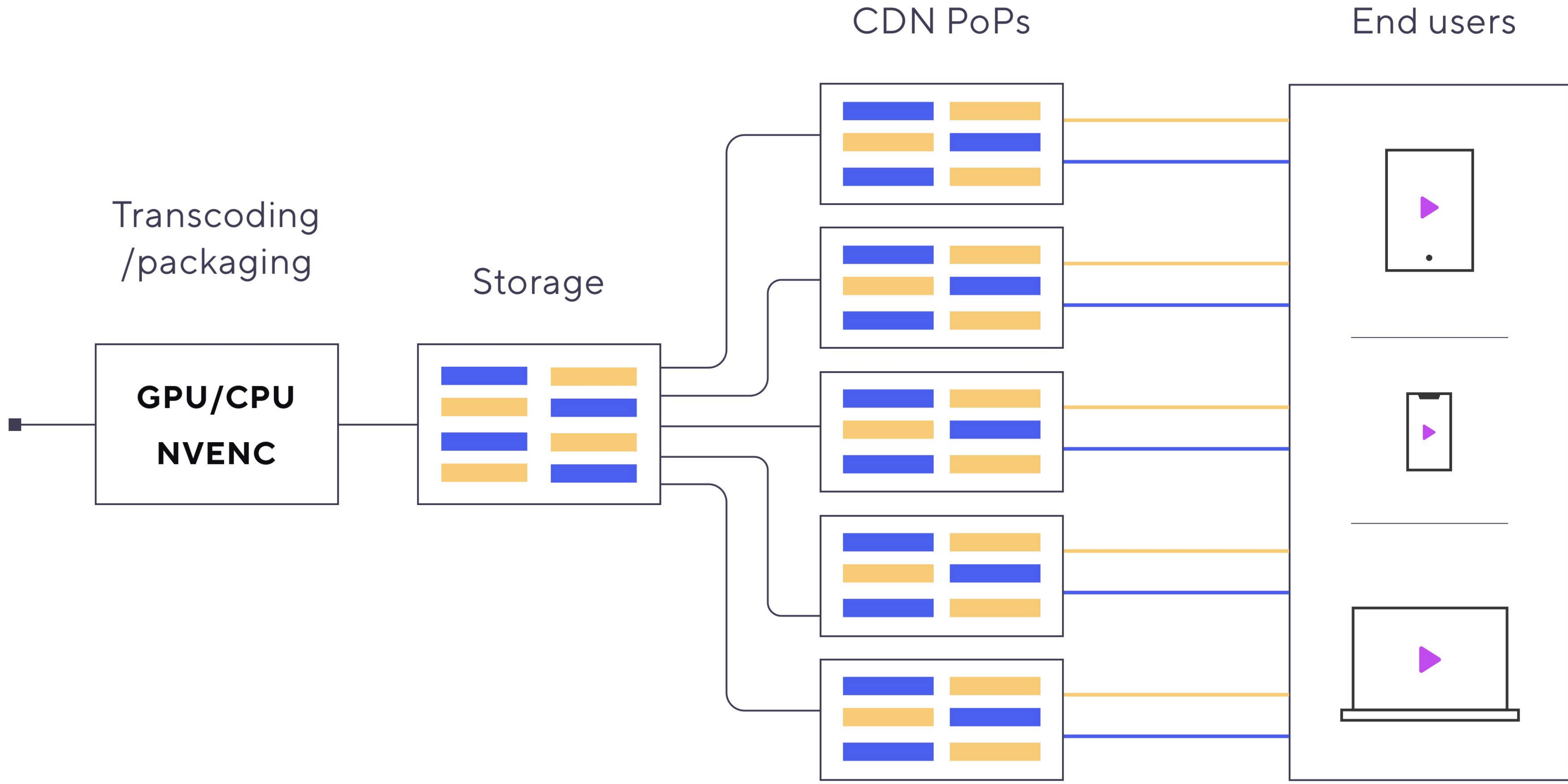
HLS

MPEG-DASH

HLS + DASH – dynamic packaging

CDN PoPs

End users

Transcoding

GPU/CPU

NVENC

Storage

mp4

mp4

mp4

Dynamic packaging

HLS
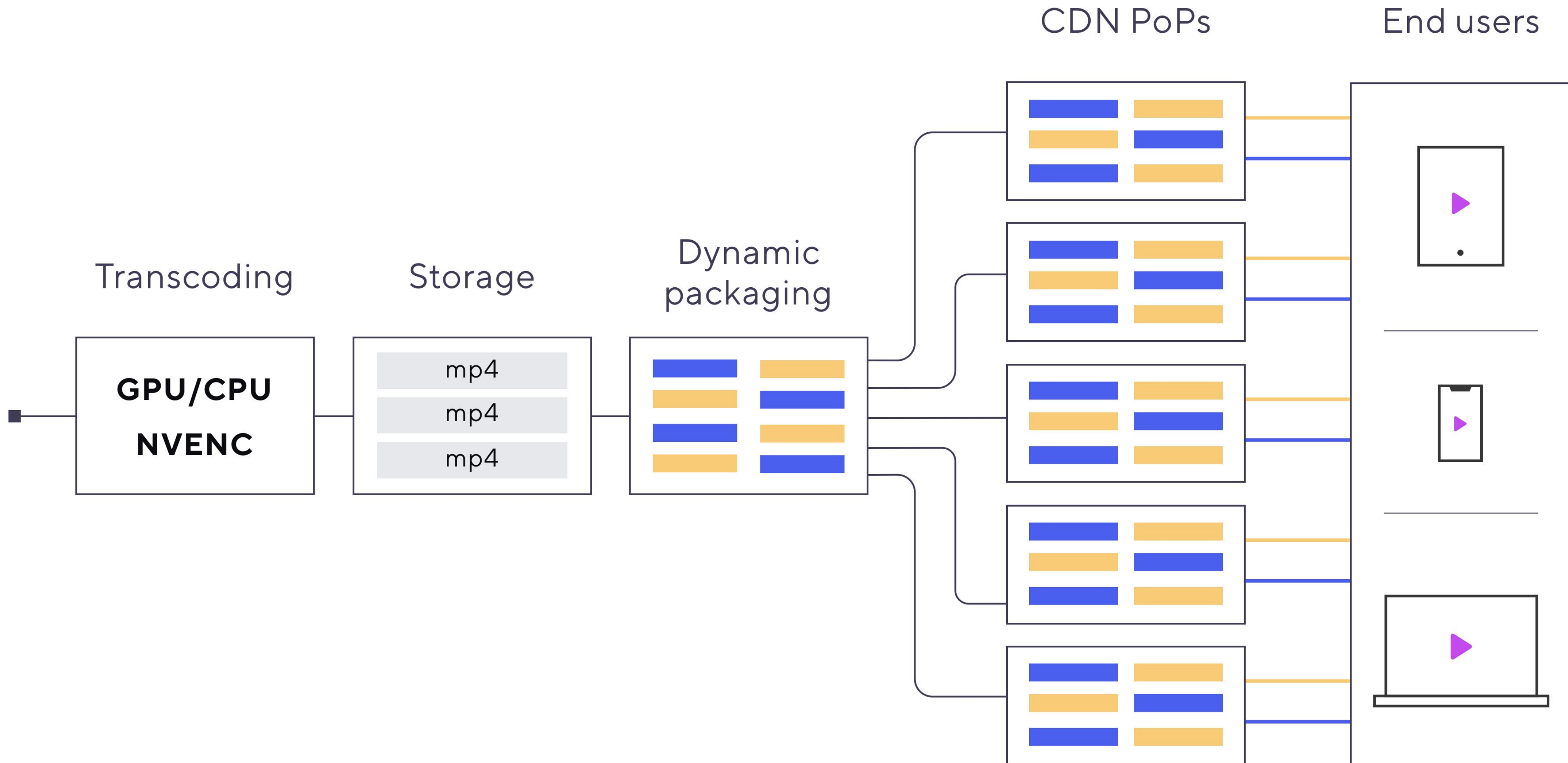
MPEG-DASH

CDN Cache model

HLS

MPEG-DASH

CDN Cache model

CMAF packaging

Transcoding /packaging

Storage

CDN PoPs

End users

GPU/CPU NVENC
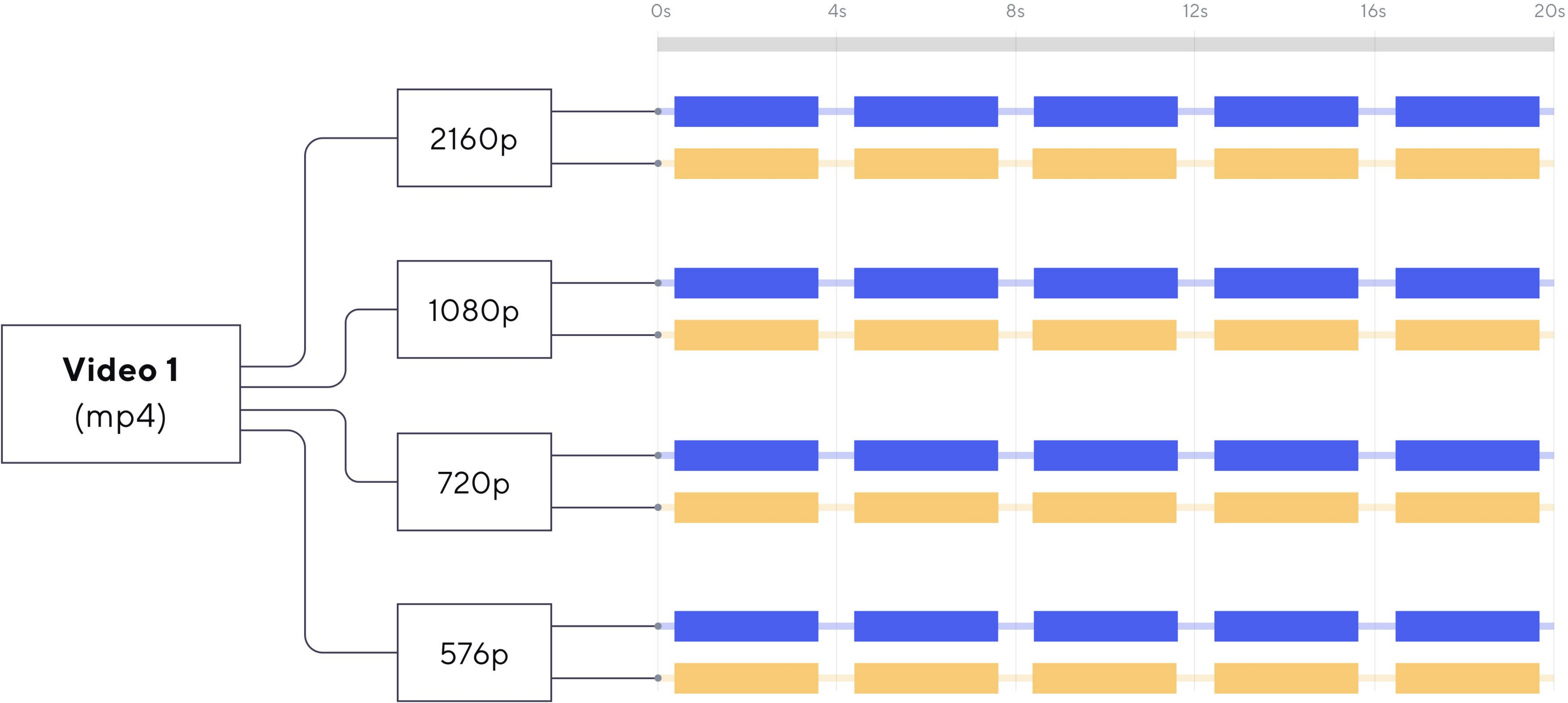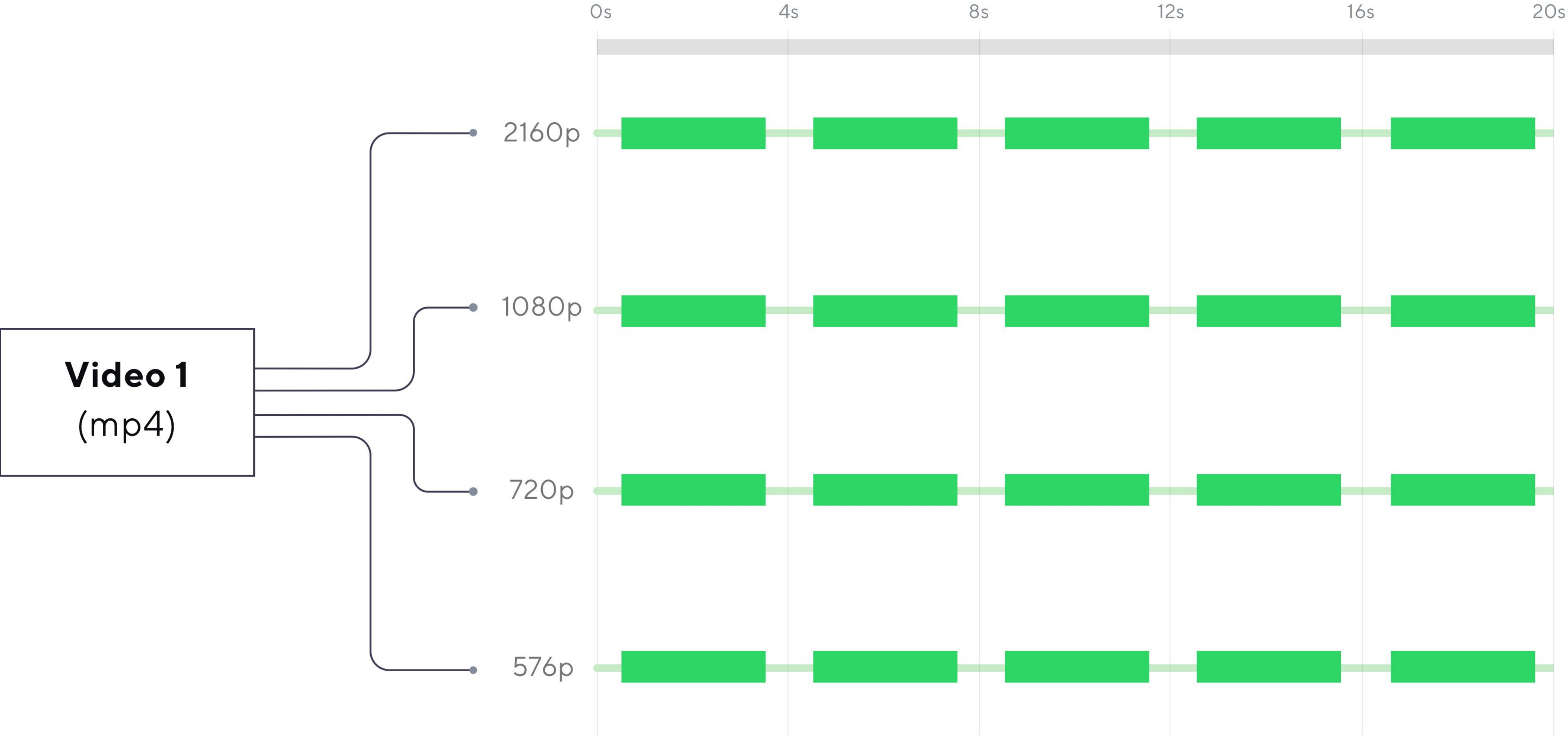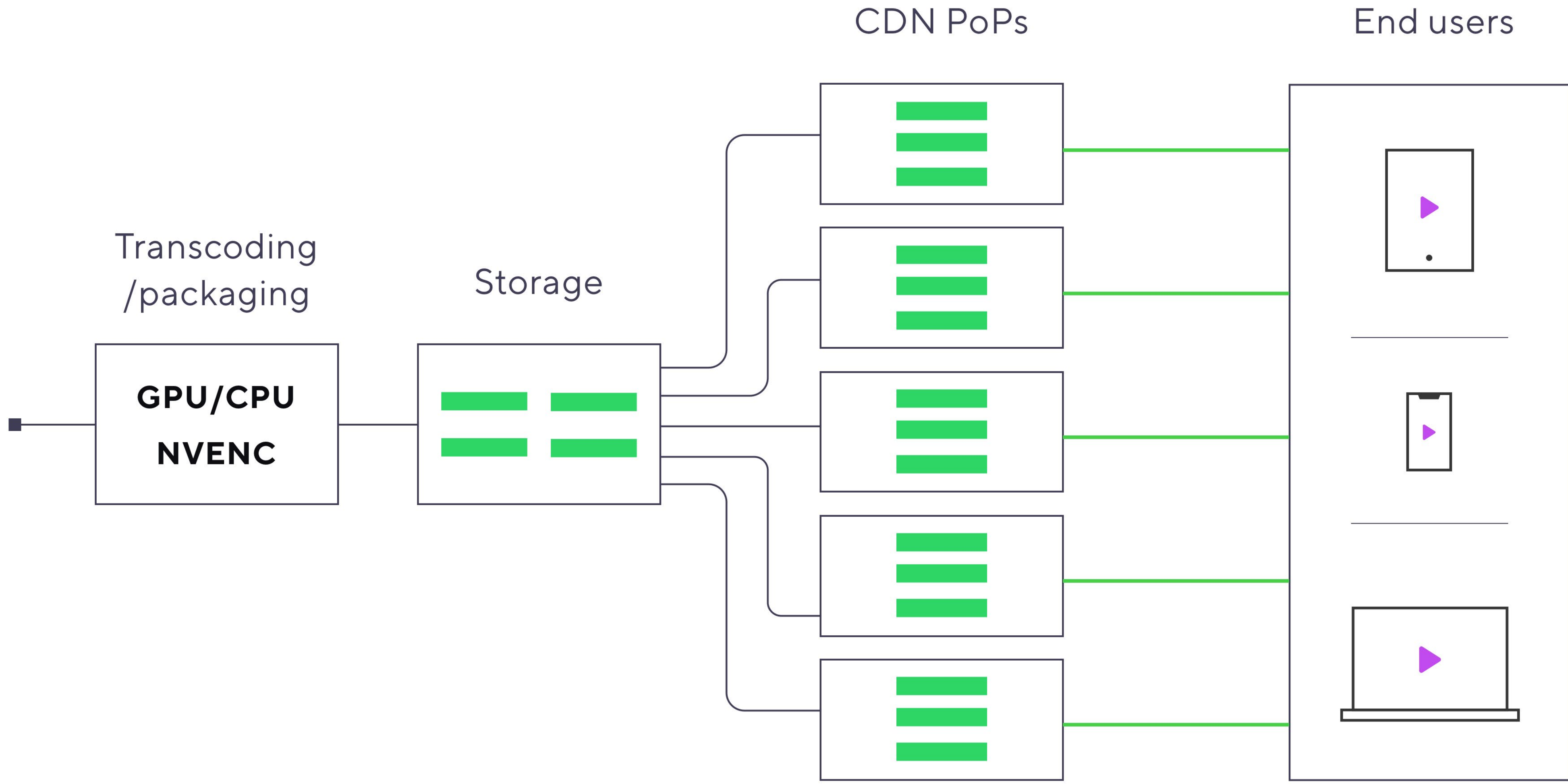
CMAF

Things to consider when integrating CMAF

- Encoder/packager support

- CMAF does not support non/muxed audios

- Potential unavailability on legacy devices
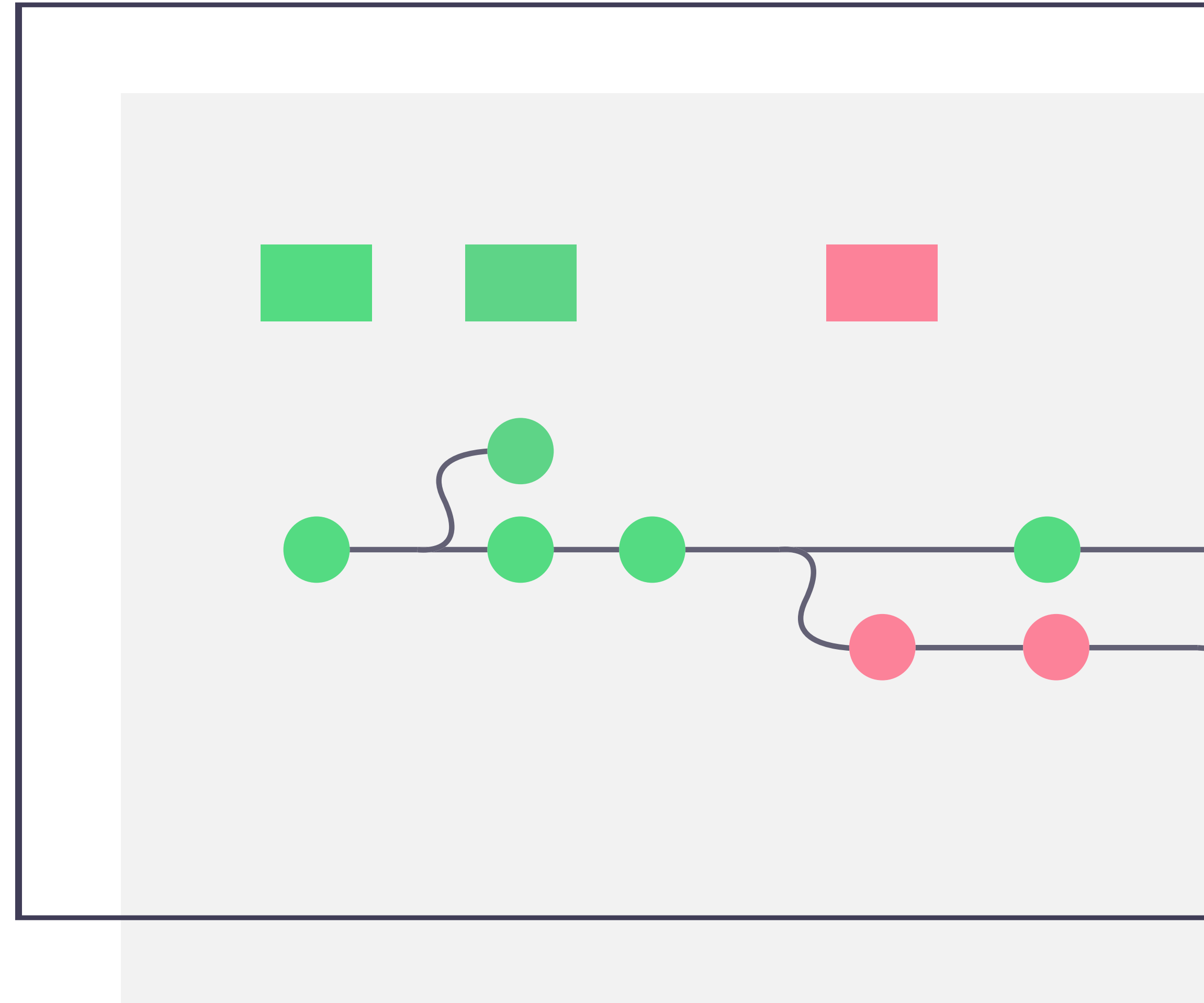
Sample of unsupported devices

Apple	Google Chromecast	Roku	Amazon FireTV	VIZIO	Samsung TV
iPhone 4	First gen	Legacy devices	First Gen	Legacy TV's	2010 – 2011 and earlier models
The Original iPad		Roku DVP		2014 E-Series	
The iPod Touch 4th Generation		Roku SD		2014 M-Series	
		Roku HD			
		Roku HD-XR			
		Roku XD			
		Roku LT			
		Roku 2 HD			
		Roku 2 XD			
		Roku 2 XS			
		Roku Streaming Stick			

CMAF packaging benefits

- Storage reduction

- CPU usage reduction

- CDN Cache efficiency improvements
  – performance benefits

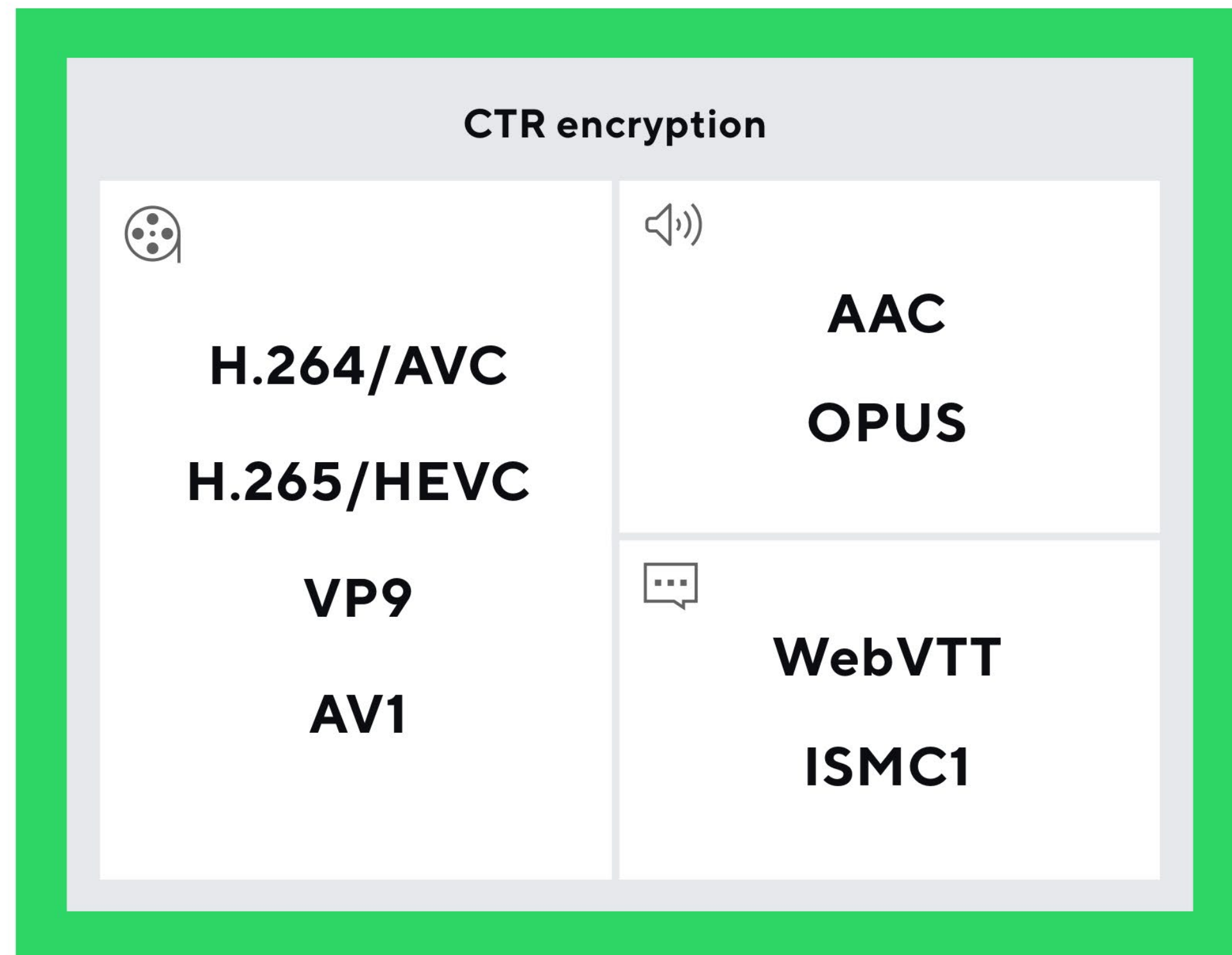# CMAF AND DRM

DRM Schemes

Block Cipher operation modes
(both part of CENC)

- Widevine (Google)

- Playready (Microsoft)

- Fairplay (Apple)

- AES-CTR (Counter)

- AES-CBC
  (Cipher Block Chaining)

AES-128 CTR and AES-128 CBC

AES-CTR and AES-CBC

Fmp4

CTR encryption

H.264/AVC
H.265/HEVC
VP9
AV1

AAC
OPUS

WebVTT
ISMC1

Fmp4

CBC encryption

H.264/AVC
H.265/HEVC
VP9
AV1

AAC
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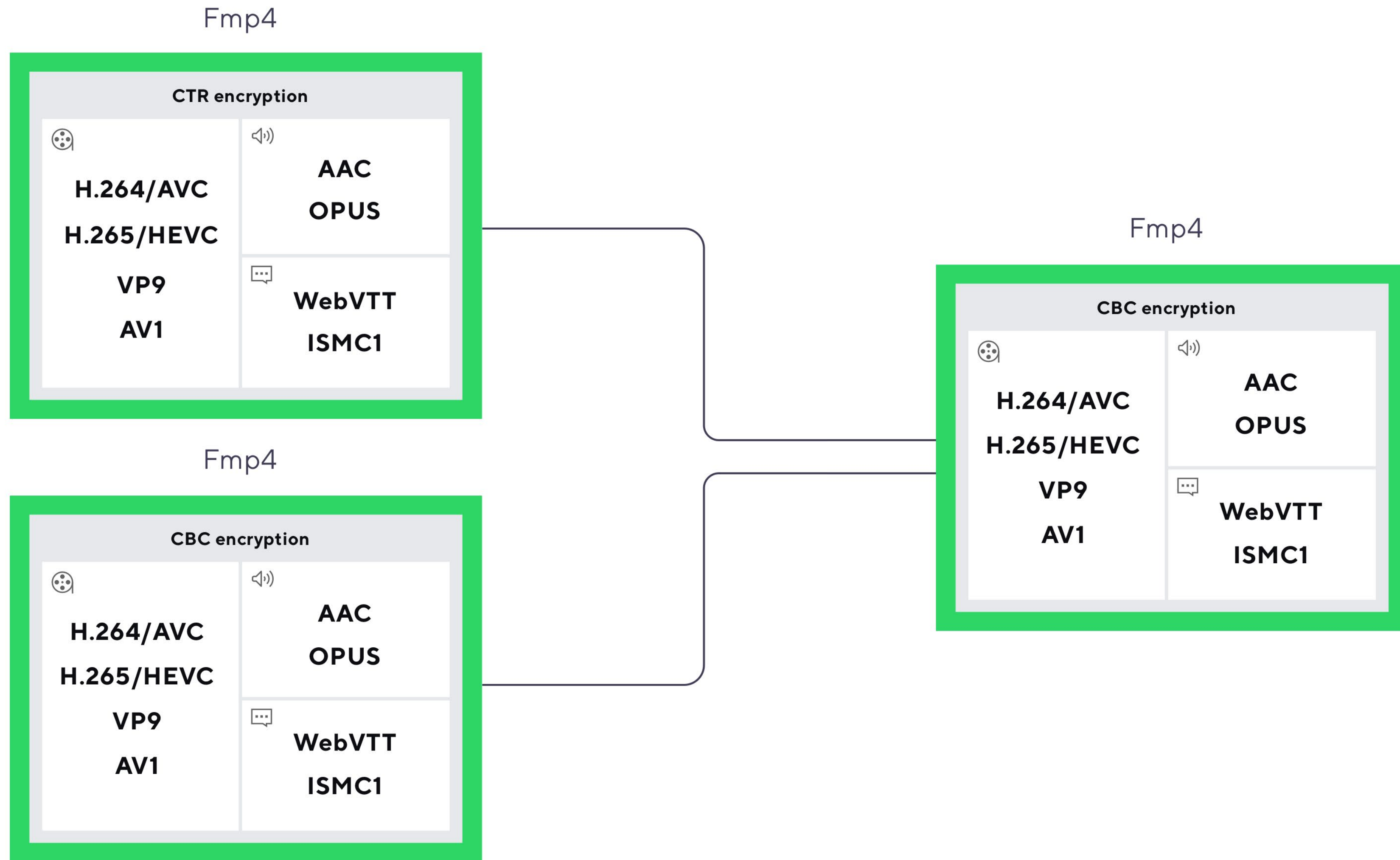ISMC1
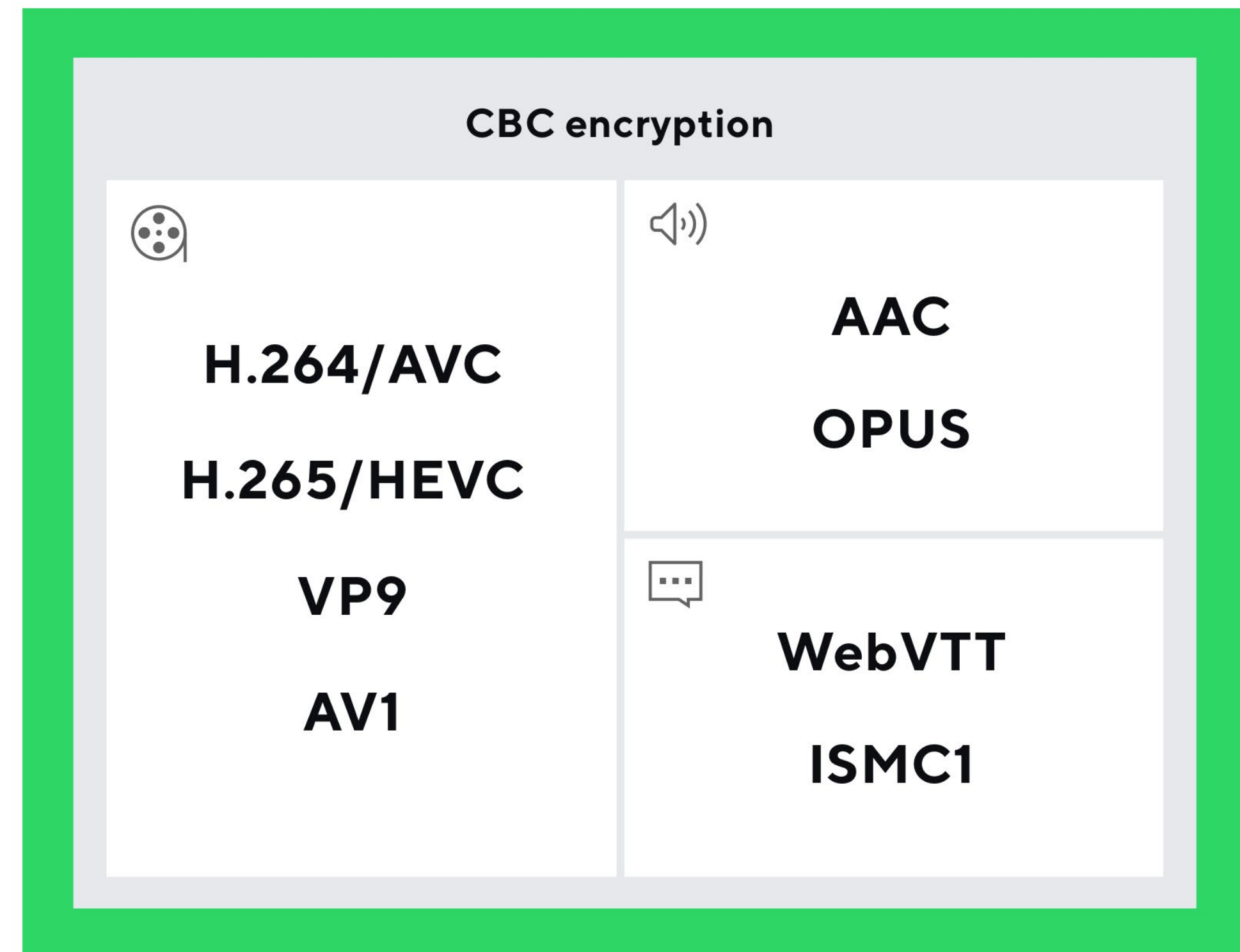
Unified encryption

- DRM license server: PlayReady 4.0 or higher support

- DRM content packager: AES-128 CBC encrypted fMP4 media chunks

- DRM client: HLS and/or DASH, AES-128 CBC mode decoding

Current status overview

Apple IOS 10+	Safari	Android 7.1+	Chrome 68+	Firefox 60+	Edge 18+
Yes	Yes	Yes	Yes	Yes	?

Chromium 68+	Roku 9.0+	Xbox One version 1709+	ChromeCast	Android TV ExoPlayer API 25+
Yes	Yes	Yes	Yes	Yes

Takeaways

- Utilizes a universal fragmented mp4 container (ISOBMFF /fmp4)

- Drive down cost of storage and encoding

- Improves cache efficiency

- Limited legacy support

- Promising but not there yet for multi-DRM scenarios
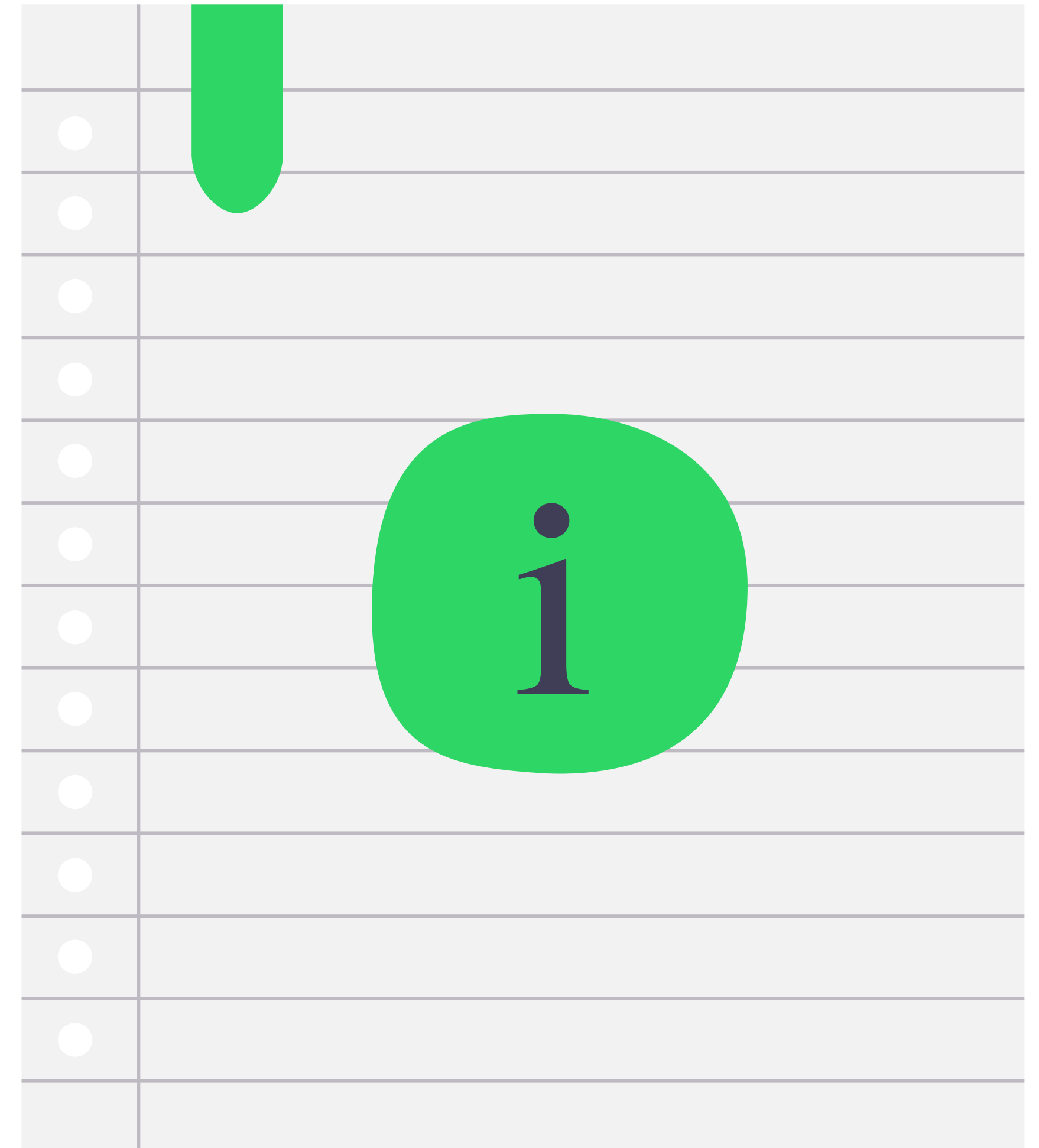
Resources

- castlabs.com/resources/faq/drm

- pallycon.com/blog/cmaf-the-quest-for-single-format-streaming

- www.wowza.com/blog/apple-low-latency-hls

- www.iso.org/standard/71975.html

- blog.irdeto.com/2019/02/05/cmaf-may-be-ready-but-are-you-ready-for-cmaf

- blogs.akamai.com/2016/06/cmaf-what-it-is-and-why-it-may-change-your-ott-future

- www.wowza.com/blog/what-is-cmaf

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QUESTIONS

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