# Van TV-light naar streaming dominantie

LIVERY

Online TV was de eerste 10 jaar het minderwaardige broertje van reguliere TV. Maar inmiddels is dit omgedraaid:

- **Aanbod:** we leven in een gouden tijdperk van content, met een ongelooflijk aanbod van on-demand, live streams, lineaire online kanalen, creators en influencers
- **Kwaliteit:** van postzegel naar 4K, van schokkerige beelden naar 60fps en van regelmatig bufferen naar instant starten
- **Schaal:** video is 90% van alle internet traffic en grote live streams trekken miljoenen gelijktijdige kijkers, die dankzij CDNs betrouwbaar bediend worden
- **Toegang**: Mensen zijn overal online en kunnen overal TV kijken via hun mobiel, tablet, computer, TV
- **Gebruiksgemak:** apps die fijn werken en met persoonlijke aanbevelingen komen (al blijft inloggen een drama).

...maar met meer vertraging en minder synchroon

Waar traditionele TV decennia lang tussen de 5 en 10 seconden 'glass to glass' zat, is dat bij streaming vaak 30 seconden of meer, en de vertraging verschilt enorm tussen verschillende apparaten, verbindingen en aanbieders. Gevolg: noisy neighbour syndroom. Maar dat is zeker niet het enige nadeel.
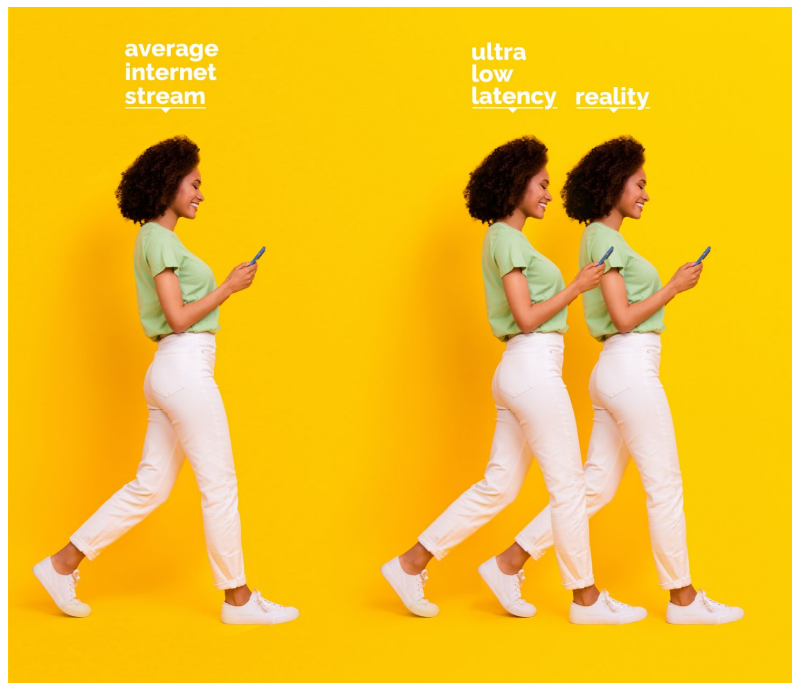
Waarom hebben we het überhaupt over latency?

Latency is lang niet altijd belangrijk.

Sowieso niet bij scripted. En bij non-scripted vooral bij live. En bij live vooral bij content waar de kijker invloed heeft.

De ontwikkeling van interactie bij traditionele TV

LIVERY

Interactieve televisie is er al sinds de jaren 80, maar is nooit echt doorgebroken, en slechts een kleine minderheid van alle gemaakte programma's maakt er gebruik van. Door de jaren is dit gebeurt op basis van:

- **Teletekst**
- **Stemmen (en betalen) met de telefoon**
- **Stemmen (en betalen) via SMS**
- **Call TV**
- **'Red Button', HbbTV & ATSC 3.0**
- **Social media**
- **Second screen apps**

NB: sync is altijd een groot probleem geweest bij interactieve TV. Lapmiddelen als ACR (audio watermarking en fingerprinting) bestreden symptomen, maar niet de oorzaak.
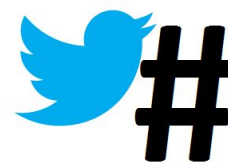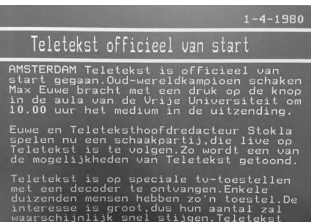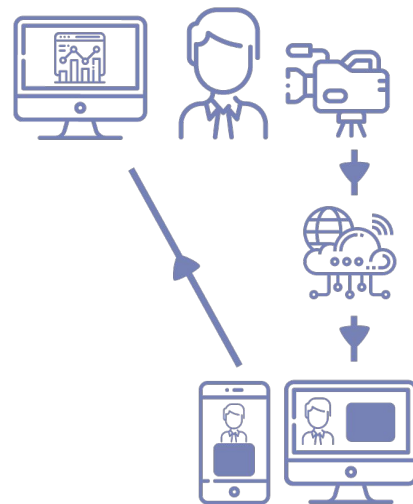
Maar online video is meer dan TV naar internet brengen

Twitch Extensions en HQ Trivia laten zien dat er meer kan op internet dan TV interactief maken: het stelt interactie centraal en voegt daar video aan toe. Maar: "appointment TV" stijl en FOMO.
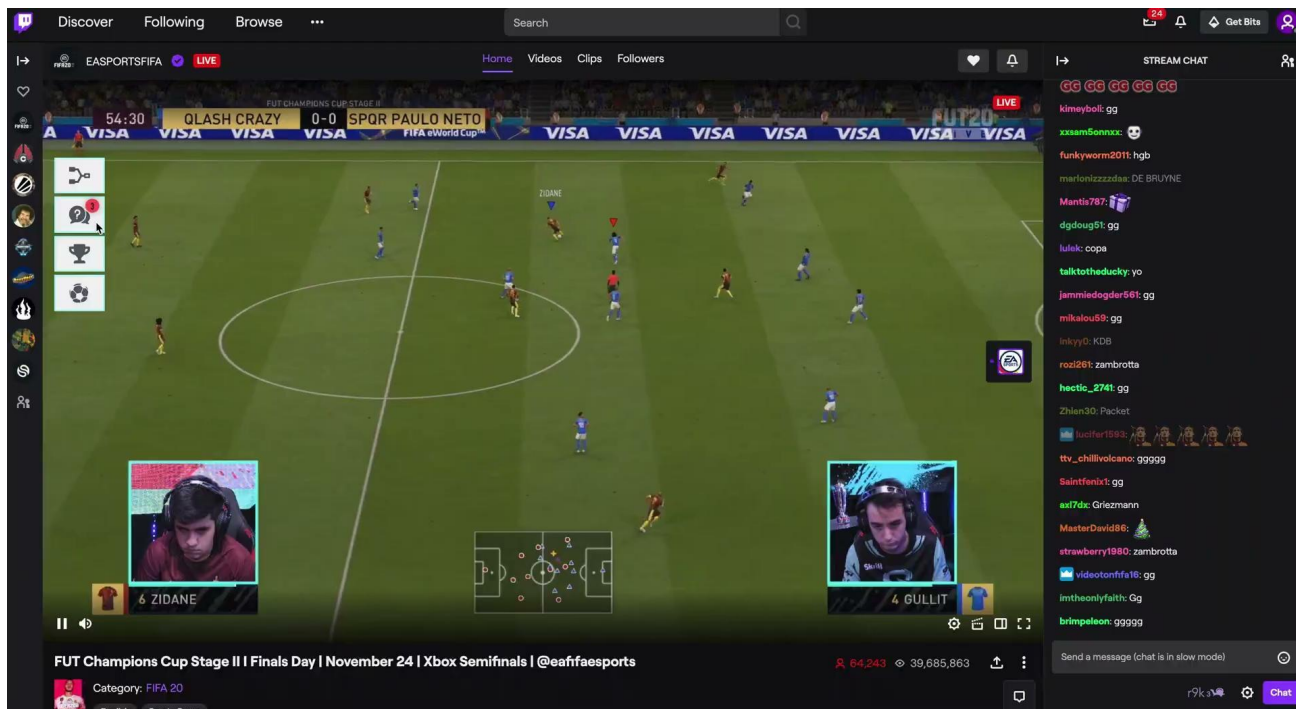
Feedback loop: fundament van interactieve video

00:00:000 Host in the studio asks a Poll Question.

00:05:000 The questions including *Poll interaction are visible in the client.

00:10:000 The Poll is open for 5 seconds for the viewers to answer.

00:10:010 Host in the studio is able to reverence the results.

00:15:010 The host mentions the results are visible in the client.

+0.0 sec

+5 sec

+5 sec

CAMERA ENCODER CDN VIDEO PLAYER

INTERACTIONS

LIVERY
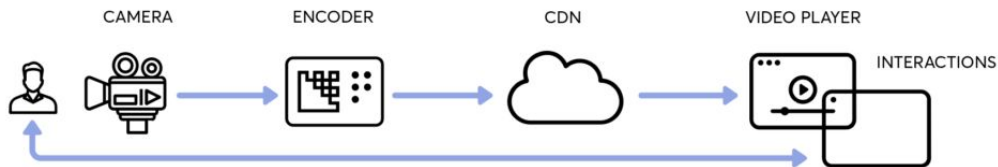
Video Distribution & Latency

LIVERY

	RTMP (Real-Time Messaging Protocol)	**HLS** (HTTP Live Streaming)	**WEB-RTC** (Real-Time Communication)	**Dash** (Dynamic Adaptive Streaming)
Examples	Facebook Live	Apple TV	Youtube Live, Google Hangouts	Youtube, Netflix HTML player
Playback	Flash-based player	Web, iOS & Android	iOS, Android & Web (no mobile safari)	iOS, Android & Web
Latency	2-5 seconds	>3 seconds (LHLS >2 seconds)	<1 second	<3 seconds
Cost	Medium	Low	High	Low
Scalability	>100K	>100K	<100K	>100K
Adaptive bitrate	NO	YES	YES	YES
Codec	H.264 On2 VP6 Sorenson, Spark Screen video and Screen video 2	H.264 H.265	H.264 H.265 VP9 (not supported by Apple)	Codec agnostic

LOW LATENCY

ULTRA-LOW LATENCY

SUB-SECOND LATENCY

+18 seconds
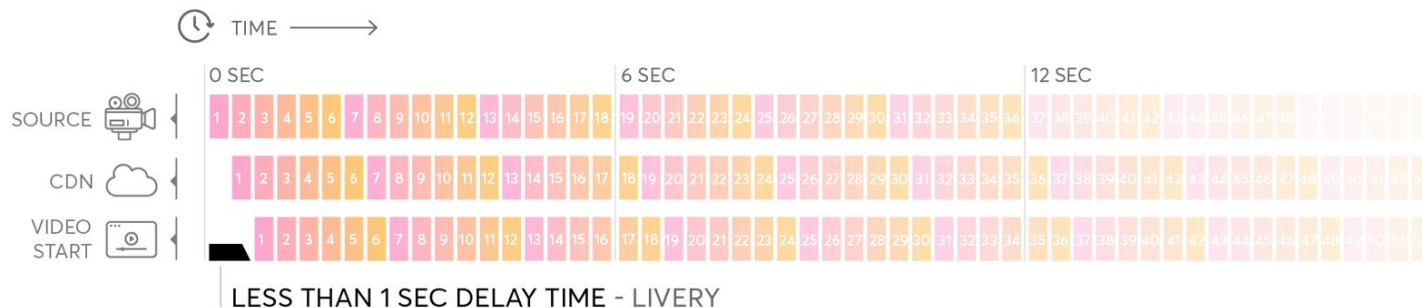
3 seconds

1 seconds

0 seconds

HTTP-BASED TECHNOLOGIES LIKE DASH & HLS

HTTP-BASED TECHNOLOGIES LIKE ULL-CMAF & LL-HLS

WEBRTC/WEBSOCKET-BASED TECHNOLOGIES

Traditional Segment based setup

TIME →

	0 SEC	6 SEC	12 SEC
SOURCE	SEGMENT 1	SEGMENT 2	SEGMENT 3
CDN		1 · SEGMENT 1 · 1	2 · SEGMENT 2 · 2
VIDEO START			SEGMENT 1

12 SEC DELAY TIME - TRADITIONAL HLS & DASH

Chunk based delivery (<3 seconds)

TIME →

LESS THAN 1 SEC DELAY TIME - LIVERY

LIVERY

Low Latency with ULL-CMAF

Based on ULL-CMAF and in close collaboration with Akamai, we were able to offer a latency optimized video workflow with active synchronization::

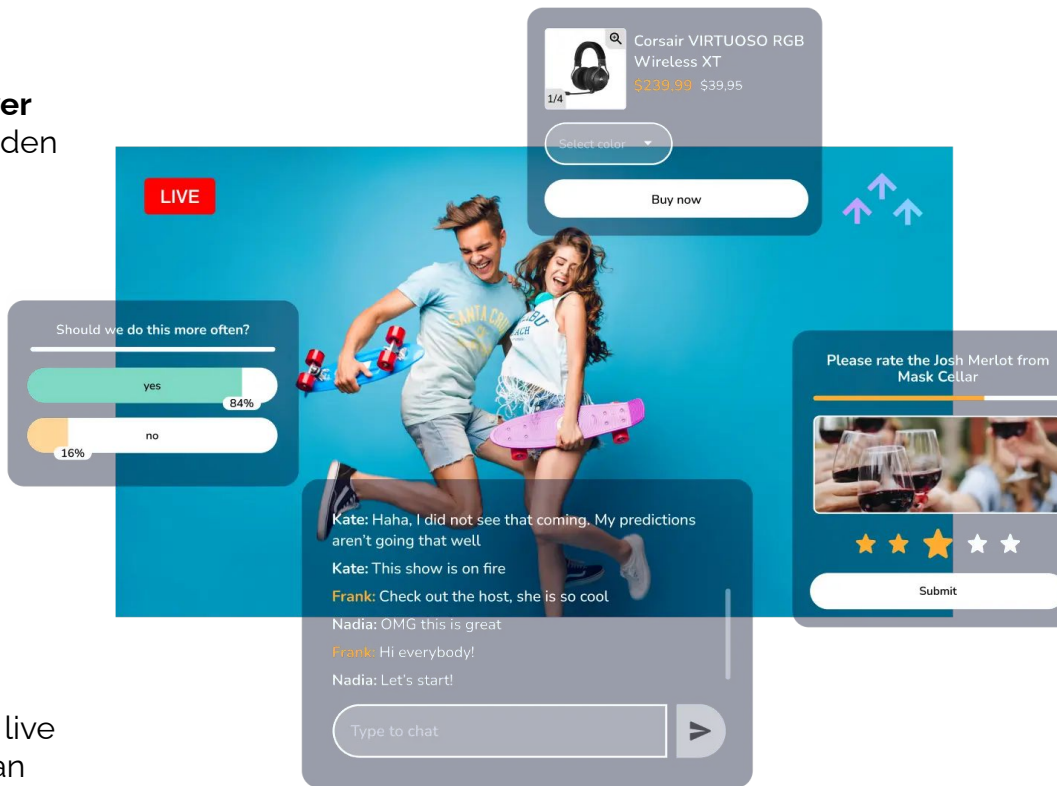- Shift encoder priority from quality to latency optimization
- Push video in real-time to the CDN, instead of request-based
- Ensure the ingest server is close to the encoding facility
- Optimize the CDN mid-tier for fast transfers
- Ensure servers are close to the end-user with a minimal amount of hops
- Optimize buffer logic for frame-by-frame playback
- Livery added additional synchronization mechanisms
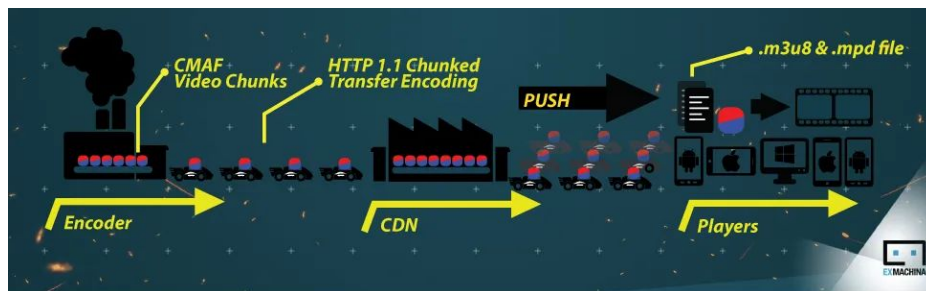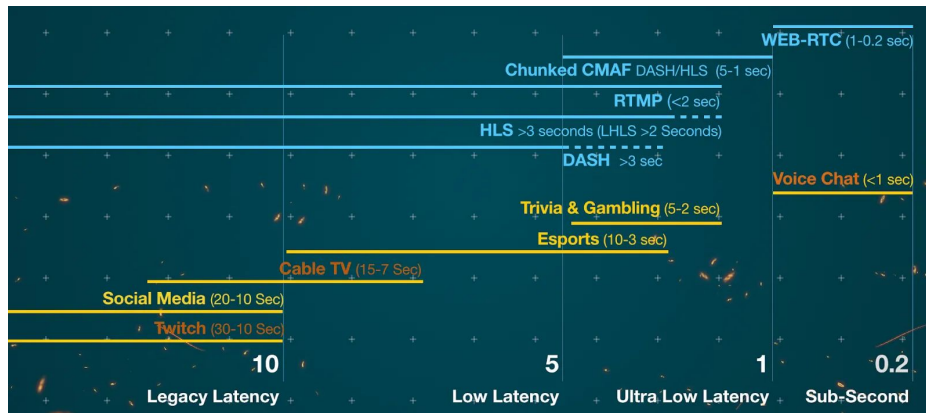
Interactieve video = streaming andersom

Bij Livery benaderen we online video volledig vanuit de specifieke behoeften van interactieve use cases:

- **Live video is het uitgangspunt**
- **Video en interactie vloeien naadloos in elkaar over**
- **We richten ons op persoonlijke devices** en vermijden de afstandsbediening
- **Low latency is belangrijk,** maar:
- **"Synchronizität über alles":**
    - Perfect timen van interacties
    - Voorkomt cheating
    - Desnoods ten koste van beeldkwaliteit
- **WebRTC is op papier geschikt, maar:**
    - Beperkt schaalbaar
    - Kostbaar
    - Audio & video kwaliteit ondermaats
- **CDNs zijn beter beschikt**
    - Vrijwel onbeperkt schaalbaar
    - Kosten efficient
    - Optimale beeldkwaliteit
- **Dankzij ULL-CMAF is dit nu mogelijk:** interactieve live video die waar miljoenen mensen naar kijken *en* aan meedoen

Our Building Blocks

For technical documentation: https://docs.liveryvideo.com/

Encoder:

5. Flexible cloud encoders that spin up on demand

6. Adaptive & fixed bitrate encoders offer cost effective encoding from low traffic, 24/7 streams to primetime events watched by millions

7 AI Pipeline will add smart, just-in-time processing, allowing AI/ML and content recognition, fueling Livery's interactive layer

CMS, integrations and management:

1. Multi Tenant Infrastructure for the interactive platform dramatically reduces costs per customer

2. Presenter View offers an at-a-glance data dashboard with all key live stats and feedback data for hosts, presenters and moderators

3. API First: after our video platform, Livery is rolling out APIs across all its features, offering maximum flexibility for partners to integrate Livery in their own solutions

4. Registration, login and authentication support allows any user to join, and organizations to offer powerful, frictionless SSO integrations

Player:

8. New UI: In 2023, Livery rebuilt it's UI from the ground up, mobile first, offering a seamless blend of video & interactivity

9. Interactive layers & widgets: Livery's player can be expanded with any kind of interactive overlay, including those powered by the AI Pipeline

10 Low latency DASH in iOS Safari: Livery's the first video platform to offer the same low latency via DASH in the iOS browser

11 Player Controls: new integrated video & interactive controls maximize screen use efficiency

Overall:

A **ULL-CMAF: Livery created the first end-to-end workflow for ULL-CMAF, bringing Netflix-quality audio and video to low latency streams.**

B.   Sync: an integrated synchronisation approach from encoder to player ensures everyone sees the same thing at the same time.

C.   CDN: Powered by Akamai, Livery uses the world's largest CDN for cost efficient delivery of low latency, synced video - scalable to millions
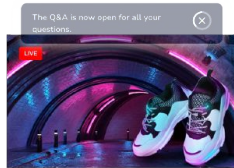
Selection of Livery Interactive Features

Information

Count down

Announcement
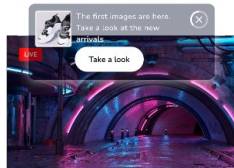
Clickable anouncement

Webclip

Communication
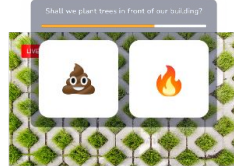
Rich Vote

Trivia

Sentiment
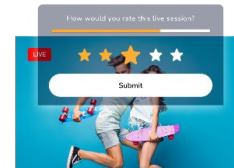
Rich Trivia

Rating

Poll

Chat
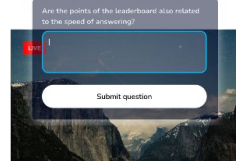
Q & A

Gamification

Prediction

Estimation

Quiz game
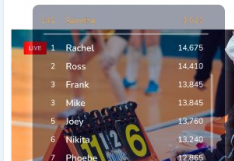
Leaderboard

Shopping

Product detail
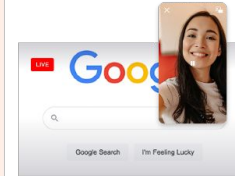
Picture in Picture (PiP)
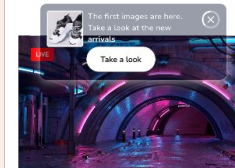
Clickable anouncement
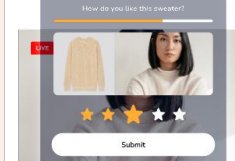
Product rating

LIVERY

Live Demo!

iOS

Android

iOS, demo US
https://embed.liveryvideo.com/?livery_dashwc&id=6
1ed59d0e4b00c6f290351b4&livery_interactive=http
s://demo-us.interactive.livery.live/?livery_tenantId=_
____-m2LVicwjIaWqyQAAA==

Android & Web, demo US
https://embed.liveryvideo.com/?id=61ed59d0e
4b00c6f290351b4&livery_interactive=https://d
emo-us.interactive.livery.live/?livery_tenantId=
____-m2LVicwjIaWqyQAAA==

LIVERY

US Demo (JE Tenant) - Beta & Regular Adam

Adam beta for iOS + demo-us

https://embed.liveryvideo.com/?livery_dashwc&id=5ddb98f5e4b0937e6a4507f2&livery_interactive=https://demo-us.interactive.livery.live/?livery_tenantId=_____-m2LVicwjIaWqyQAAA==

Adam regular + demo-us

https://embed.liveryvideo.com/?id=5ddb98f5e4b0937e6a4507f2&livery_interactive=https://demo-us.interactive.livery.live/?livery_tenantId=_____-m2LVicwjIaWqyQAAA==
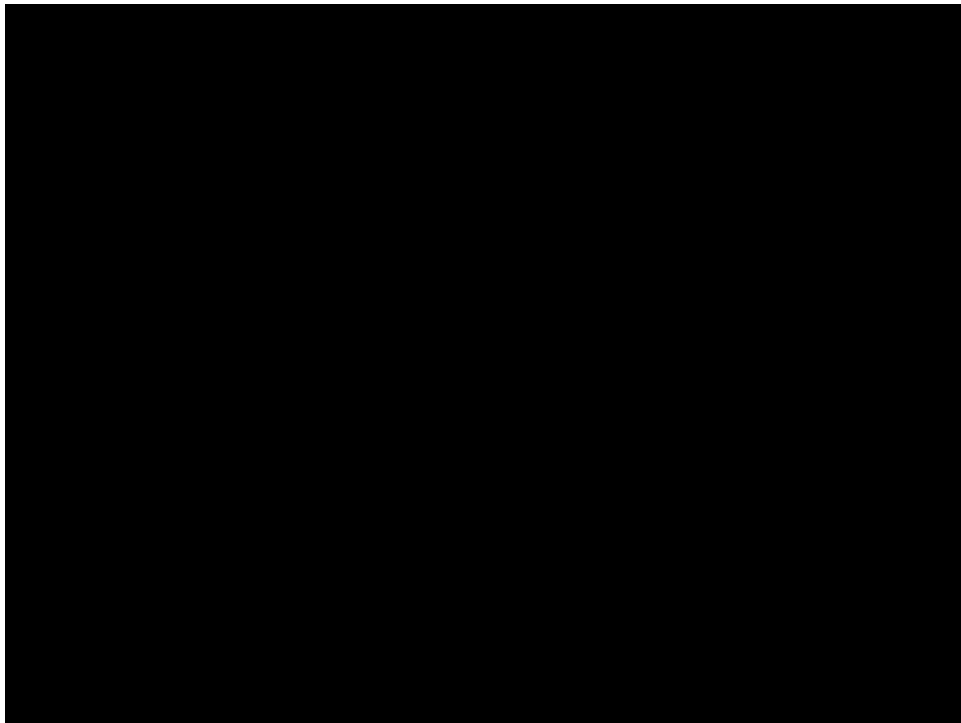
LIVERY

Bedankt!

LIVERY

Jeroen Elfferich, CEO
jeroen@liveryvideo.com
liveryvideo.com

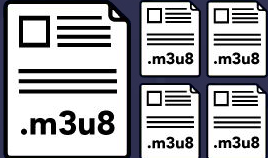Scan for 24/7 demo

Low Latency How (MP4)
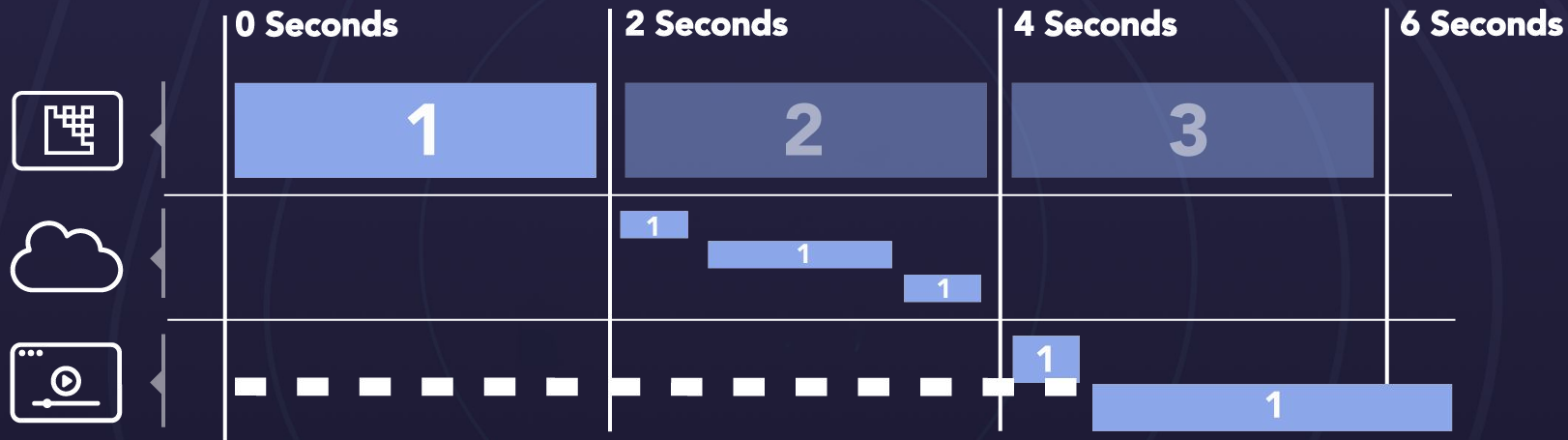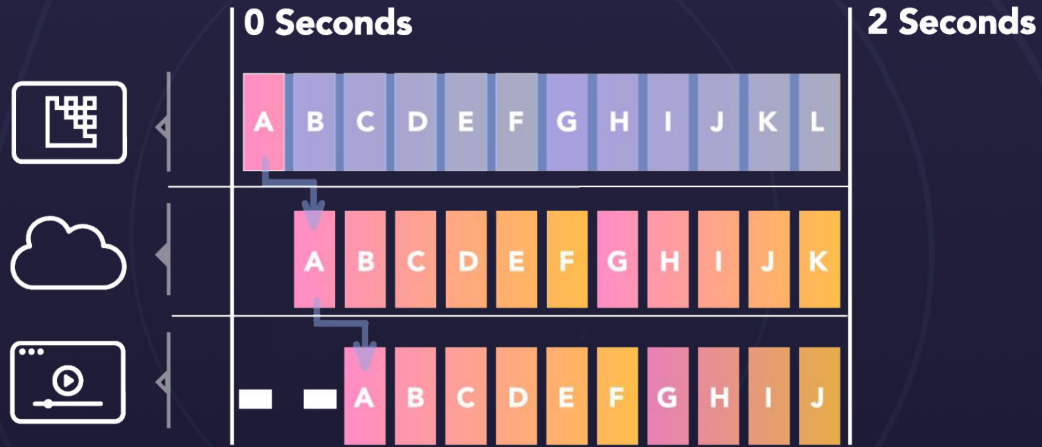
Problems Addressed by Smart & Interactive Video

"It's hard to motivate employees for online learning and training"

Employers struggle to improve their Employee Value Proposition as e-learning, compliance training, surveys and virtual team building feel one way, are hard to discover & miss a sense of urgency.

What's lacking is live, gamified micro learning in a quick, fun, attractive format that's accessible from anywhere and serves as a gateway to broader, permanent and more enjoyable learning.

E.g: PWC, Agfa, Havas, Erste Bank

LARGE COMPANIES:
LIVE E-LEARNING
DMU: Chief Learning Officer

"We have a hard time pulling people back into our sites and apps"

Online shopping is utilitarian and predictable. There's little incentive to frequent. Limited time deals and exclusives are communicated poorly. Social video is expensive, inflexible and doesn't share data.

Shoppable video could offer a reason to (push) notify users. From 'hard shopping' to a more varied, informal or even gamified approach, loyalty can grow and community fostered.

E.g: Hobbii, Nike, Bol, Louis Vuitton

RETAILERS & ECOMMERCE:
SHOPPABLE VIDEO
DMU: CRO/CMO

"Every month, more customers churn to competing providers"

We can access more sport, series and movies than ever. But users are oversaturated and rotate subscriptions. Appointment-TV style experiences that once captured millions and inspired and united us seem to be missing in our hyper-personalized world.

A frequent interactive live show could be a reason for people to come back together, have fun, predict things and be rewarded.

E.g: NBC, RTL, Bongo, Draft Kings

STREAMERS & PUBLISHERS:
GAMIFIED MARKETING & LOYALTY
DMU: CMO

"Online event attendees are feeling left out and underappreciated"

Online and hybrid events are here to stay. But remote attendees feel second rate and disconnected.

The challenge is true participation. Chat and Q&A could provide input or debate. Big events benefit from structured, scalable engagement like polls and trivia. Presenters seek live, meaningful feedback. A quiz or game could excite, while curated products and merch may boost the event's bottom line.

E.g: event organizers and venues

BUSINESS & LEISURE EVENTS:
HYBRID ENGAGEMENT
DMU: CTO/CRO

"We need new ways to reach students and to prevent dropping out"

Too many at-risk students leave the educational system without qualifications, especially in vocational schools. What's needed is a format and tone of voice that students identify with, something interactive, quick and current.

Live, scheduled and gamified learning events combine structure, ease of use and user gratification. This could complement and back up the regular programme.

E.g.: secondary & higher education

EDUCATION:
LIVE E-LEARNING
DMU: Strategy Director

Livery Addressable Market

Mirella works remote for a bank and loves playing the weekly online **pub quiz** with colleagues (1.5hrs). She never misses the **fashion week interactive catwalk** (2hrs). And now that her favorite **reality shows** use AI to automatically offer e-commerce links to products, she watches them a lot more (8hrs)

M I R E L L A (32) **11.5 HOURS**

Justin often gets AI highlight push notifications, triggering him to watch a lot of **sports** (12h), also because he likes live predictions against buddies and doesn't mind the personalized ads. He is into tech and live chats during the weekly **gadget update** (2hrs). He also enjoys cooking along with chefs on the **interactive cooking show** twice a month (1.5hrs)

J U S T I N (39) **15.5 HOURS**

Mia takes weekly live **spanish lessons** with whiteboard gesture recognition (4hrs) and watches daily AI subtitled **telenovelas** (8 hours). One of her favorite influencers teaches dance at **LA Playground** twice a month (2hrs). Last week she won **a live trivia quiz** (1hr) after scanning a QR code on her panini wrapper.

M I A (18) **15 HOURS**

John works at PWC that does weekly **interactive all-hands meetings** (3 hrs). He subscribes to a stock podcast that also offers **live trading lessons** (8 hrs) to practise scenarios, and likes its AI text & video summary service. He watched **a black friday event** and got new sneakers at half off (1hr). While driving home he often listens to an AI narration of todays **NBA games** (4hrs).

J O H N (44) **16 HOURS**

Heather likes to watch live streams with her grandchildren with the AI safe filter enabled (2hrs). She crafts things and plays **Hobbii Bingo** every week (4hrs) - last time she won limited edition wool! She also enjoys **Scandinavian crafting videos** with live translation (4 hrs). Plus she got tickets to tonight's final online reunion **concert** of the Rolling Stones (2.5hrs).

H E A T H E R (62) **12.5 HOURS**

IN 2028:
12H
SMART VIDEO USE PER PERSON PER MONTH

X

5.1 BILLION PHONE USERS

=

184 BILLION HOURS PER YEAR

WITH

EFFECTIVE SALES PRICE **8cts.** PER USER HOUR

RESULTS IN A GLOBAL **59 BILLION** MARKET POTENTIAL

LIVERY AIMS FOR A MARKET SHARE OF
10% OF EUROPE & US
2% OF REST OF THE WORLD

RESULT: A SERVICEABLE MARKET OF
€4.7B
WITH **€2.8B** MARGIN

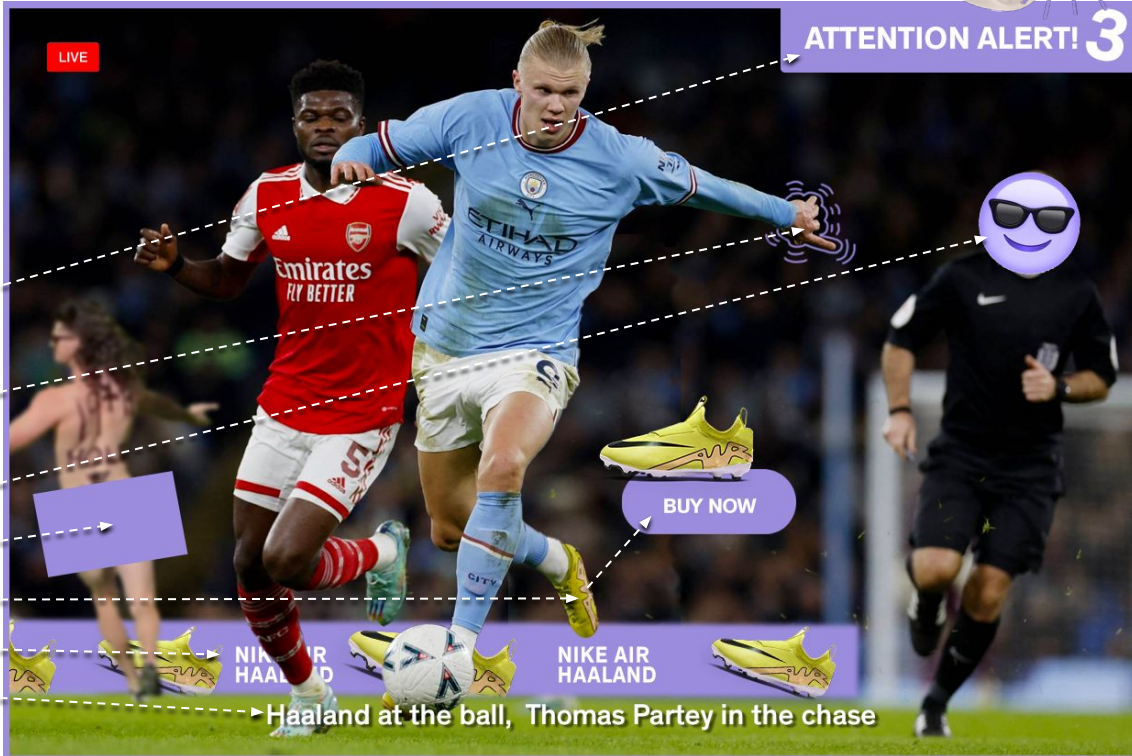# Roadmap: Livery's Unique 3 Seconds Window for AI

0 SEC: SOURCE

3 SEC: LIVE BROADCAST

VIDEO DISTRIBUTION WITH 3 SECONDS LATENCY

CLOUD ENCODER AI TOOLS, PUBLISHED WITH ZERO DELAY IN SYNCED INTERACTIVE OVERLAY

Upcoming highlight warning

Audio translations

Gesture recognition

Spotlighting

Fun filters

Object / person tracking

Product recognition

Personal & contextual advertising

Automatic subtitles

Automated metadata rendering

Multi-game highlights warning

LIVE

ATTENTION ALERT! 3

BUY NOW

NIKE AIR HAALAND

NIKE AIR HAALAND

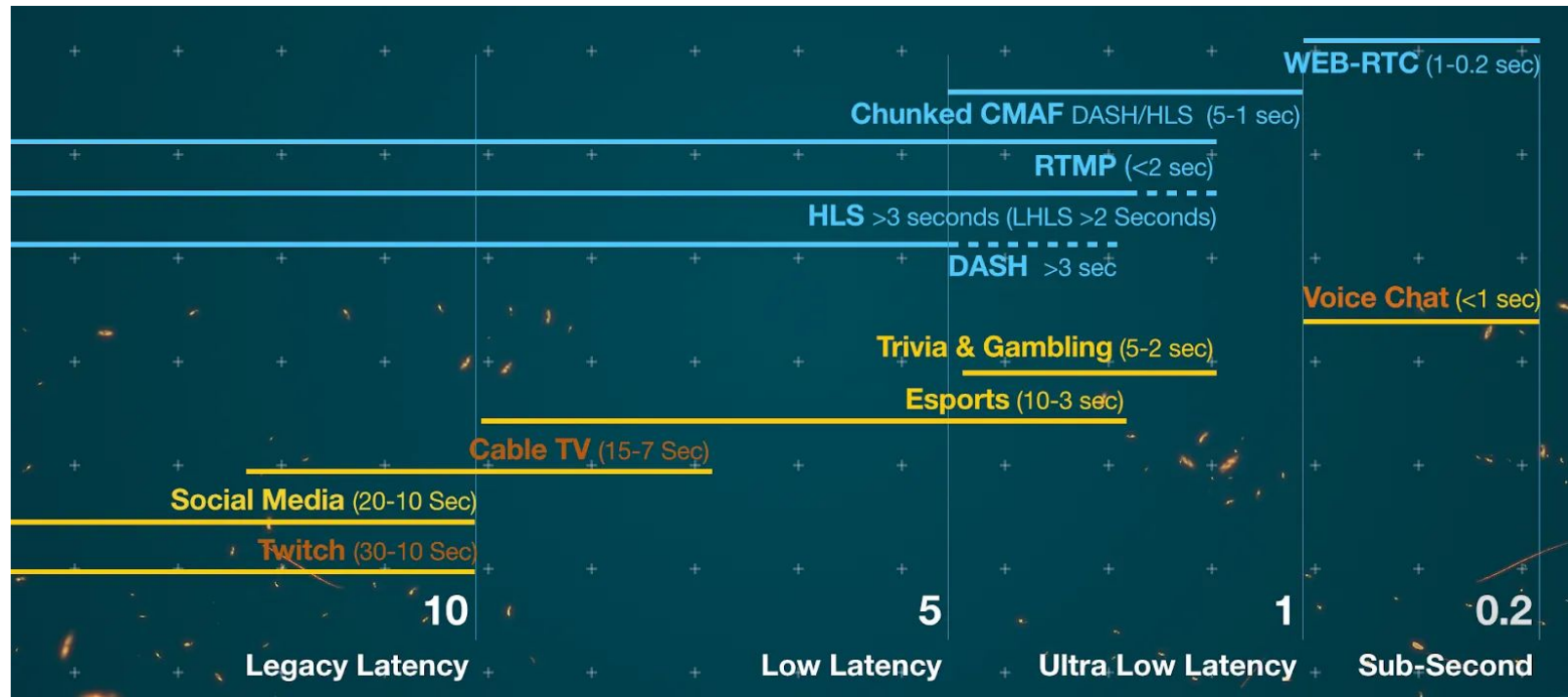Haaland at the ball, Thomas Partey in the chase

Live generated metadata: Players: Erling Haaland (23452,789), Thomas Partey (6789,456) - Referee: Klaus Mahler (1689,4746) - Persons: streaker (8923,5889) - Products: Nike air Haaland - Manchester City vs Arsenal - gesture: Haaland pointing (274,927) - Weather: dry - time: 21:34

26

The Latency Spread

Easily set up your live stream, end-to-end including a player for web, iOS and Android. Integrate in your desired platform and engage with interactive moments during your live sessions. Start selling with live shopping, educate, track and improve students results or just stream in high quality with less than 3 seconds behind reality.


WEB-RTC (1-0.2 sec)

Chunked CMAF DASH/HLS (5-1 sec)

RTMP (<2 sec)

HLS >3 seconds (LHLS >2 Seconds)

DASH >3 sec

Voice Chat (<1 sec)

Trivia & Gambling (5-2 sec)

Esports (10-3 sec)

Cable TV (15-7 Sec)

Social Media (20-10 Sec)

Twitch (30-10 Sec)

10   5   1   0.2

Legacy Latency   **Low Latency**   **Ultra Low Latency**   **Sub-Second**

LIVERY

Livery: The solution to power your live experiences
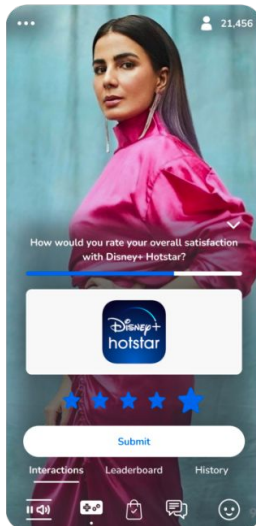
LIVERY

Easily set up your live stream, end-to-end including a player for web, iOS and Android. Integrate in your desired platform and engage with interactive moments during your live sessions. Start selling with live shopping, educate, track and improve students results or just stream in high quality with less than 3 seconds behind reality.
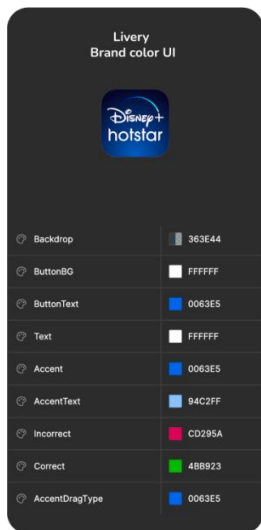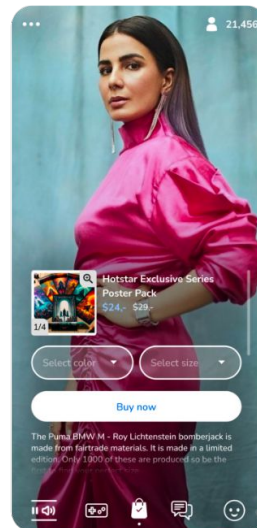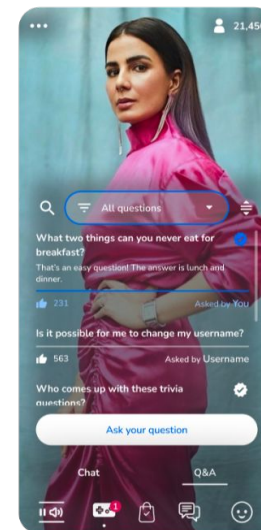

Customize
to your brand
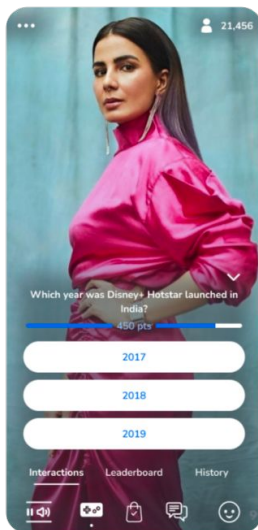
Storytelling with
trivia & quizzing

Rating, research &
export user data

An engaging
channel for live
shopping

Chat, Q&A
and much more...

Use Livery for...

High quality interactive live sessions that can scale up to millions of people.

- **Corporate Learning & Development:** learning for onboarding, reskilling of (remote) teams.
- **Live e-Learning:** enriche your e-learning course:
- **Live Shopping:** conversions up to 30%
- **Game shows & Trivia:** engage with leaderboard and prizes
- **Corporate Communication:** all hands or remote stakeholder meetings.
- **Market research** export data to analyze
- **Engaging webinars** no more dull webinars

For a full overview:

REQUEST A DEMO

LIVERY