



Content Adaptive Streaming



The Emerging Video Leader



Public since 2014



61.8 M\$ in 2017 (+29%)



240 people in 18 countries



800 clients in 100 countries



Strategic partnerships  



22 Patents

ATEME designs software video compression solutions to enable innovative live or on demand video delivery services. while preserving picture quality.



Machine Learning/AI, Buzz word of 2018

INTELLIGENT MEDIA WORKFLOWS
Increase the Value of Content
with Machine Learning

 Per-Title Encoding

 CLOUD & AI

AI POWERED HEVC ENCODER

The Traditional AI Approach
Single Engine AI - ANI or Narrow Intelligence
Pre-processed data coupled with hand crafted machine learning algorithms outperforms humans, but requires well structured datasets within narrowly defined domains.

MACHINE LEARNING
Automated Metadata
Extraction & Analysis

AI Content Aware
Encoding

 Google Cloud
Machine Learning

What is Video Quality ?

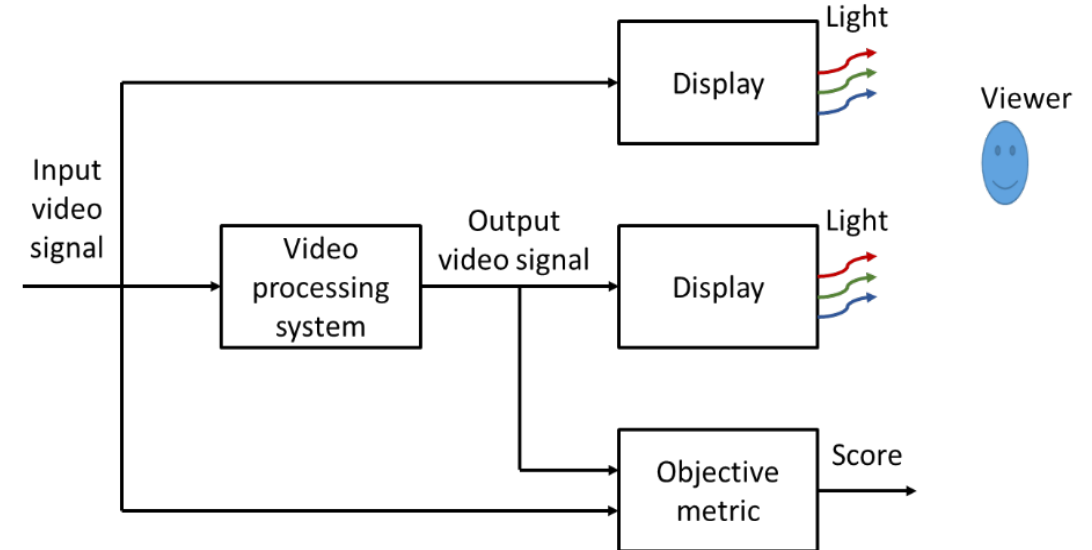
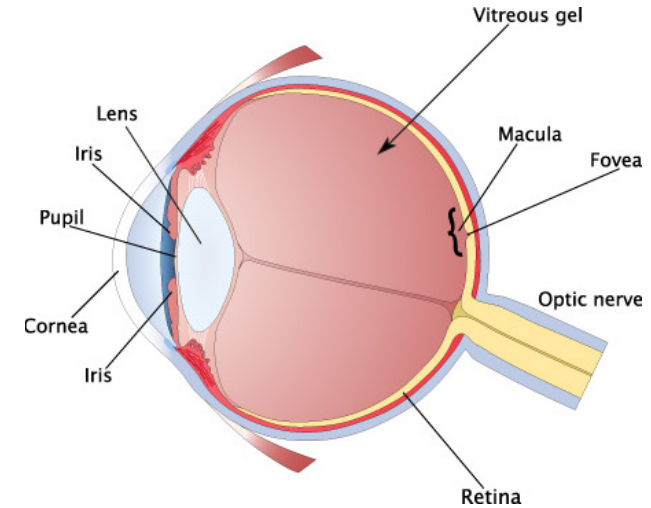
Video Quality Assessment:

Subjective (human) assessment:

- Human survey
- Golden eye

Objective (computer) assessment:

- Allowing automation
- PSNR, SSIM, FMSE, VSNR, VQM, PQI, VIF, MOVIE, ...



Objective Video Quality Assessment Issues

VMAF score 77

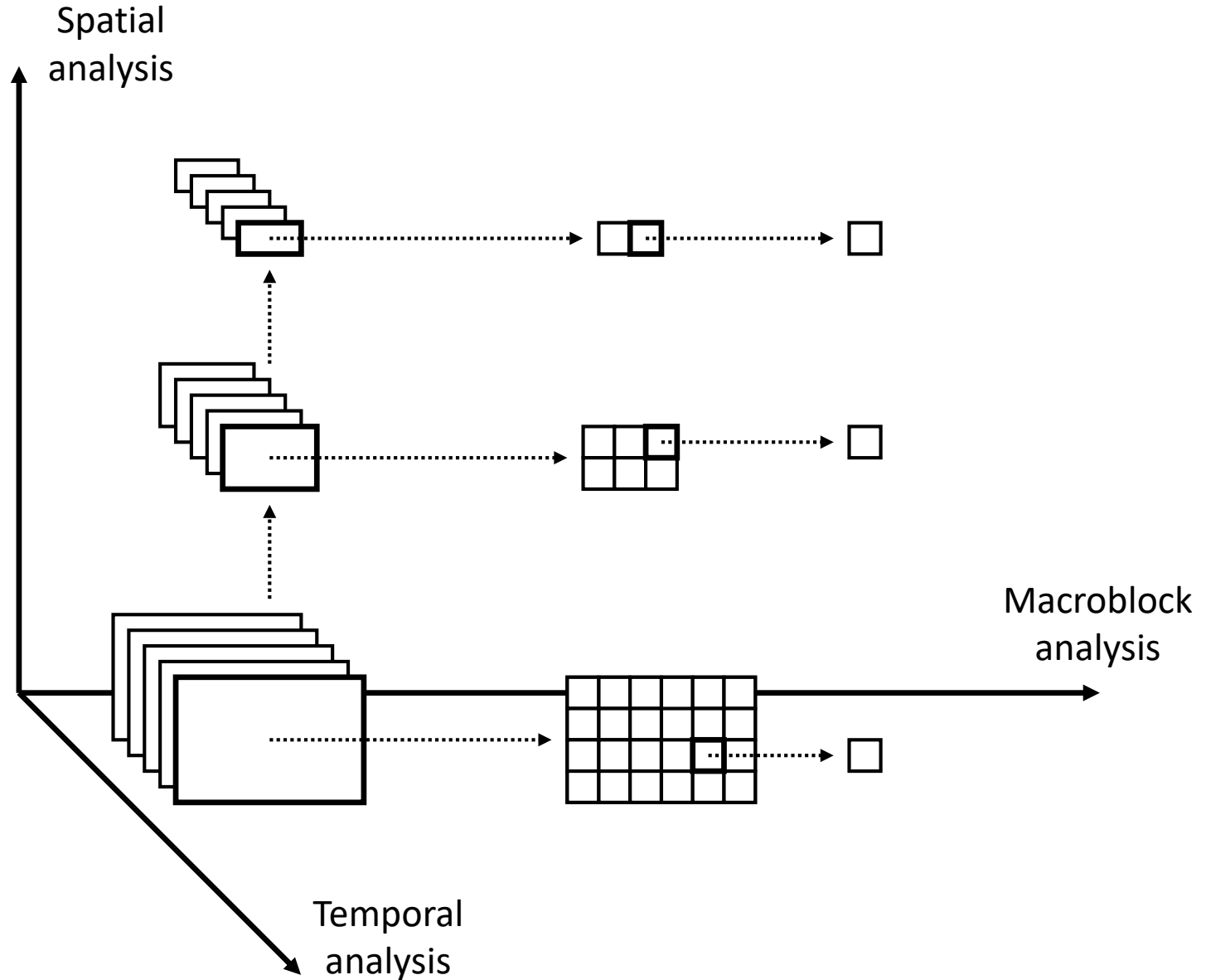


VMAF score 75

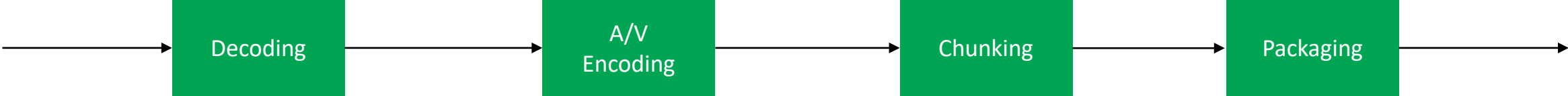
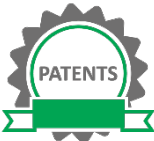


ATEME Quality Index (AQI)

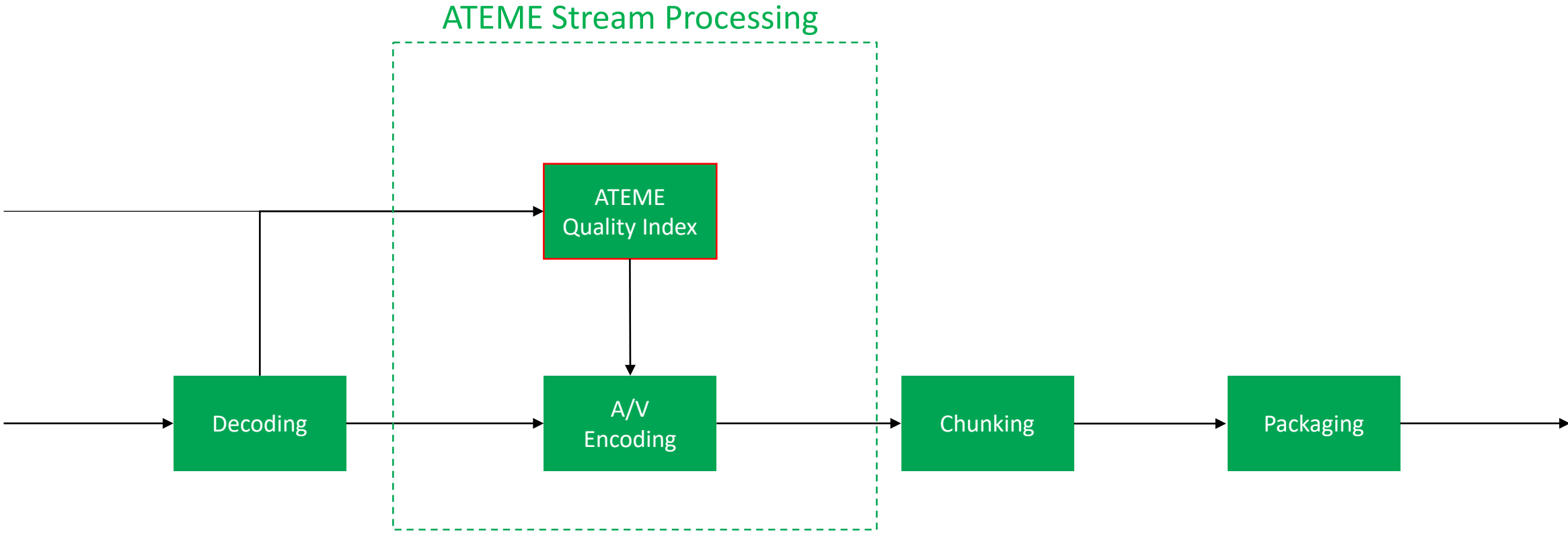
- $AQI = F(\text{Content}, \text{Rate}, \text{Resolution}, \text{Codec}, \text{Display})$
- Given a content, AQI is the perceptual quality estimated at any rate and resolution, for any codec and viewing conditions
- Features combination through machine learning



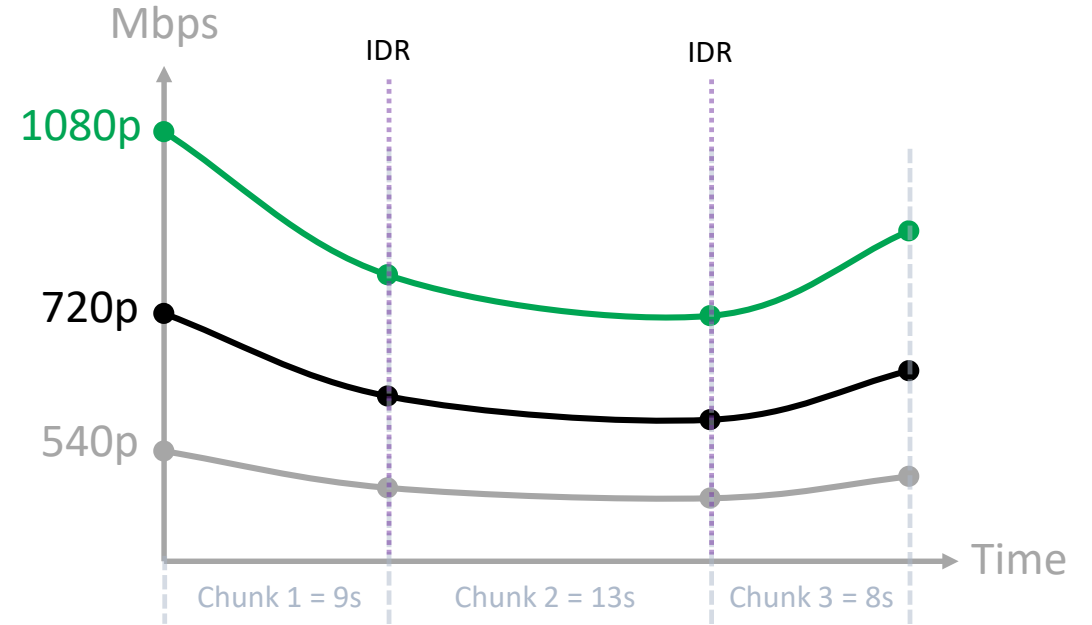
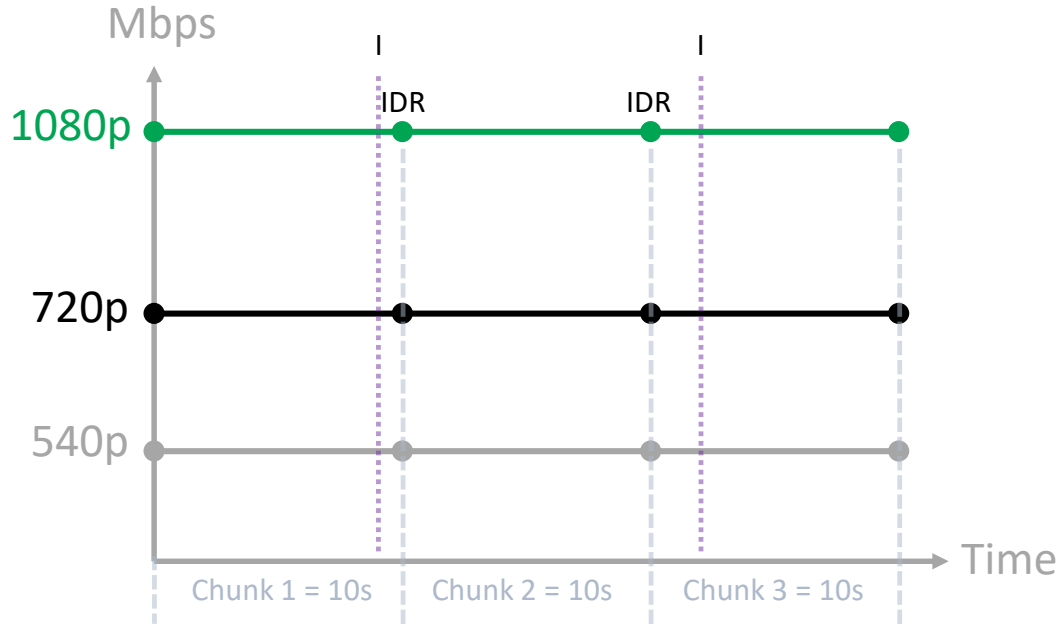
OTT Traditional Workflow



Artificial Intelligence Driven Perceptual Quality Index



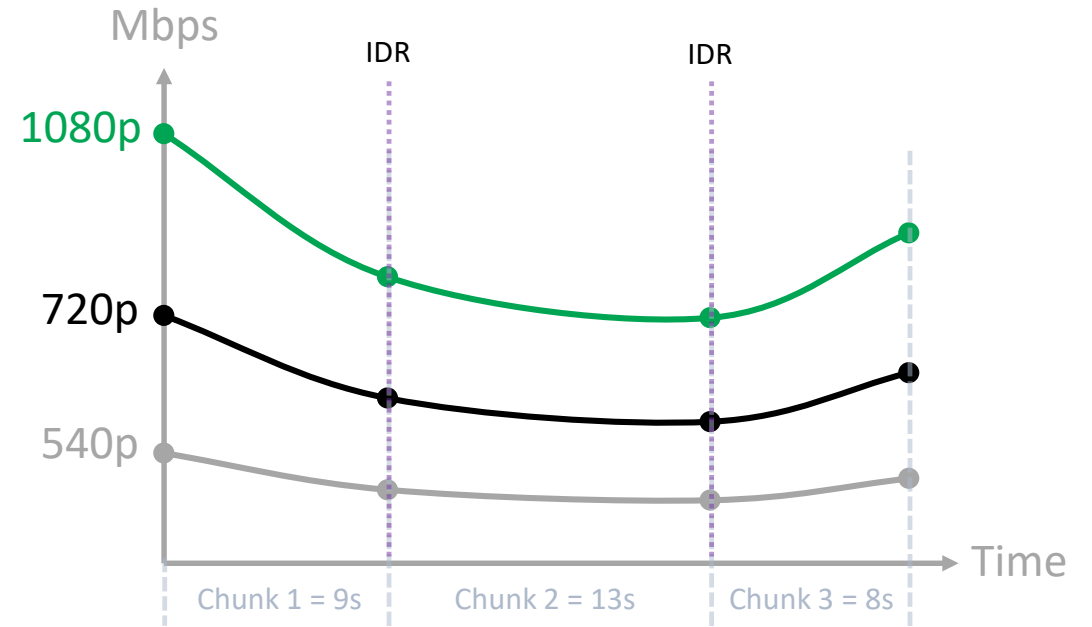
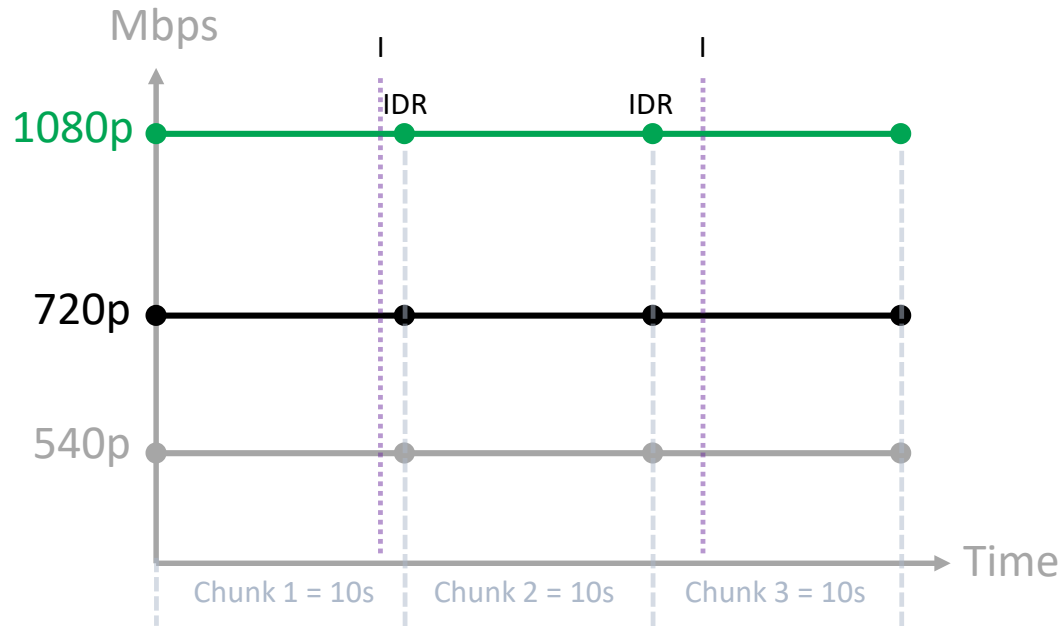
Content Adaptive Streaming: Chunking



..... Scene Cut

	Feature	Adaptive Streaming	Content Adaptive Streaming	Benefits: Lower Bandwidth + High VQ
1	Chunking	Fixed length chunks	Dynamic chunks aligned on scene-cuts (with min and max duration)	Reduce occurrence of large I frames

Content Adaptive Streaming: Bitrate



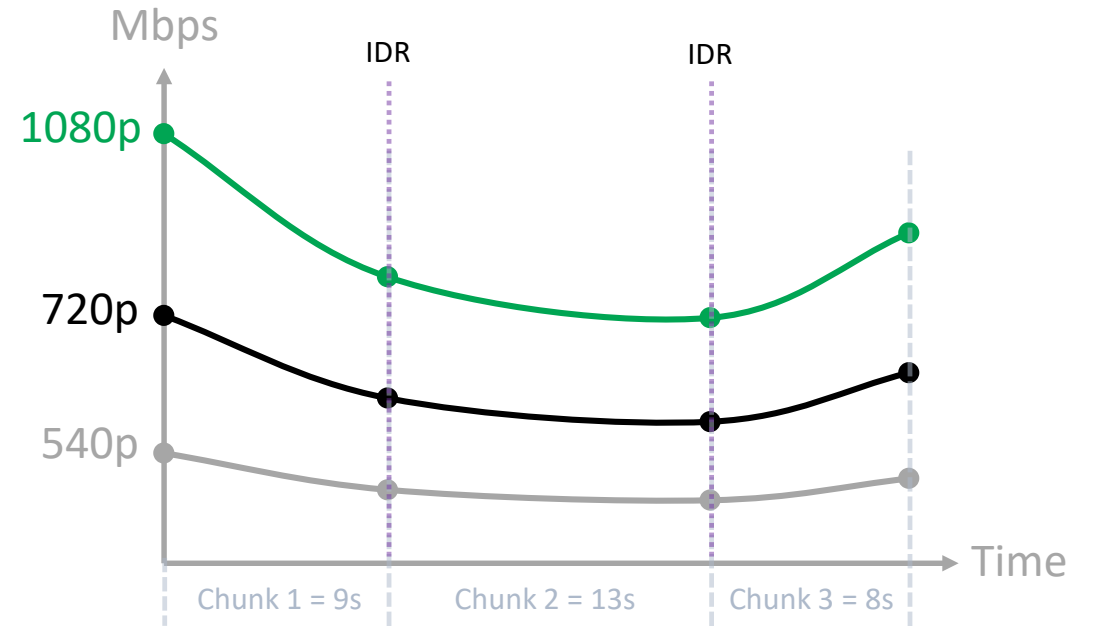
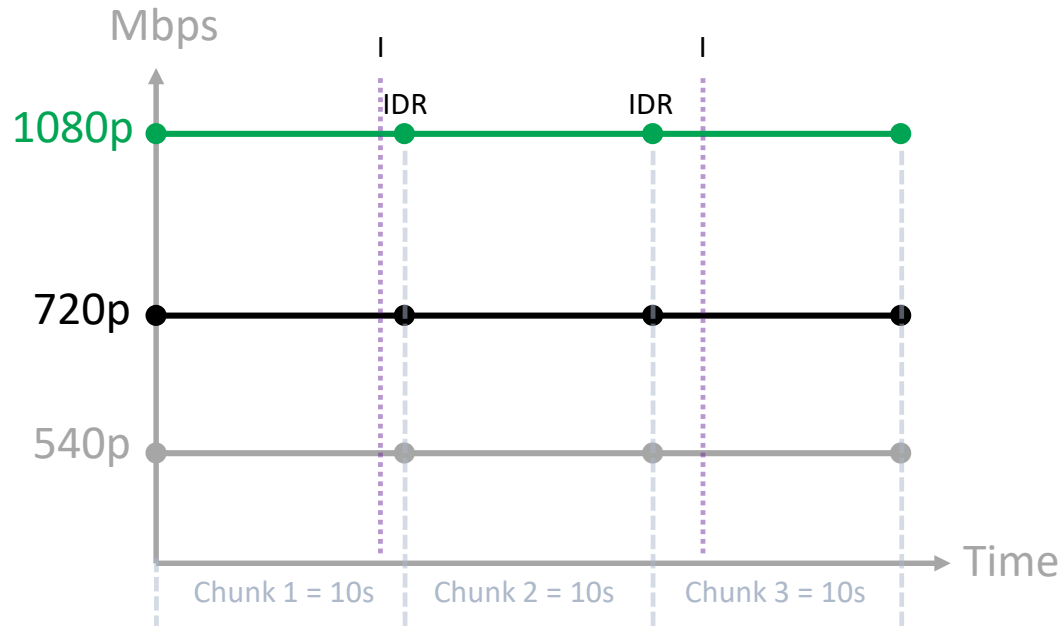
..... Scene Cut

	Feature	Adaptive Streaming	Content Adaptive Streaming	Benefits :
2	Bitrate	CBR profiles	Constant Quality	Lower Bandwidth + High VQ Allocate bits to complex scenes vs easy ones

Example: CBR 5000 kbps vs CQR 2600 kbps



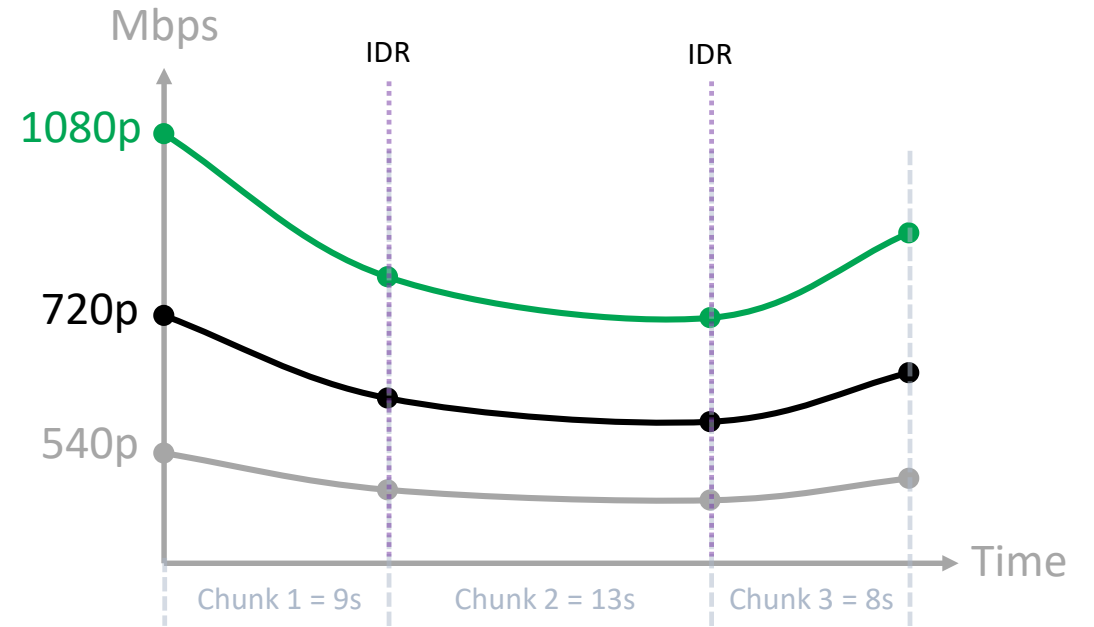
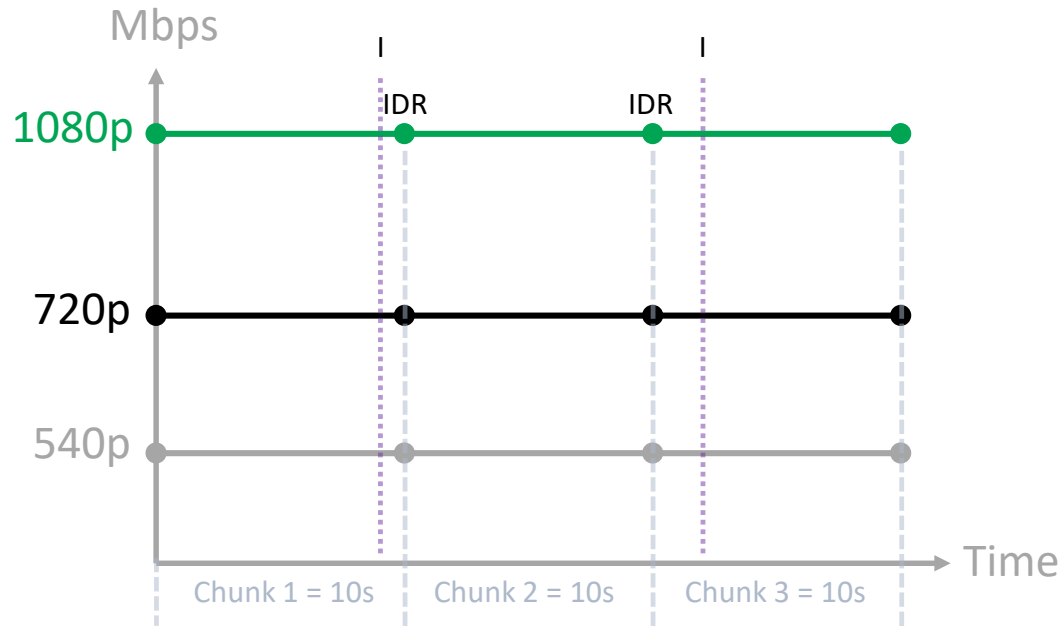
Content Adaptive Streaming: Profiles



..... Scene Cut

	Feature	Adaptive Streaming	Content Adaptive Streaming	Benefits: Lower Bandwidth + High VQ
3	Profiles	Same resolution/bitrate for any content	Dynamic choice of profiles based on an analysis of the content complexity	Optimize profiles VQ and compression

Content Adaptive Streaming: More Efficient Compression



..... Scene Cut

	Feature	Adaptive Streaming	Content Adaptive Streaming	Benefits = Lower Bandwidth + High VQ
1	Profiles	Same resolution/bitrate for any content	Dynamic choice of profiles based on an analysis of the content complexity	Optimize profiles VQ and compression
2	Bitrate	CBR profiles	Constant Quality	Allocate bits to complex scenes vs easy ones
3	Chunking	Fixed length chunks	Dynamic chunks aligned on scene cuts (with min and max duration)	Reduce occurrence of large I frames

SKY: Adaptive Streaming vs ATEME Content Adaptive Streaming

Profile	Resolution	Bitrate (kbps)
8	1920x1080	6000
7	1280x720	4900
6	1280x720	3200
5	1024x576	2000
4	896x504	1200
3	764x432	620
2	512x288	280
1	320x240	90

Profile	Resolution	Bitrate (kbps)
7	1920x1080	4500
6	1280x720	3400
5	1280x720	2200
4	960x540	1200
3	764x432	600
2	512x288	260
1	320x240	90

SKY: CBR versus ATEME Content Adaptive Streaming

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Current: 18290 kbps overall

Profile	Resolution	Bitrate (kbps)
7	1920x1080	4500
6	1280x720	3400
5	1024x576	1800
4	960x540	1200
3	764x432	600
2	512x288	260
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ATEME recommended: 11850 kbps overall

~35% bitrate gains

Brutal Force vs AI

	Per-Title Encode Optimization	ATEME Content Adaptive Streaming
Bandwidth Savings	Around 20%	Average 30%, up to 60%
Availability	Exclusive to Netflix	Included by default
Use cases	Optimized for File only	Live & File, Cross-Codec & Cross-Resolution
Tools	VBR and Profiles Adaptation only	CQR, Profiles Adaptation and Dynamic Chunking
Quality Metric	VMAF (Video Multi-Method Assessment Fusion)	ATEME Quality Index
Measurement Method	Brute force trial encodes	Low footprint processing bundled with encoding

Content Adaptative Streaming Benefits



- New paradigm to optimize compression
- Lower Bandwidth => Network cost reduction
- High VQ => QoE improved



Thank you





Back Up Slides



Flexible Set of Parameters

- Minimalist
 - Maximum admissible bitrate
- Detailed
 - Maximum admissible bitrate
 - Min/max number of profiles
 - Set of desired resolutions
 - Highest profile characteristics
 - Maximum rate
 - Average rate
 - Spatial resolution
 - Quality
 - Lowest profile characteristics
 - Any intermediate profile characteristics
- Any combination of those

Frequently Asked Questions

- When is this available?
 - Now for tests on source content you provide and at IBC for wider product availability
- Is this applicable to Live?
 - Yes. Only some features requiring a complete first pass on the content are not applicable to Live but major benefits can still be achieved on Live use cases.
- With VBR profiles, what bitrates are included in the playlist/manifest?
 - Typically the maximum bitrate. This is the least impactful method on the player predictive algorithms but other methods can be discussed on a case by case basis.
- Can I adapt this to match my own delivery ecosystem?
 - Yes. We understand interoperability is critical, and we expose many controls to turn on and off individual parameters like dynamic chunking. We also allow defining required use cases like specific resolution(s) you always want to generate even when suboptimal.