



ITALY

# VIDEO STANDARDS EVOLUTION

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# AGENDA

- Industry recognition
- Bandwidth increase
- Codec efficiency
- Streaming impact
- Codec evolution
- Business aspects
- AI impact
- Next Gen codecs
- Takeaways



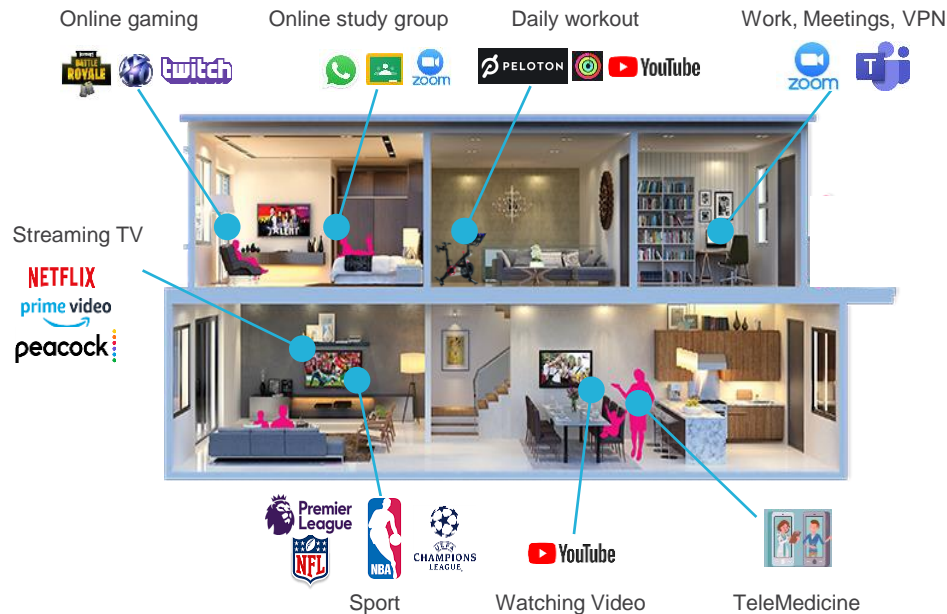
NATIONAL  
ACADEMY  
OF TELEVISION  
ARTS & SCIENCES

Recent Emmy award related  
to AI optimization



# MORE BANDWIDTH RESULTS IN....

## New usage

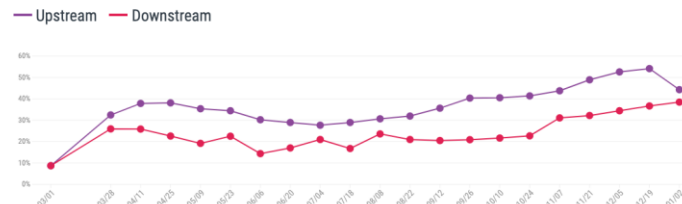


## New Constraints

### National Peak Internet Growth During COVID-19

Observed Increase in Peak Consumer Usage Since Early March 2020

Overall change in pre-COVID internet usage since 3/1/20

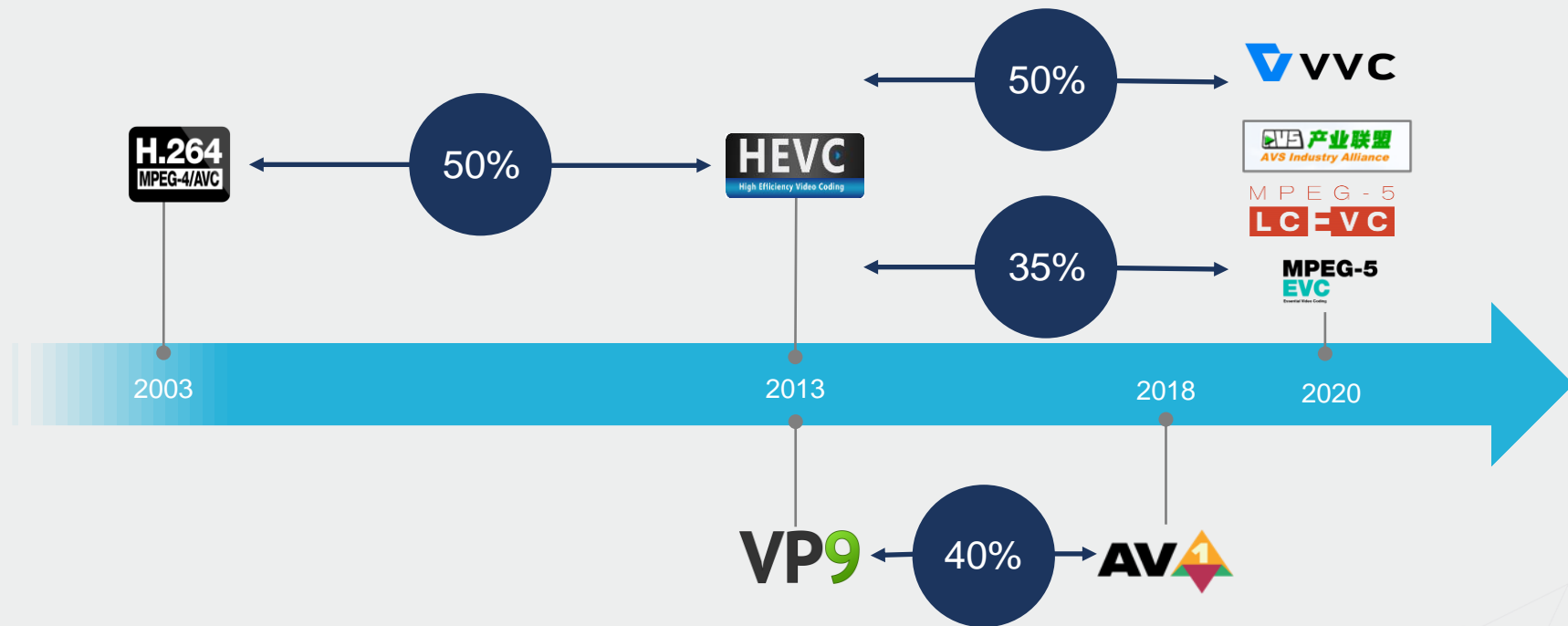


Source: Data from NCTA member companies and others.

40% bandwidth growth

Need for bandwidth savings / compression efficiency ➡ cycle repeats

# CODEC EFFICIENCY



# STREAMING IS DRIVING CODEC DEVELOPMENT

## Broadcast codec development



Resolution-driven

## Streaming codec development



Consumer device-driven

## Today's (streaming) codecs



10B  
devices



2B



VP9

4B

~16 billions enabled devices

## Next Gen codecs



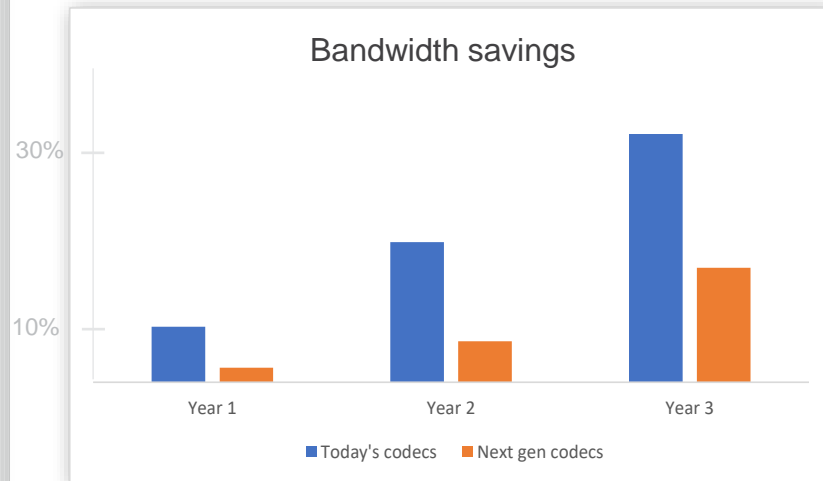
No significant # of enabled devices yet

# TODAY'S CODECS vs. NEXT GEN BANDWIDTH SAVINGS

## Assumptions

1. 40% WW internet traffic increase every year
2. 10% improvement every year for today's codecs
3. Next gen codecs are 50% more efficient than today's codecs
4. Next gen device penetration:
  - Year 1=5%, Year 2 =10%, Year 3 = 20%

## Bandwidth savings



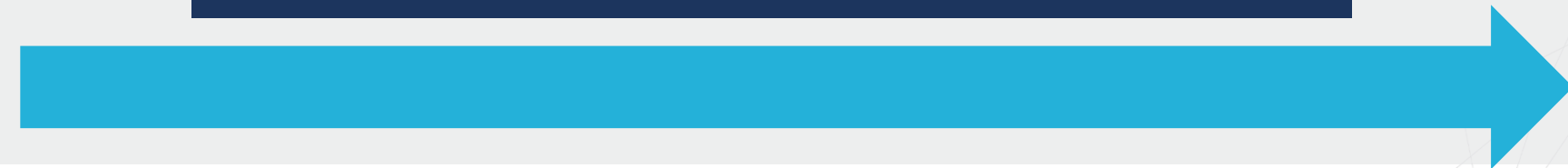
In Year 3, 2/3rd of bandwidth savings comes from today's codecs

# TODAY'S CODEC – AREA OF IMPROVEMENTS



ML-AI based Improvements

Core Compression improvements



# ML-AI MAKES BETTER PREDICTIONS & DECISIONS

Better  
frame rate  
selection

Better  
resolution  
selection



Better  
encoding settings  
decision

Better  
video quality  
prediction

All predictions & decisions being taken in real-time!

# BETTER DECISIONS AND PREDICTIONS TRANSLATE IN...

Lower  
CPU footprint

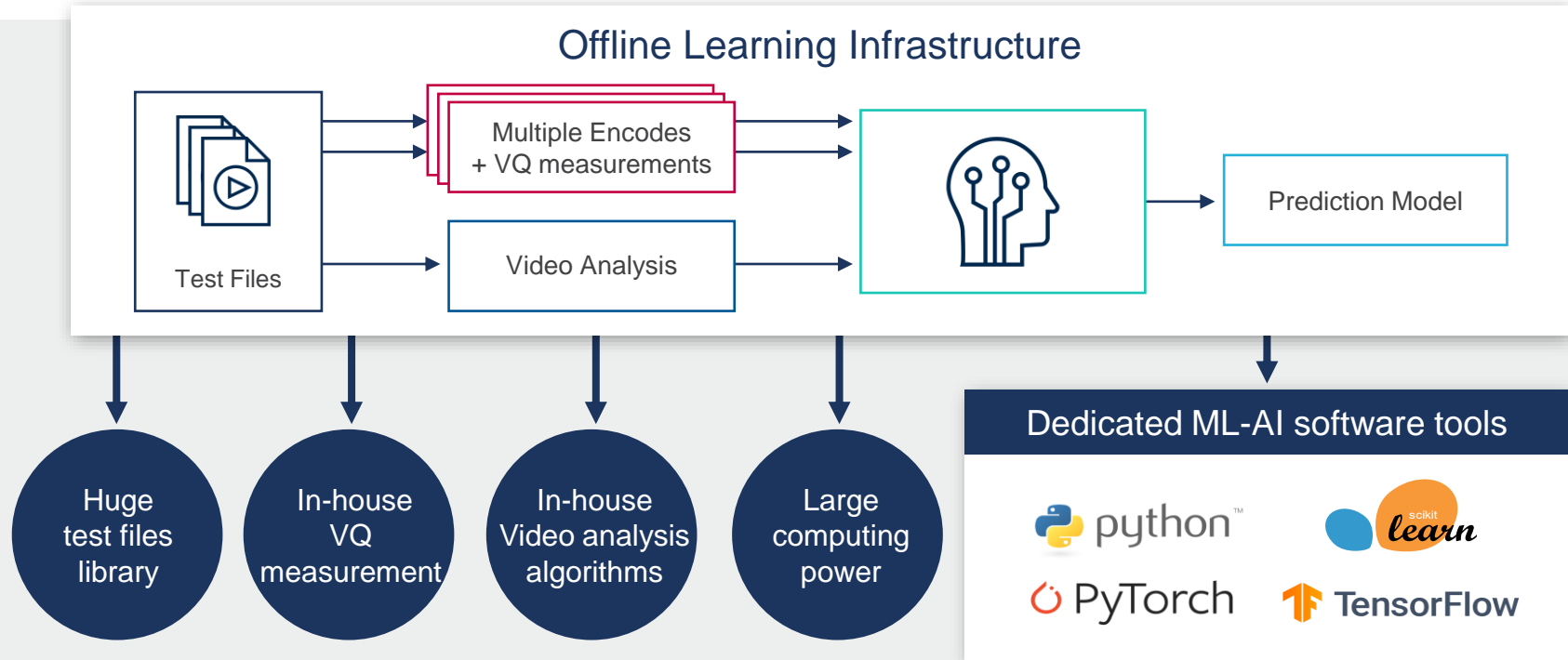
Enhanced  
QoE








Bitrate  
savings

All 3  
when ML-AI tools  
are combined

# ML-AI IS ALL ABOUT THE OFFLINE LEARNING INFRASTRUCTURE

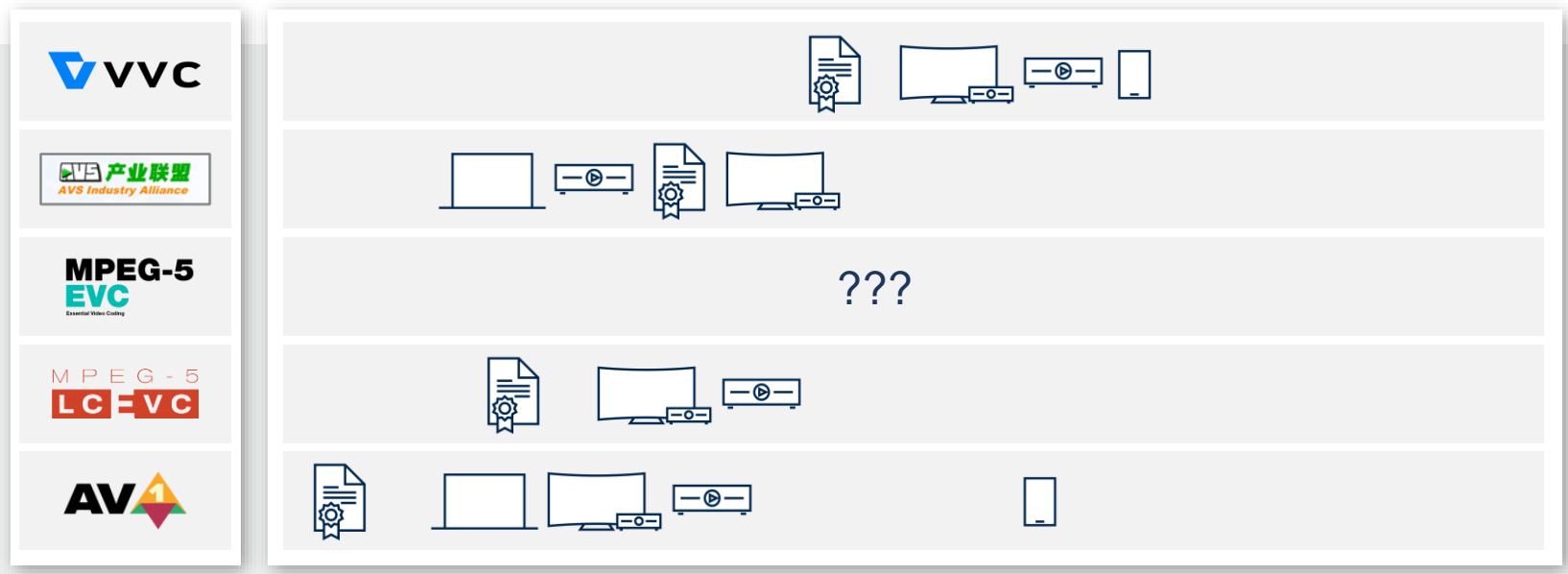


Since 2017, Harmonic is investing in its learning infrastructure

	Body	Rationale	Licensing status
	MPEG/ITU	HEVC successor	MC-IF fostered 2 pools
	MPEG	VVC alternative with better licensing terms	Licensing terms before Q2'22
	MPEG	Add-on layer to boost today's codecs	Patent held by v-Nova
	SARFT	Chinese alternative to VVC	Licensing terms unknown outside China
	AOM	Royalty free codec for internet distribution	Sisvel asking for royalties

Licensing terms critical to next gen codecs success, still unsolved

# CODEC INTRODUCTION TIMELINE



2020

2021

2022

2023

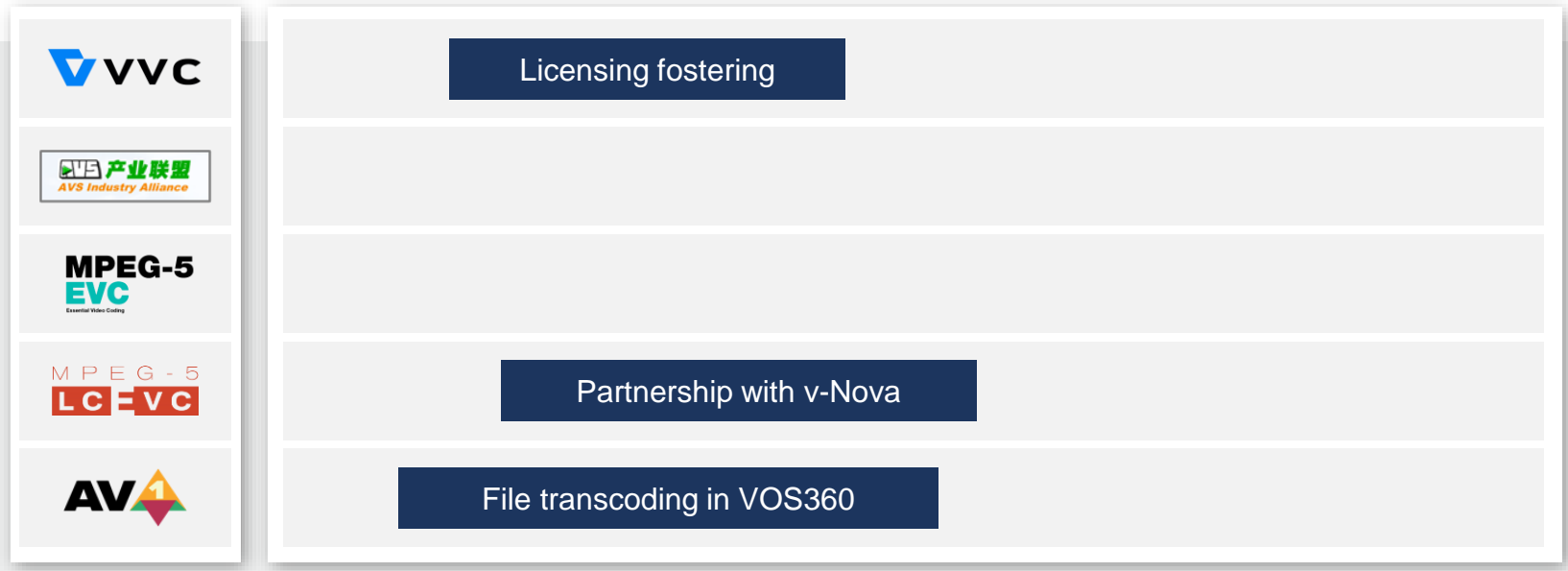
2024



licensing terms



# HARMONIC'S ACTIVITY ON NEXT GEN CODECS



## Compression is always relevant

New usages create bandwidth needs

Compression saves storage & delivery costs

## Improving today's codecs is essential

Huge deployment base

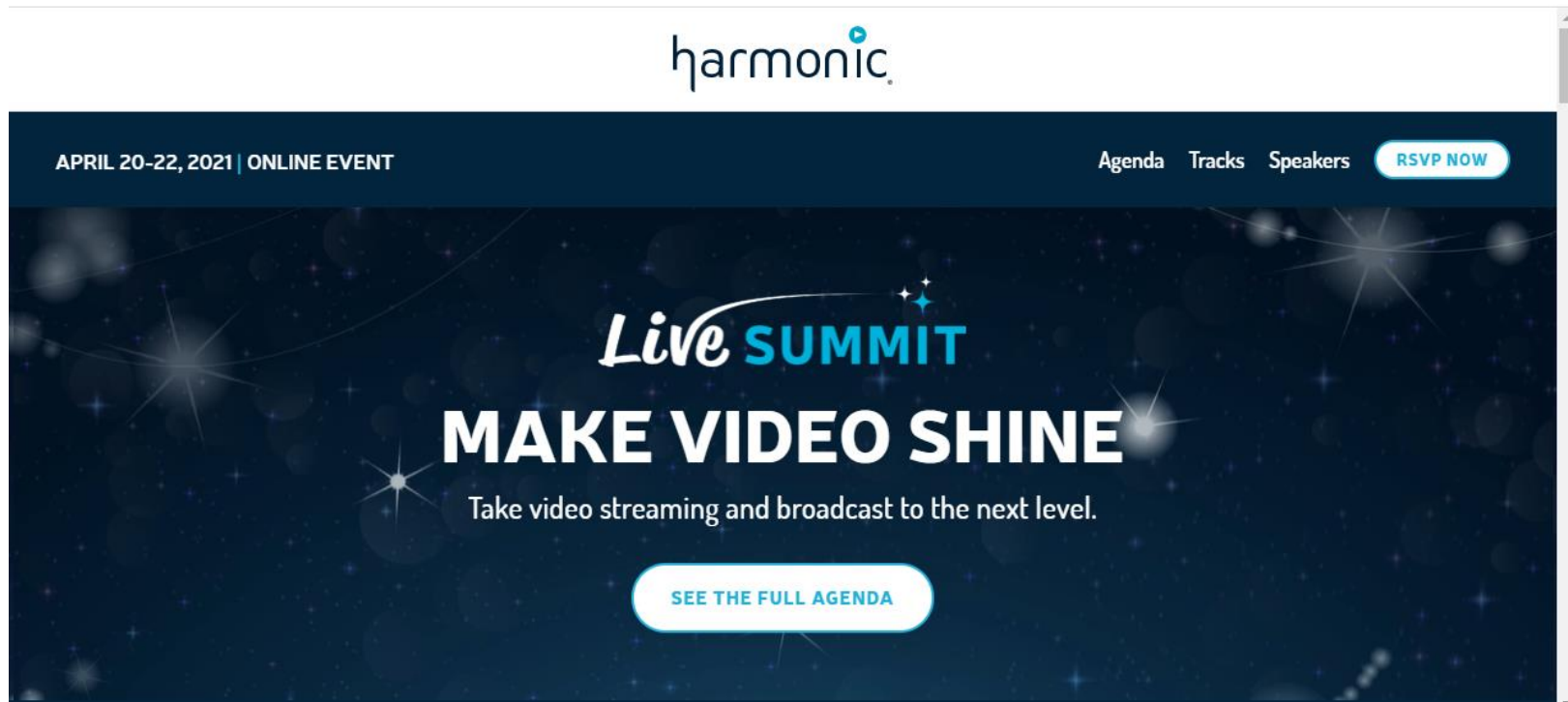
ML-AI pushes the envelope

## Next Gen Codecs are underway

Licensing terms are yet to be clarified

They have potential from 2022 and beyond

HARMONIC, your guide into the codec world



<https://live.harmonicinc.com/video-streaming/live-summit-2021/>