EVOLUTION OF THE CONTROL ROOM: LEVERAGING XR, VOICE, AI & HTML-BASED GRAPHICS SOLUTIONS

#IBCACCELERATORS2024

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Production Control Room

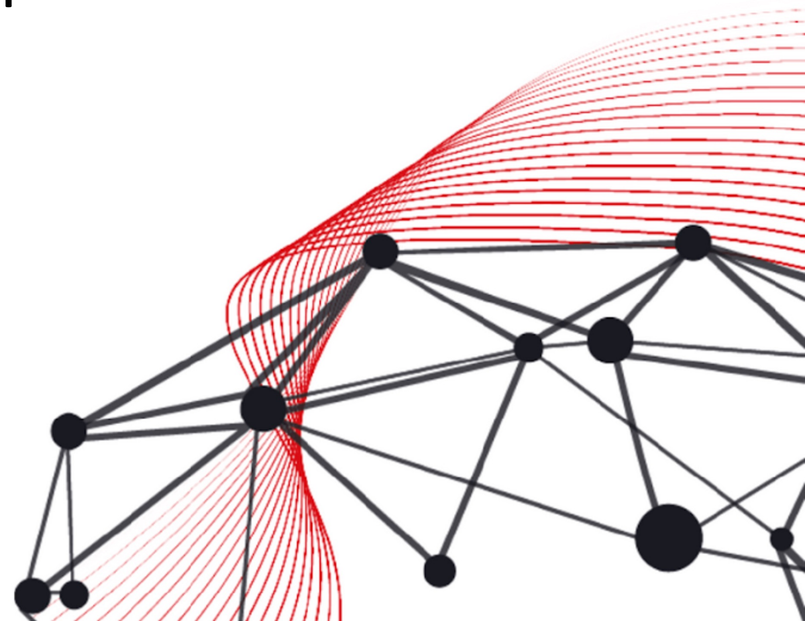
Where the crew work their magic and make the stories happen

- Audience reach across a wide range of platforms
- Challenging times – do more with less
- Transform with AI & new technologies
- Enabling us to produce more
- Facilitate teams to do what they do best
- Flexibility
- More options within the production model

The media landscape has changed

Yet we still have complex legacy workflows, hardware dependencies, and a reliance on specialist skills

- **Empower** the director to realise their creative vision
- **Simplify** workflows, leveraging AI and automation
- **Flexibility** for the production crew
- **Sustainable** work practices
- **Modular** systems



2024 CHALLENGE PROPOSAL
SIMPLIFY LIVE PRODUCTION

- **XR** virtual workspaces
- New modalities of control leveraging **AI & Voice**
- Modular approach to **HTML**-based graphics

The central challenge of gallery automation (indeed arguably any control room evolution) is…

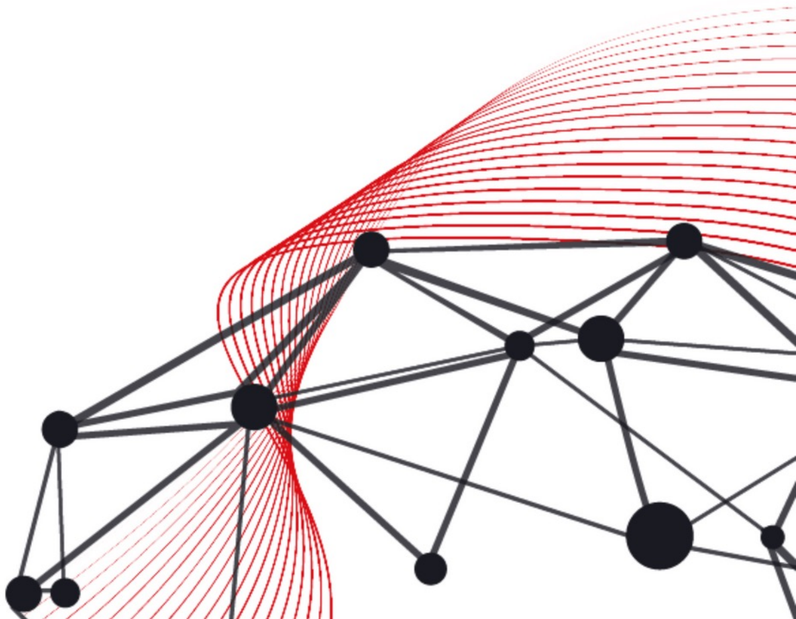
Empowering skilled operators to do more, through richer control

The two keys to unlocking this are…

Deeper device integration

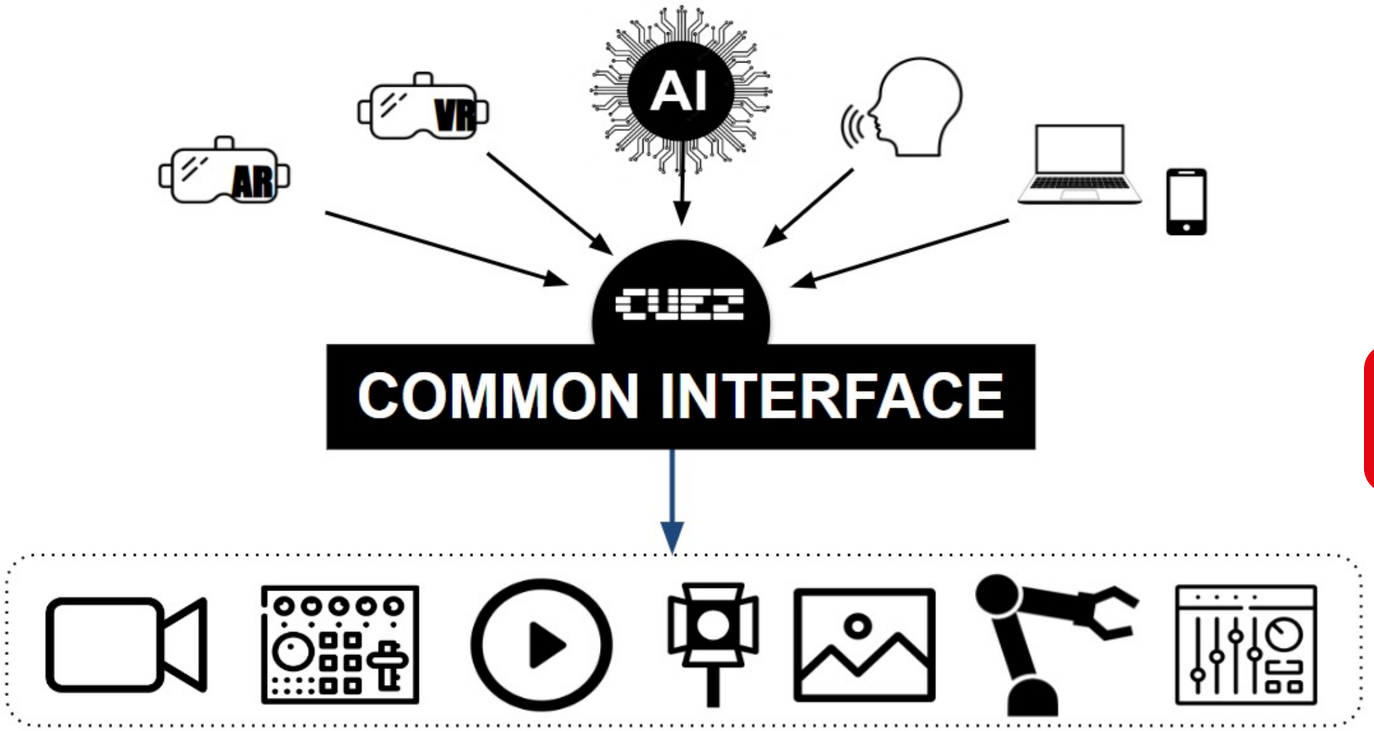
&

Smarter, flexible, user interfaces



2023 IBC Accelerator

GALLERY AGNOSTIC MEDIA PRODUCTION



Device Integration

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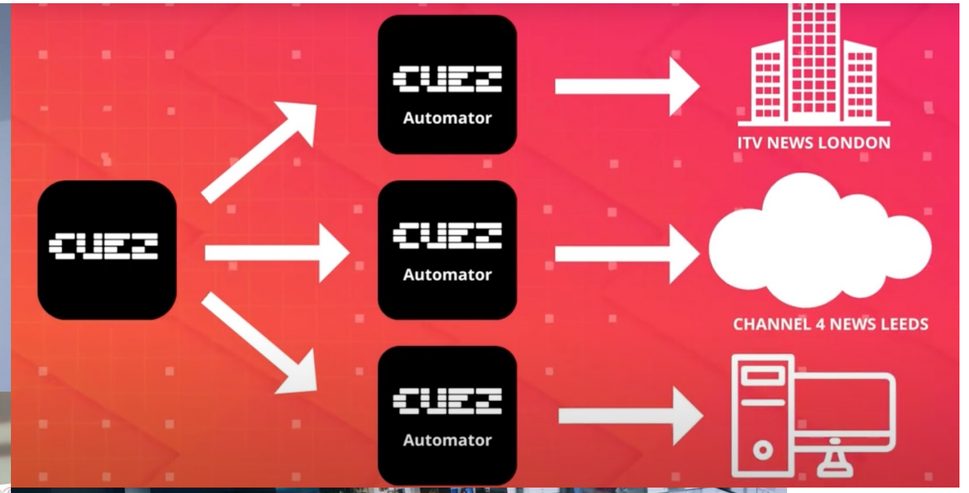
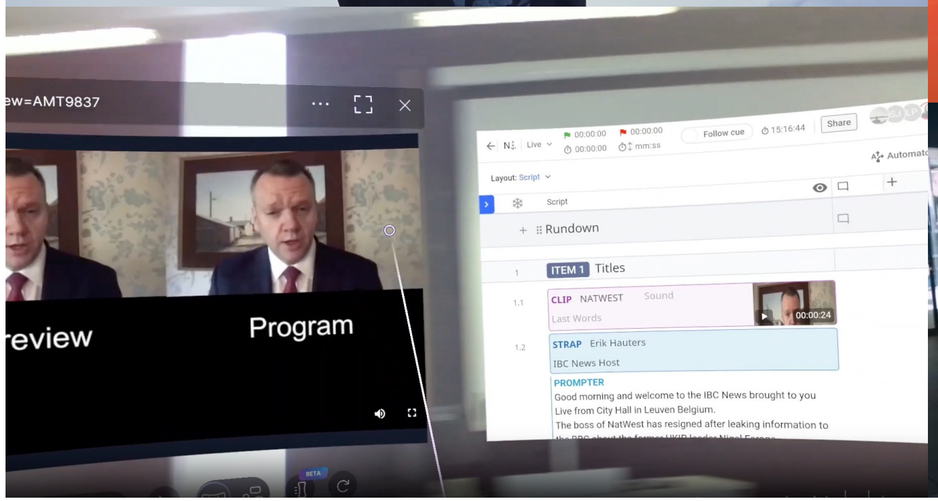




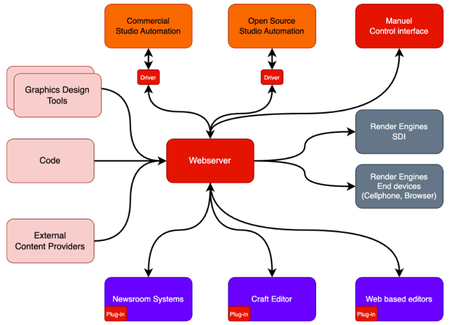
What have newer gallery models given us so far?

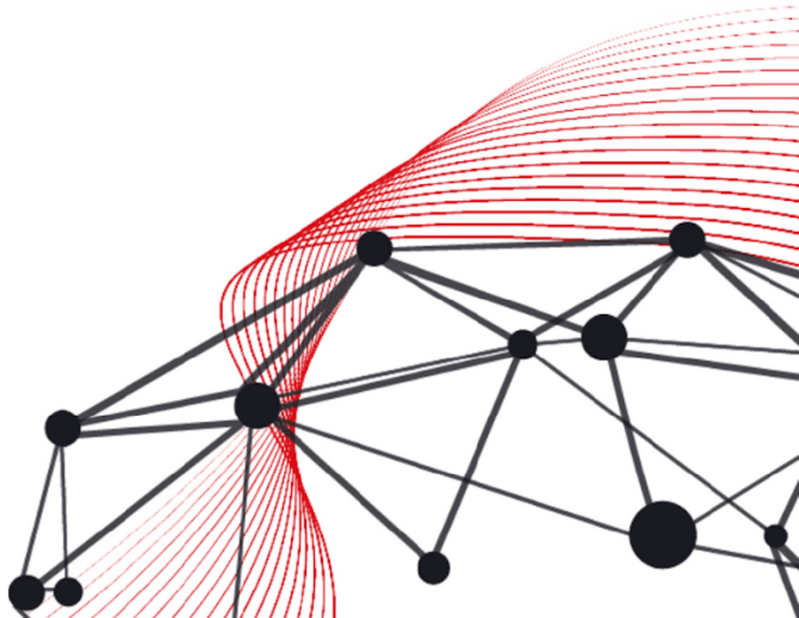
What have they taken away?

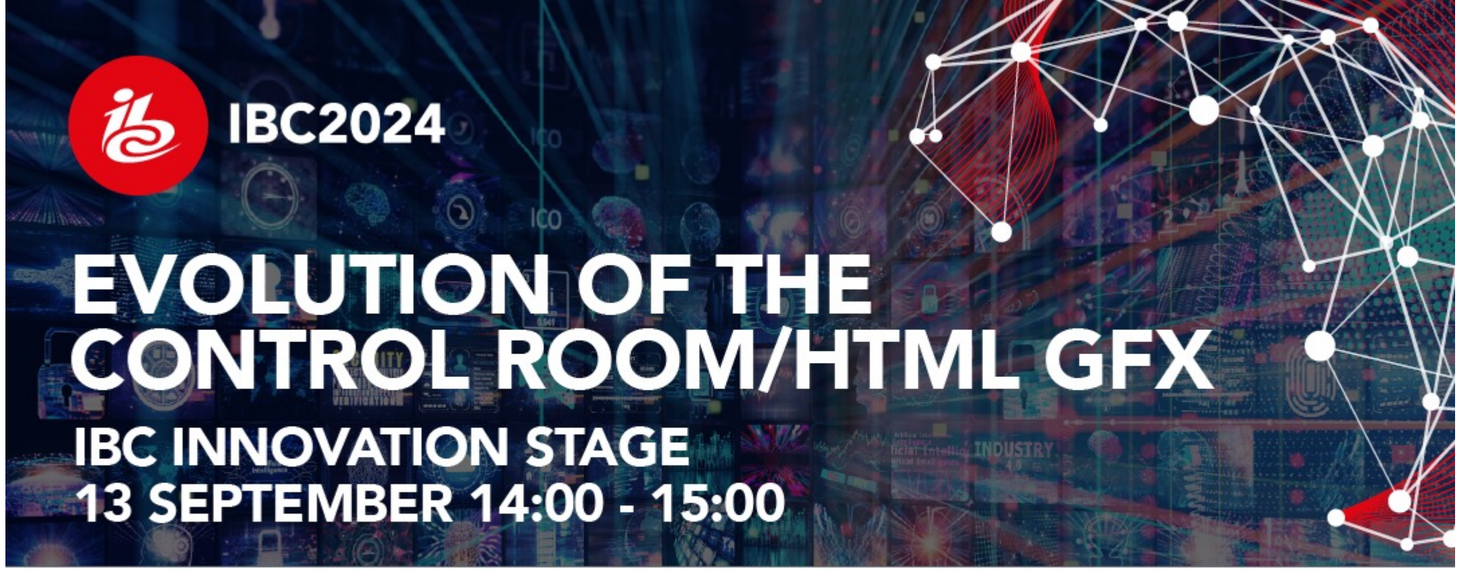
… and what might new technologies help us to now put back?

Modular HTML-based Graphics solutions

- **Why do we need a modular HTML based graphics solution?**
  - Media houses publish content to multiple platforms
  - Media is consumed across multiple platforms
  - Multiple viewing aspects are in use
  - Better support for user-controlled customization
- **How do we achieve that?**
  - **Open and visionary collaboration between vendors and media houses**
  - Use of widely accepted formats
  - Break workflow apart and into interchangeable components







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CHAMPIONS

ALJAZEERA
BBC
4
Danmark
EBU
OPERATING EUROVISION AND EURORADIO
HSLU Lucerne University of Applied Sciences and Arts
ITN
svt
Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin
TRANSMIXR
vodafone
yle
XRECO

PARTICIPANTS

CUEZ by TinkerList
CUEPILOT
ERIZOS
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SPX GRAPHICS

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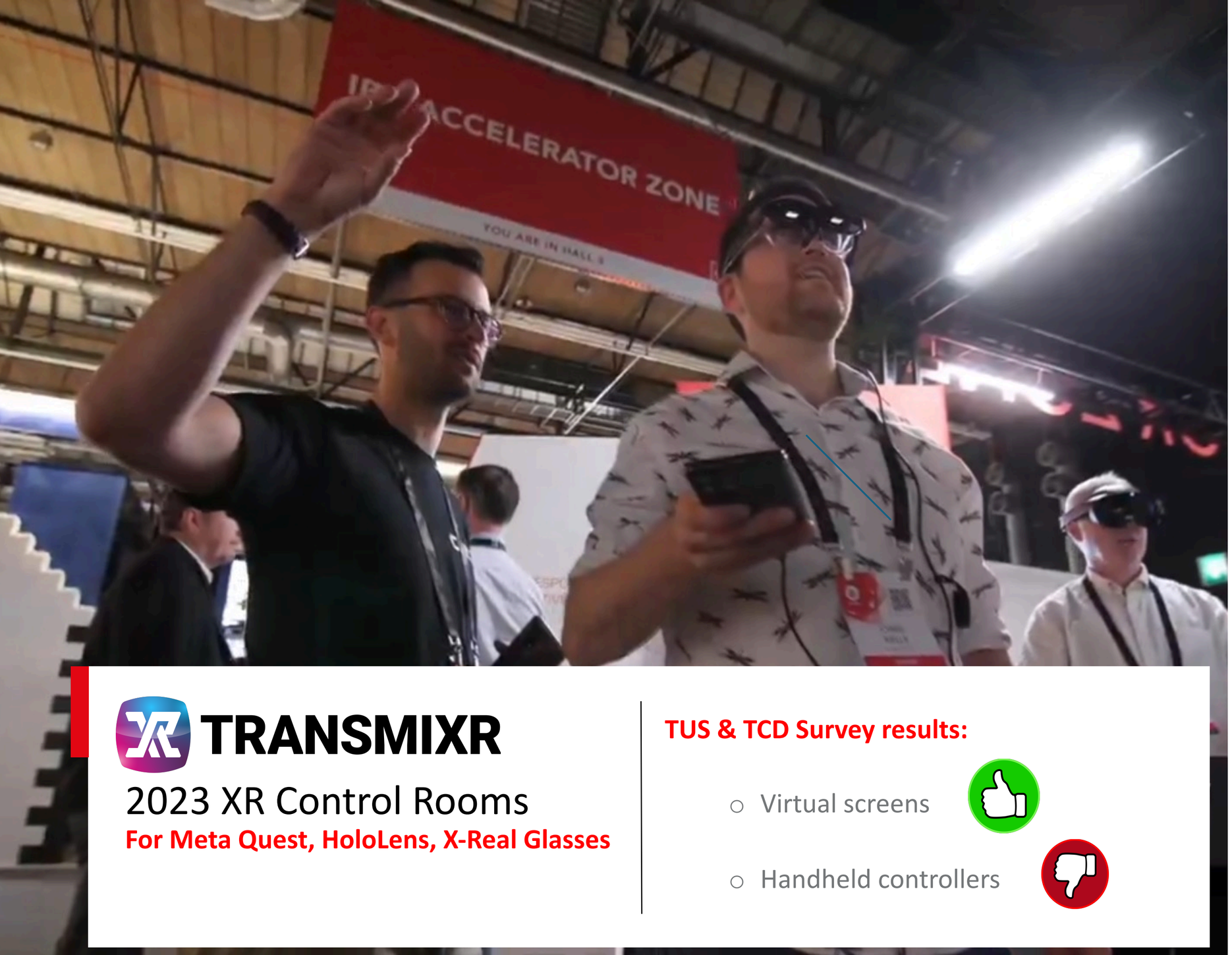

TRANSMIXR

2023 XR Control Rooms

For Meta Quest, HoloLens, X-Real Glasses

TUS & TCD Survey results:

- Virtual screens
- Handheld controllers

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TX OUT

METAQUEST VIEW

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IBC XR Control Room

PoC from TRANSMIXR, developed in Unity 3D

An open-source project by Milan Wulf was extended to include:

- Cuez Running Order
- Cuez Automator
- TRANSMIXR Dashboard
- Storypact Editor

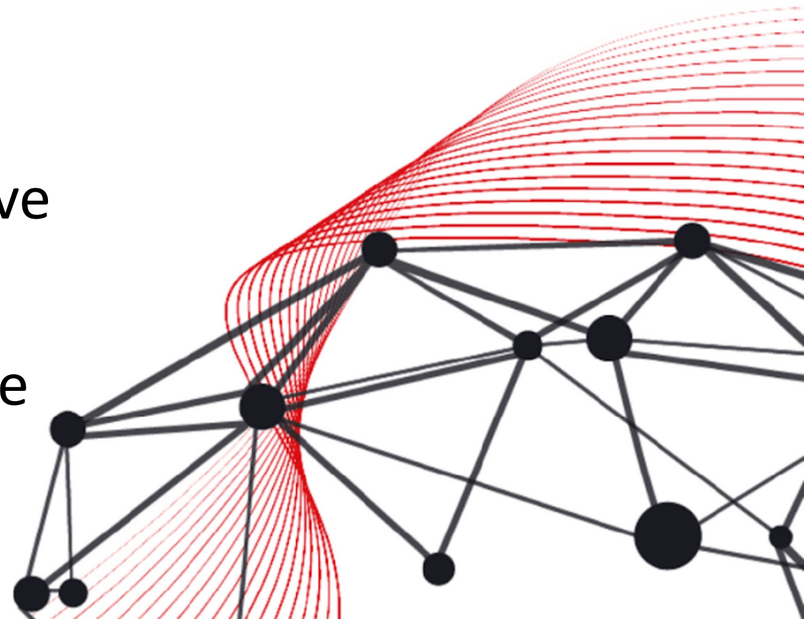
Features:

- Customisable virtual workspace
- Scalable virtual monitor stack
- Interactive screens and workstations
- Compatible with external hardware control interfaces – keyboards, touchscreens, mini-midis, etc.

Planned integrations include AI assistant, with natural language voice control, to interact with the UI and data sources.

Virtual Production...a whole new meaning

- **Virtual Studios**, with **virtual control rooms**, and innovative **volumetric video** solutions
- **No physical infrastructure, specialist production hardware or realtime camera-tracking**
- **Low-cost** with high production value
- **Scale-up and expand** with distributed virtual studios and live production XR solutions
- **Multi-format delivery**, including new immersive, interactive audience experiences



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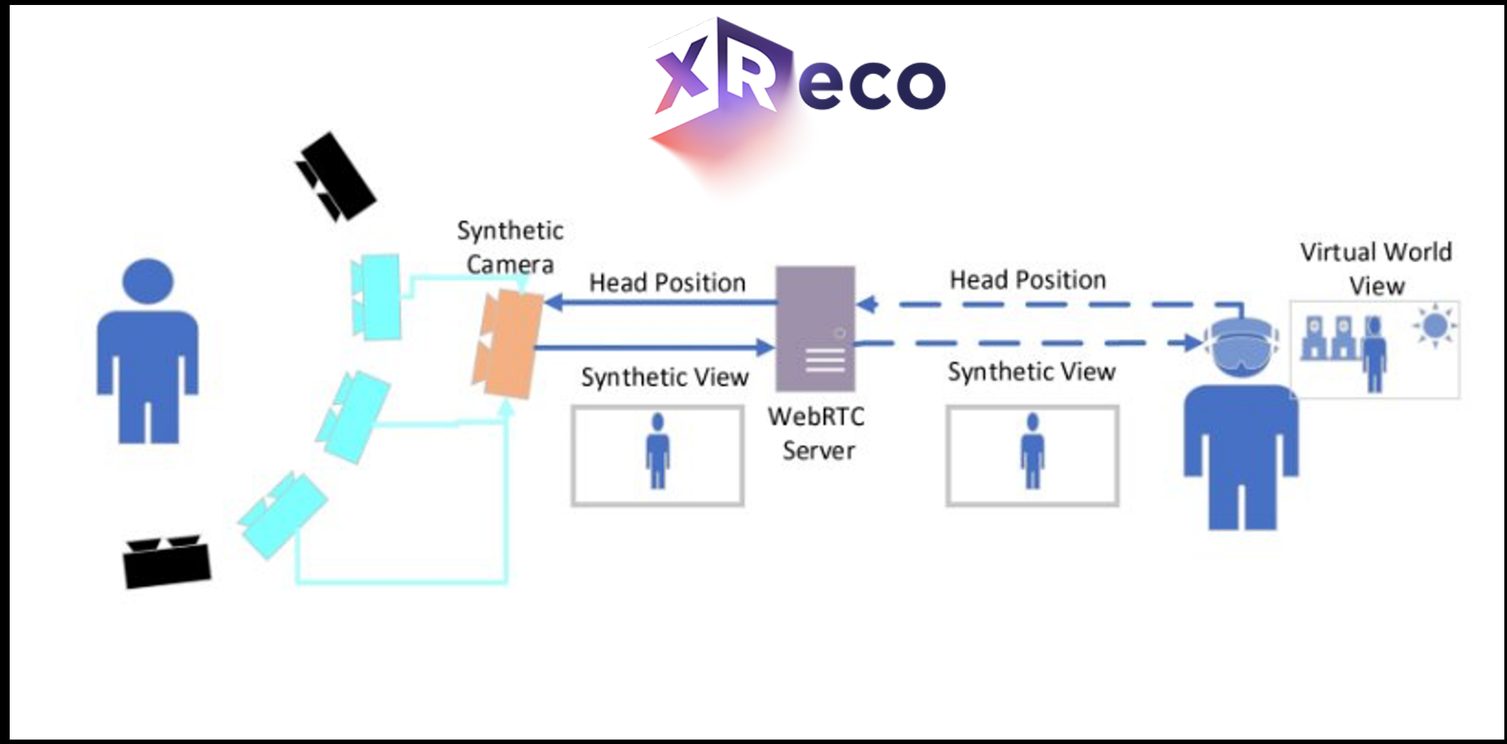
Free Viewpoint Video Live RGB+D



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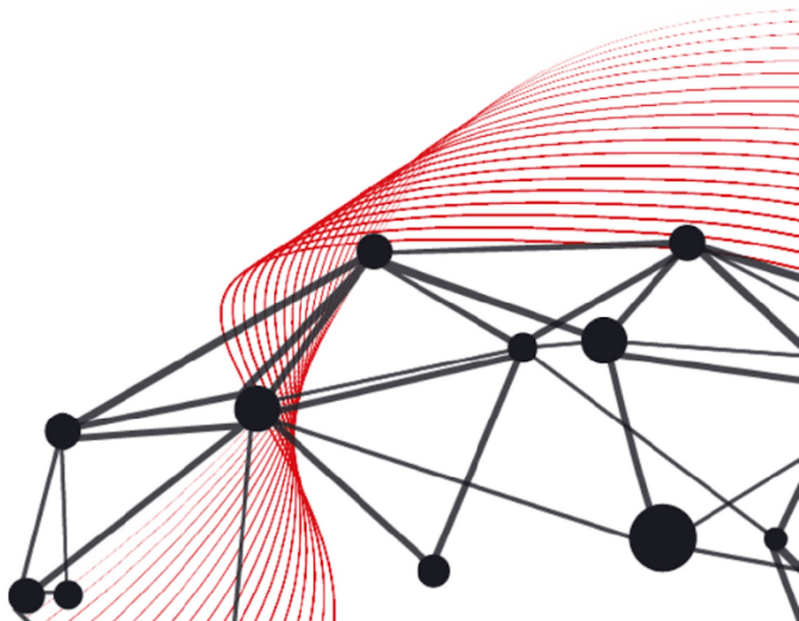
Virtual production in Unity using Free Viewpoint Video

xReco

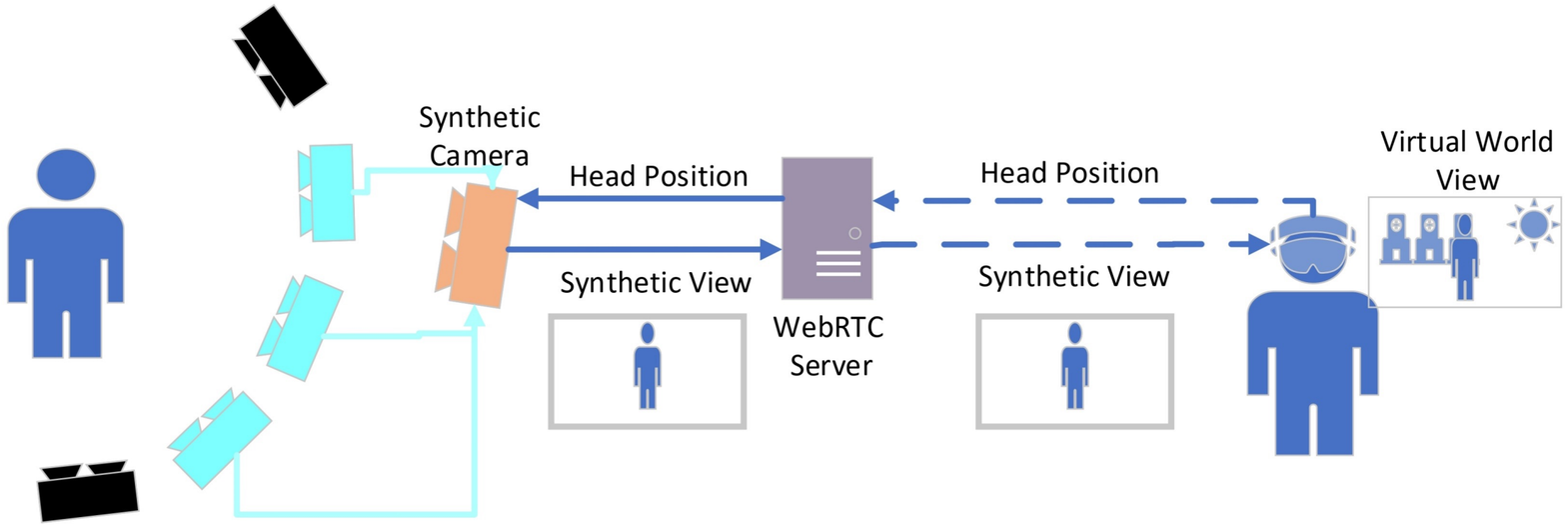


Free Viewpoint Video (FVV)

- FVV Live is a real-time FVV system developed by UPM
- XReco: Integration with virtual scenarios built on Unity
- Virtual production
  - Pre-defined smooth camera paths
  - Spontaneous camera paths

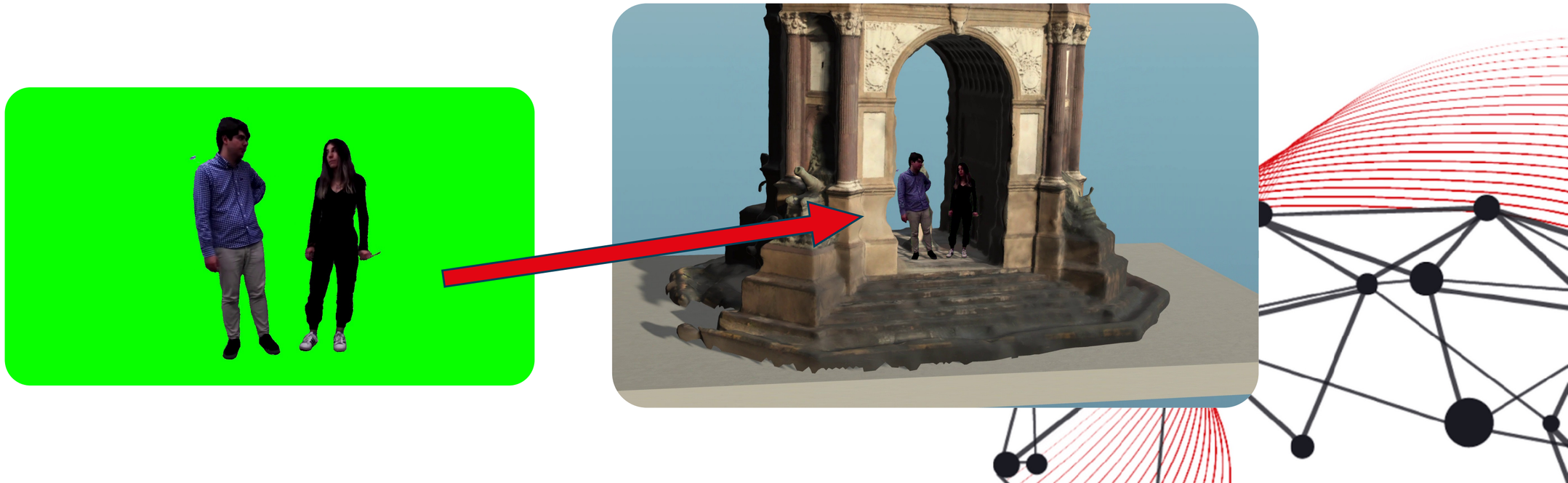
3D Human integration in Unity

- FVV Live: 9 Stereo cameras capture the scene (RGB+D)
- Green Screen setup to segment people
- Remote rendering approach

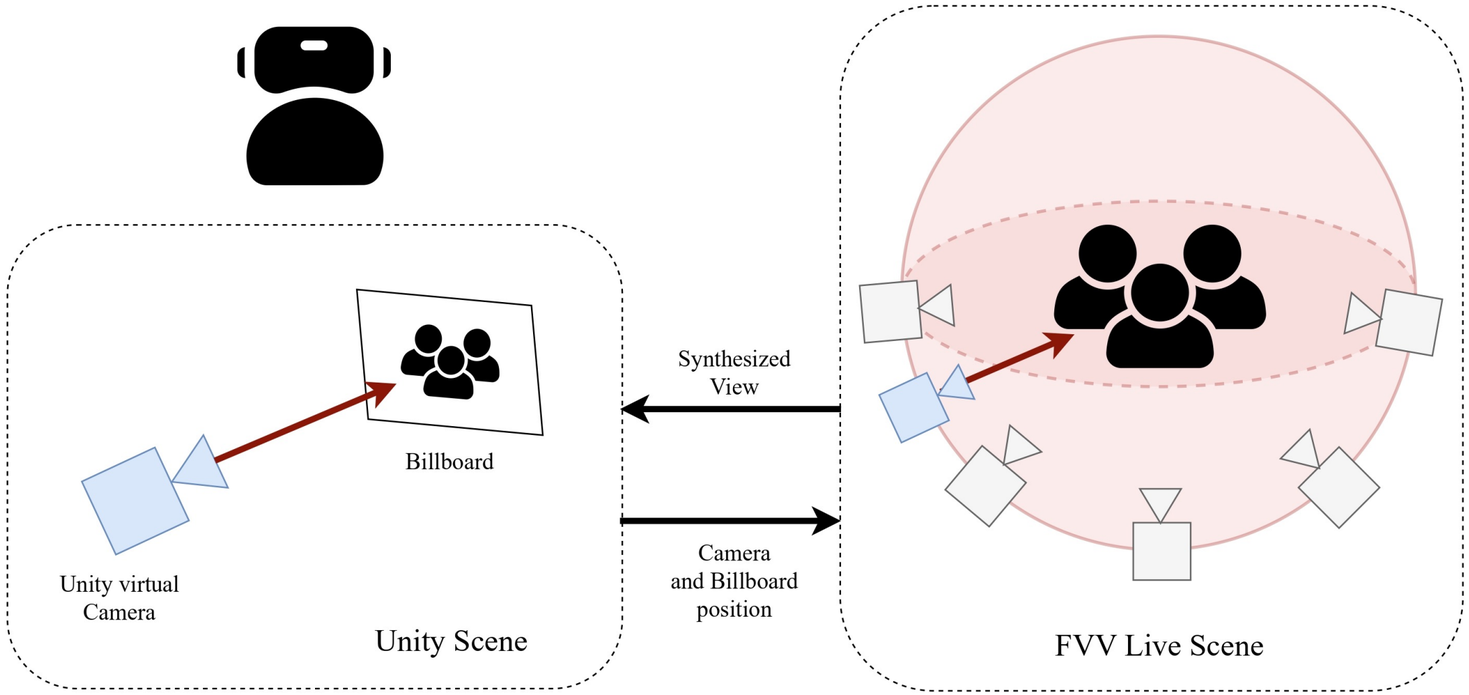


Remote rendering

- User communicates their point of view
- Synthetic views are rendered (heavy processing) in the server
- User only receives and plays 2D video

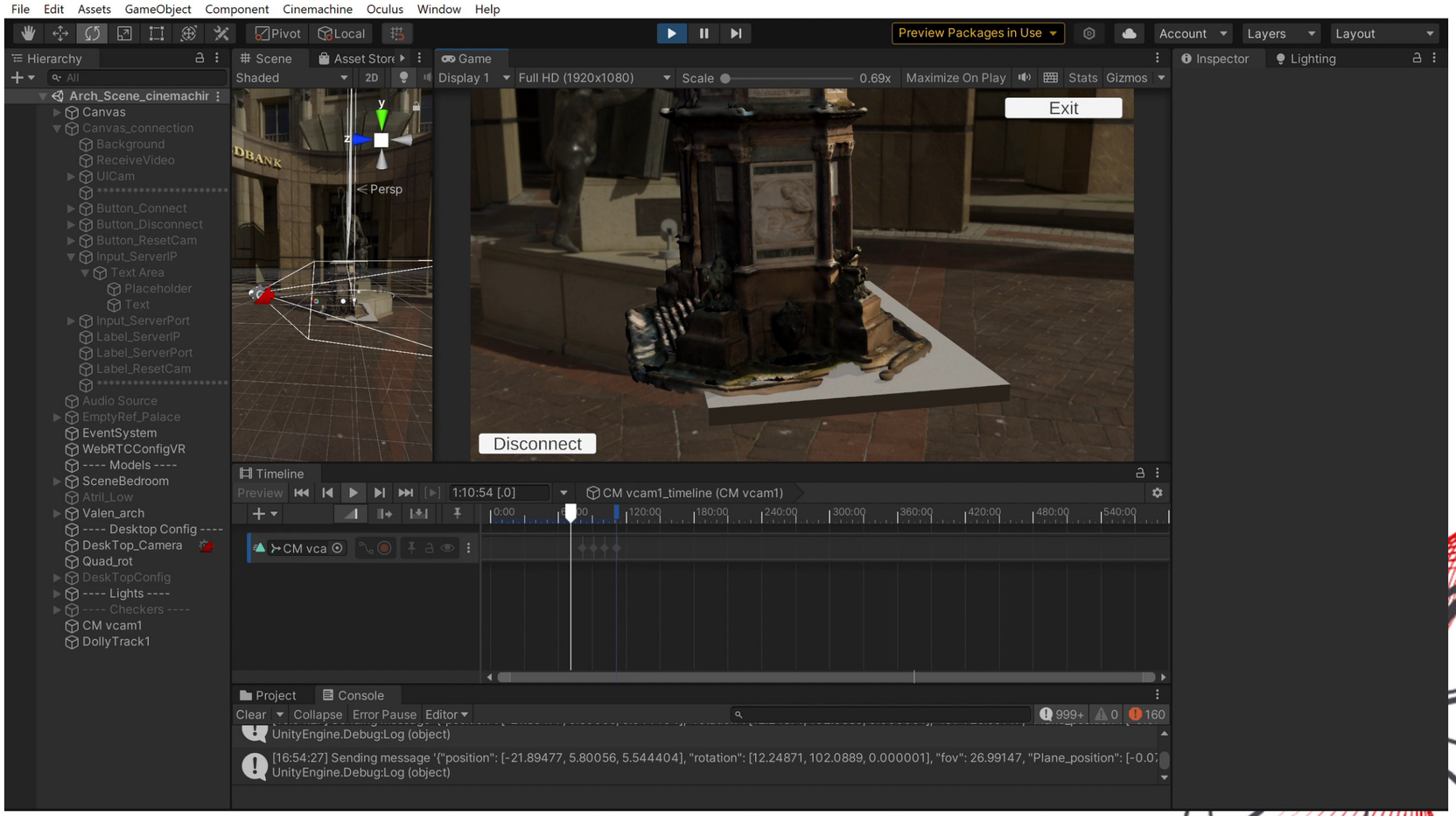


Rendering a coherent view yields volumetric sensation



- The video received is played on a billboard inside of a Unity scene
- The server takes the direction from the user to the billboard to render the virtual view

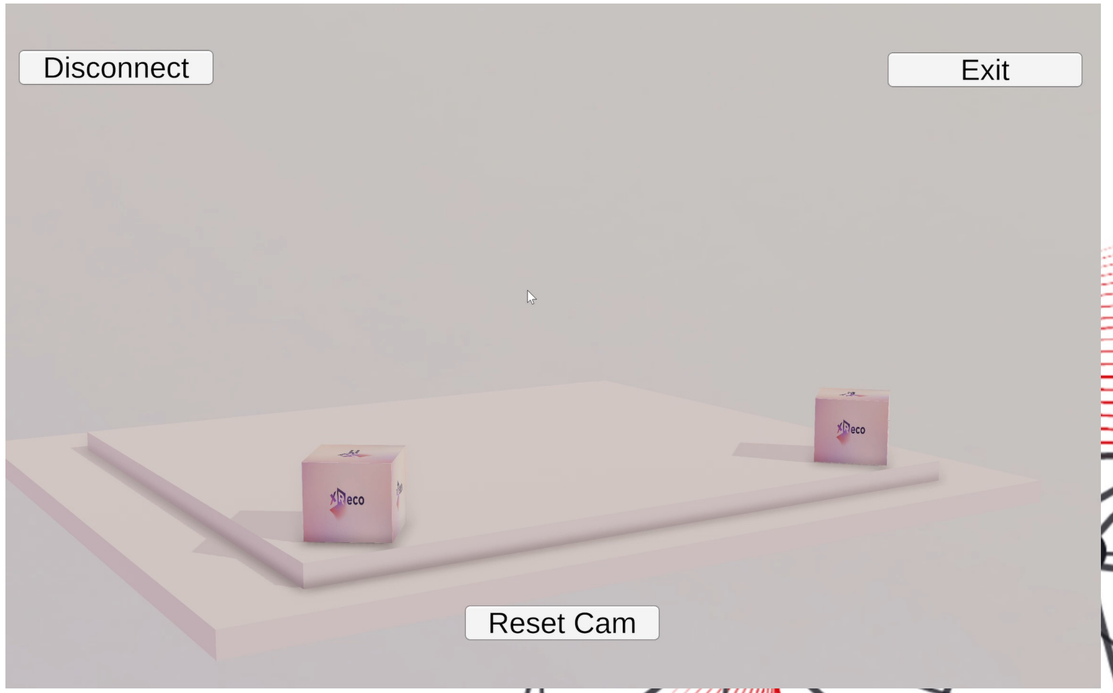
Virtual Production



Virtual Production

Pre-defined smooth camera path

Spontaneous camera path



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TRANSMIXR XR Studio

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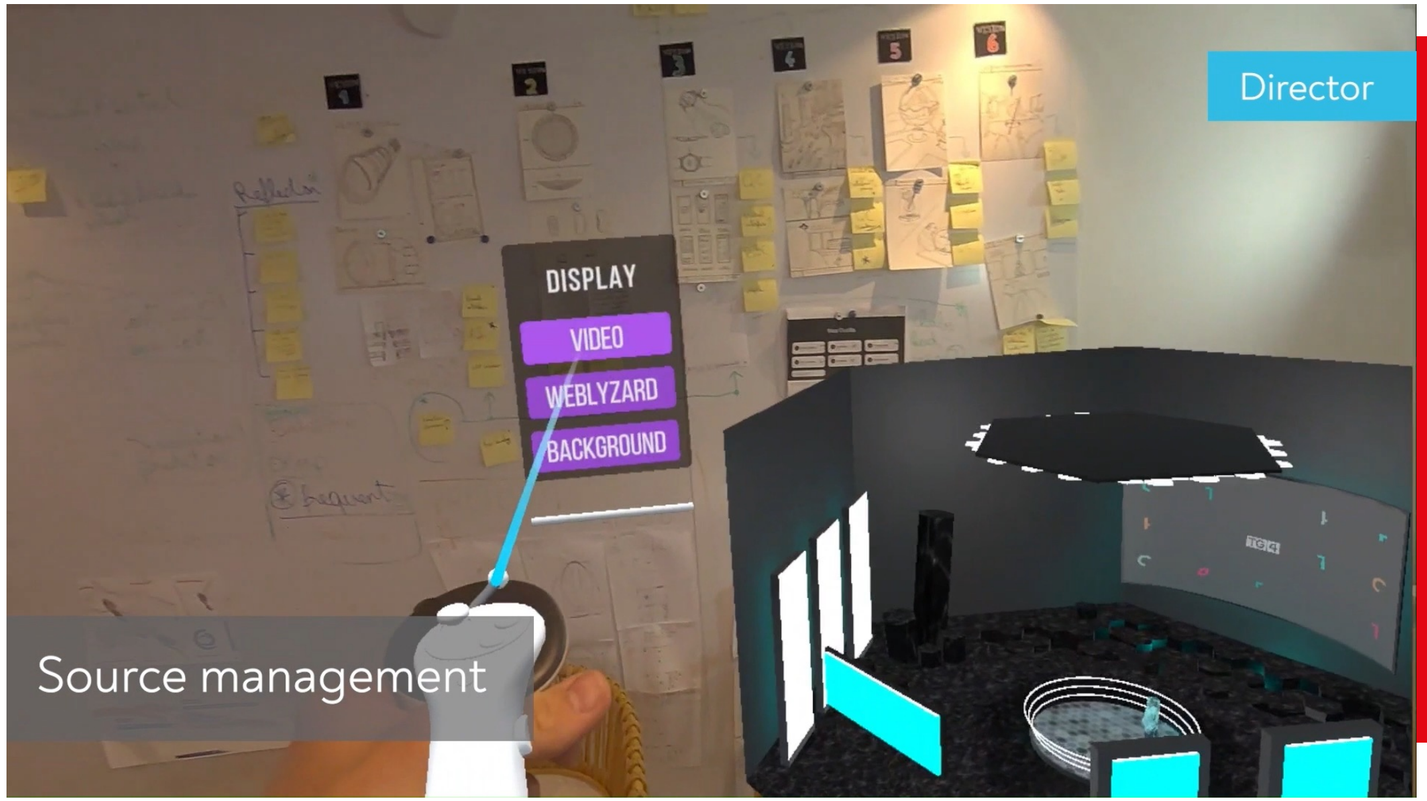


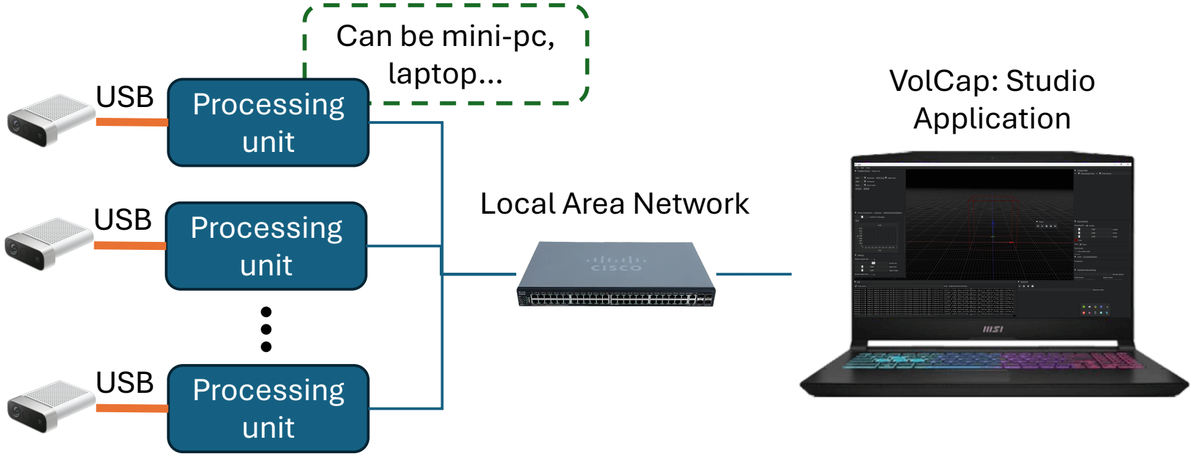
- Transform the Studio Set
- Virtual Video Walls
- Shots framed for TV and Mobile
- Virtual Cameras (invisible on output)
- No Camera-Tracking Equipment
- New XR Audience Experiences
- 6DoF and Interact with 3D Elements

LIVE

360°

TRANSMIXR Volumetric Video XR Studio

- Distributed solution
- Provides scalability
- Easy to assemble with commodity-based hardware
- Easy to use
- AI-based spatial camera calibration solution



TRANSMIXR Volumetric Video XR Studio

Features:

- Automatic sensor discovery
- AI-based spatial sensor calibration
- Live 3D and 2D viewport
- Persistent data saving
- Volumetric data compression
- Volumetric data capturing (saving)
- Volumetric data streaming (UDP)

Integrated with real-time reconstruction service

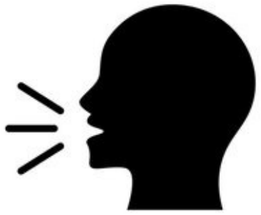
AI Assistant

Can gallery AI co-pilots reduce complexity for operators?

Runorders are structured datasets, perfect use cases for LLMs to help us navigate

Can we train AI agents to hunt for problems?

Could this win back a lot of ‘brainspace’ for operators while improving output quality?



Wasn’t voice always the best ‘control protocol’?

Do advances in natural language AI voice bring it back?

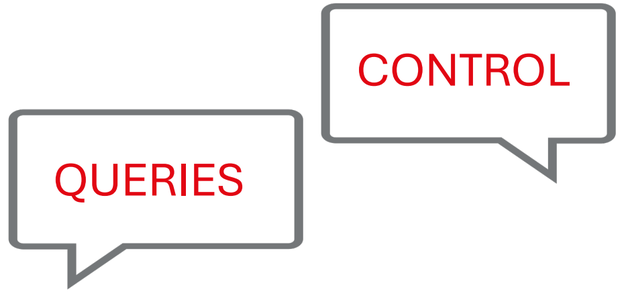
The running order needn’t be seen as ’just’ a linear plan… it’s a data bucket!

The NRCS helps teams collate content, can AI & Voice help empower production teams to more dynamically use it?

	SLUG	SEGMENT	ELEMENT	CAMERA
	TOP HEAD		IN VISION	3
	HEAD	MOBILE PHONES	CLIP	
	HEAD	US ELECTIONS	CLIP	
	HEAD	SEVERE WEATHE	CLIP	
	TITLES	TITLES		
	MOBILE PHONES	READ	IN VISION	2
		VT	CLIP	
		1+1	CHAT	5
	US ELECTIONS	READ	IN VISION	2
		VT	CLIP	
		DTL	DTL	
	SEVERE WEATHER	READ	IN VISION	1
		VT		
		1+2		5
	SPORT	SPORTS PRES	IN VISION	4
	FOOTBALL	IN VISION + OOV	CLIP	4
	GOLF	IN VISION + OOV	CLIP	4
	WEATHER	WEATHER PRES		
	GOODBYE			1
	END TITLES			

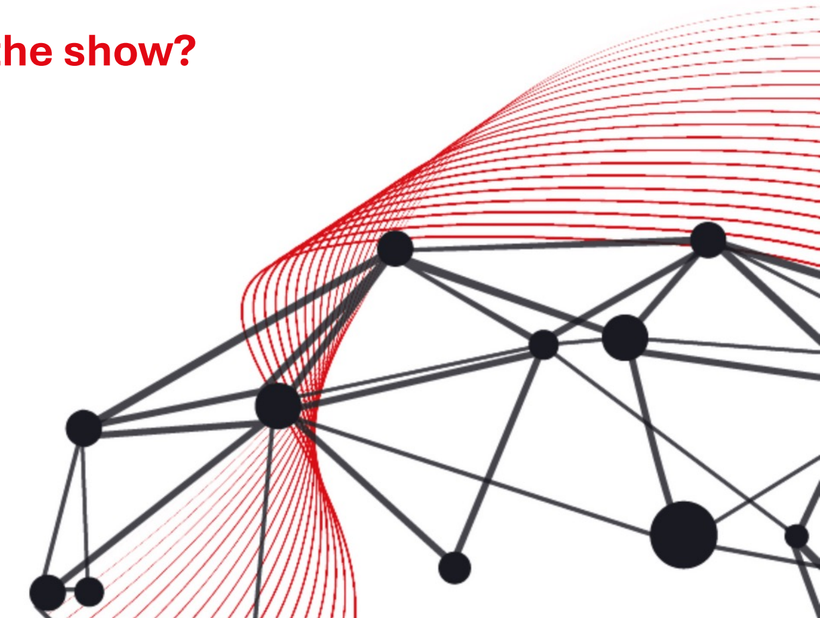
What if the director could leverage the power of LLMs to help navigate a runorder?

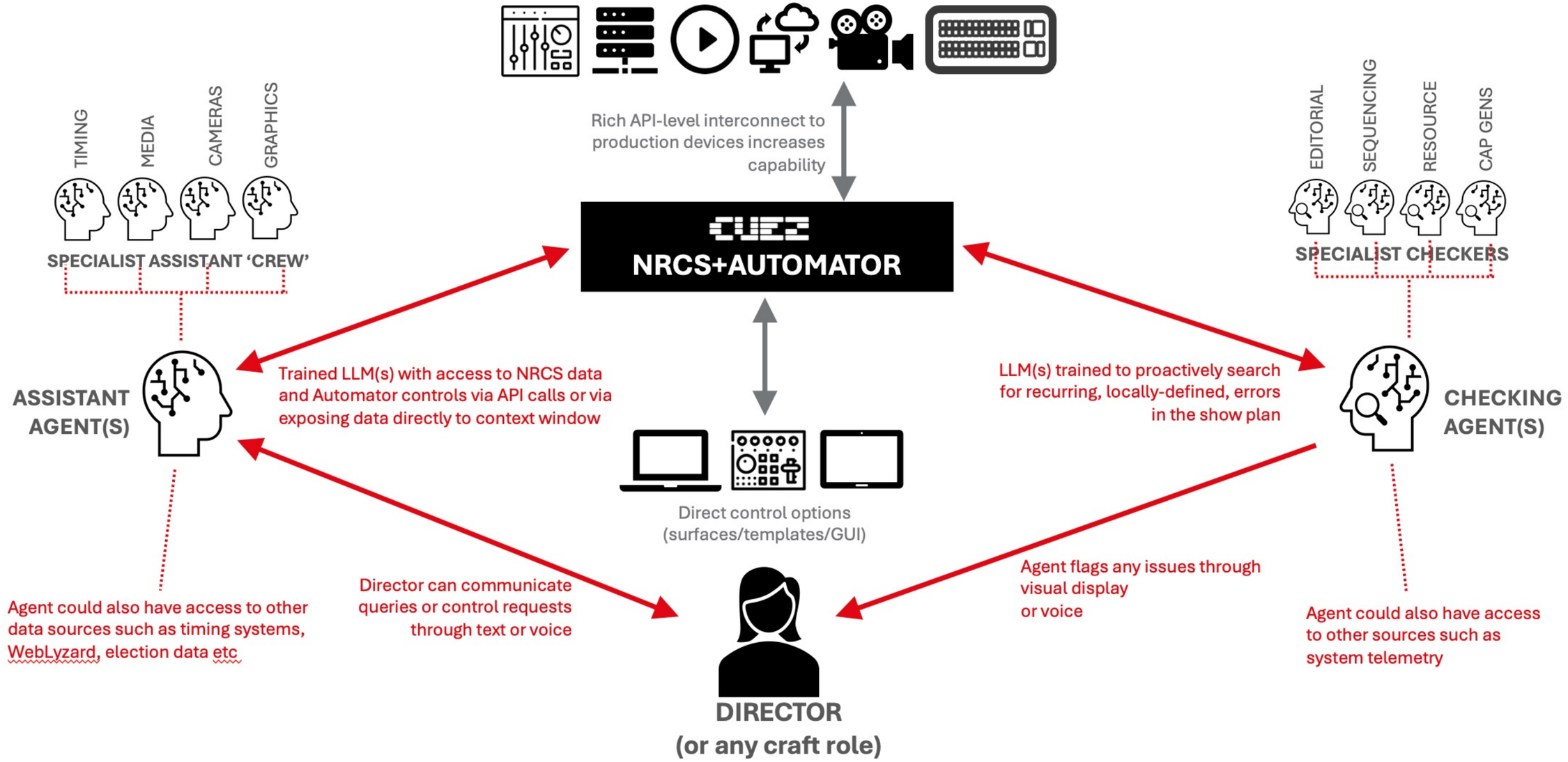
- ‘Are all of my clips for today’s show online?’
- ‘How long is the script in story 5?’
- ‘ Which item number is the election story’?
- ‘Which camera is item 10 on?’
- ‘Do we have name straps prepared for all guests?’
- ‘Do we have any float pictures for item 7?’
- ‘What is our off-air time?’



If the NRCS is also an automation system, can the same LLM can also help run the show?

- ‘Reset to the top of the show’
- ‘Camera 2 to presenter left’
- ‘Show me the football graphic on preview’
- ‘How long is left on this clip?’





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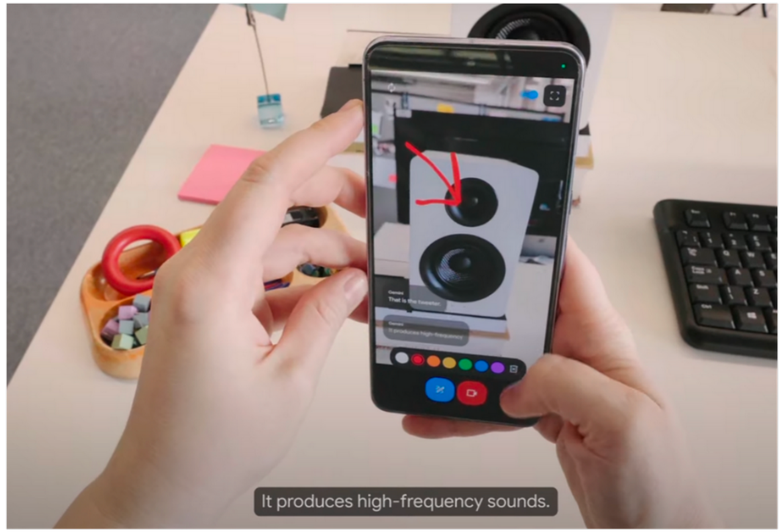
While more traditional ‘standalone’ voice recognition still has use cases, particularly where latency is an issue, integrated LLM voice interaction is exponentially more powerful.

This unlocks a new generation of voice driven capability in control rooms.



Google Project Astra / Gemini Demo

GPT 4o / Advanced Voice Mode Demo

TODAYS STUDIO
BOOKINGS for C4
10:55 - Noon
Bulletin TX
CLOCK
CAM 1: STG CAM1
CAM 2: STG CAM2
DEMO MODE

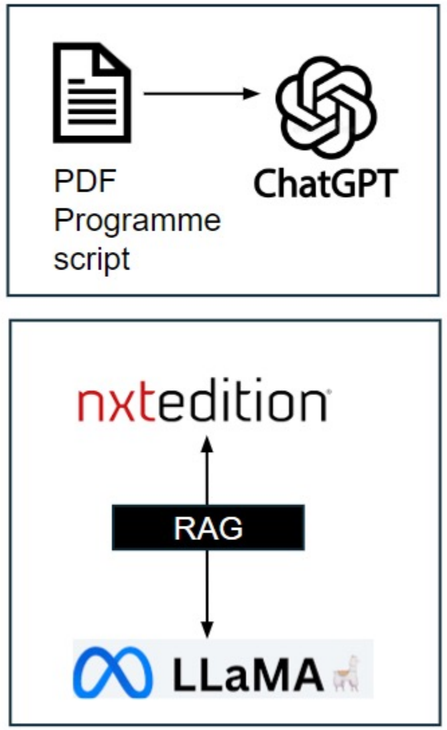
Example ‘RAG’ training data

'Programme time is the total duration of the programme from the moment the programme starts and goes on-air, until the moment the programme stops and goes off-air. Time left on programme is the amount of time left until off-air. Stop-talking is the time that the presenter is supposed to stop talking, usually near the end of the programme, usually followed only by a wide shot, the credits and/or end titles before the programme goes off-air. Count to stop talking or time to stop talking is the amount of time left until stop talking. Item time is the total duration of all of the constituent parts of an item. A time quantity (e.g1 minute) on item time means the quantity of time left until.....'

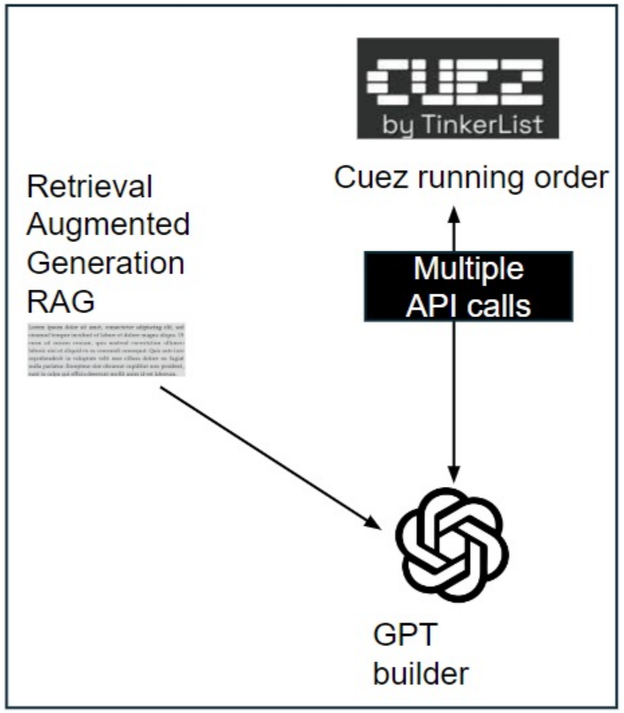
'A CU (short for Close Up) is a tight, zoomed in shot, looser than a BCU, a CU of a person means almost filling the frame with their face. E.g a CU of a person means that we should see the whole of that person's face, with a little headroom at the top, but do not see their shoulders. An MCU (short for Medium Close Up or Mid Close Up) is a zoomed in shot, looser than a CU, an MCU is usually of a person, and means seeing the person's head and shoulders only in the frame. E.g an MCU of Grace means that we should see the whole of Grace's face down to her shoulders with a little headroom at the top. An MS)short for a Mid Shot or Medium Shot) is looser than an MCU...'

'OOV (which stands for Out Of Vision), GVs (which stands for General Views), B-roll,Ulay, Underlay, Voiceover, Read over and Colour are all interchangeable terms for each other. These terms signify that the presenter's reading a script to server pictures (media) which are relevant to the content of the script. Usually the pictures are running full frame, but sometimes these terms are uses when the pictures are running in a screen...
Package, VT (which stands for Video Tape), an edit, a piece, and an edited piece are are all interchangeable terms for each other. These terms signify that an edited piece of media made up of prerecorded video and audio footage and graphics will play...'

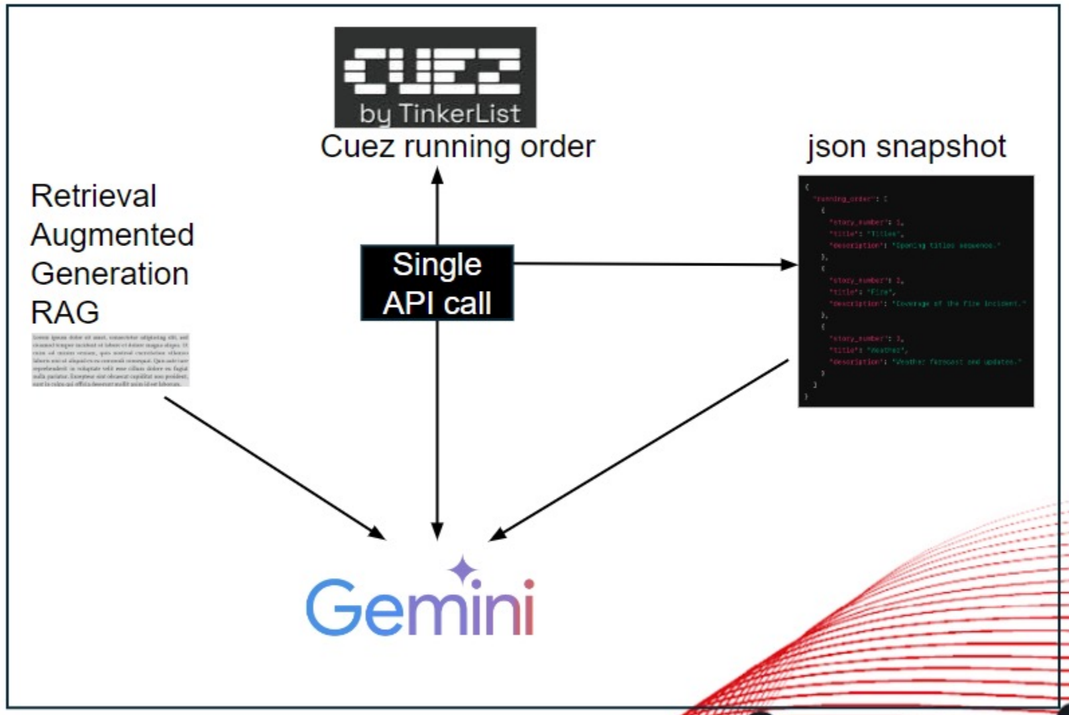
Phase 1 (pre-hacks)



Phase 2 (June 2024 hack at ITN London)



Phase 3 (July 2024 hackathon at BBC Scotland)



- This fundamentally works! (But not entirely without hallucinations)
- We feel it is the most valuable place to invest AI integration effort
- Latency is an issue, but fundamentally resolvable
- We need to optimise ‘Agent Readable Runorders’

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- We feel it is the most valuable place to invest AI integration effort
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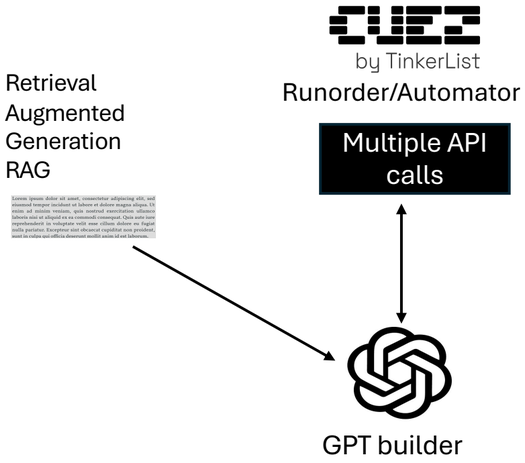
- We need to optimise ‘Agent Readable Runorders’

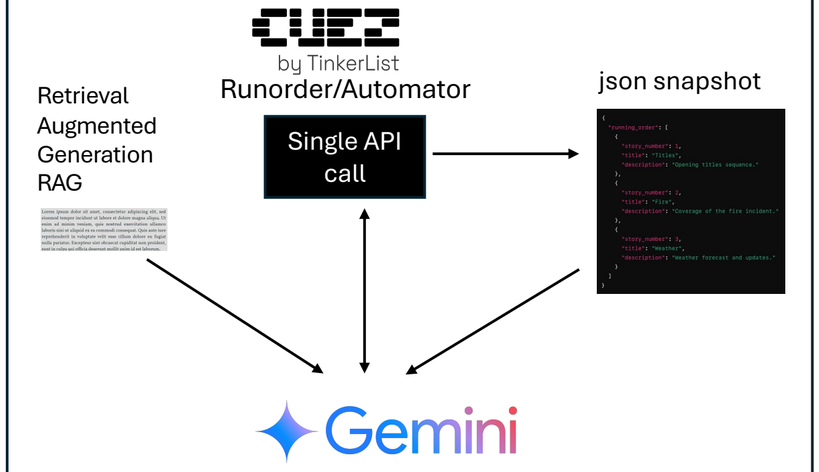
Pre-project

- LLM POCs predominantly focused on scripting/content
- Simple ‘query engineering’ adding functionality to existing platforms
- Voice primarily being used via word and phrase recognition

Hackathon 1 : June 2024 @ ITN London



Hackathon 2 : July 2024 @ BBC Scotland



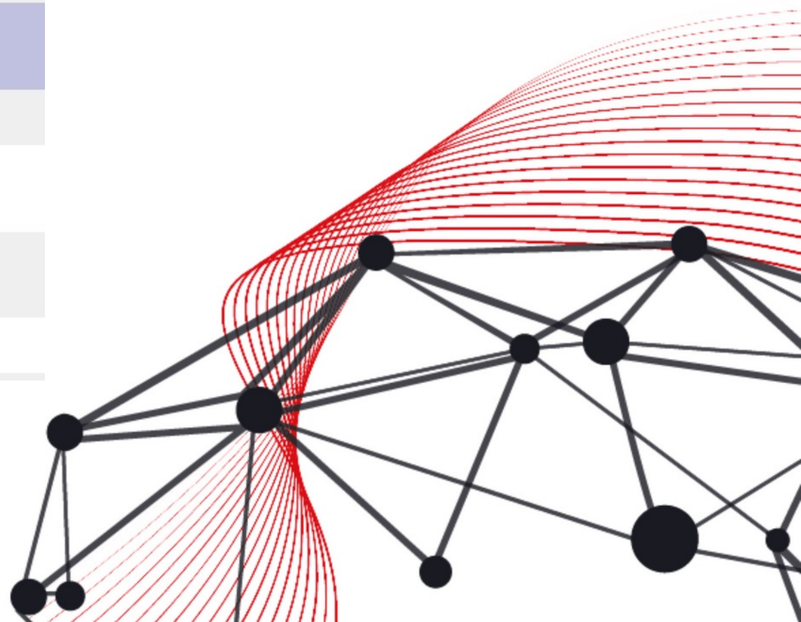
Next?

- Advanced voice modality reduces latency and adds interruption and mor nuanced voice
- Optimise data connection to reduce data query latency
- Continue to develop RAG and Instruction training, including specialist agents

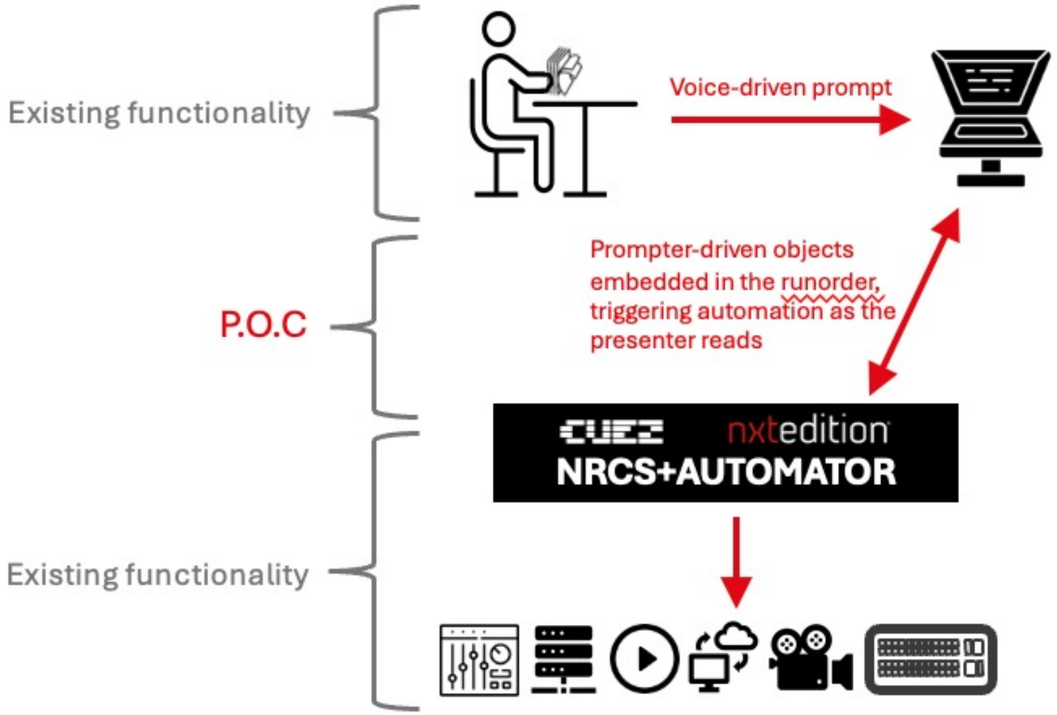
Checking Agents

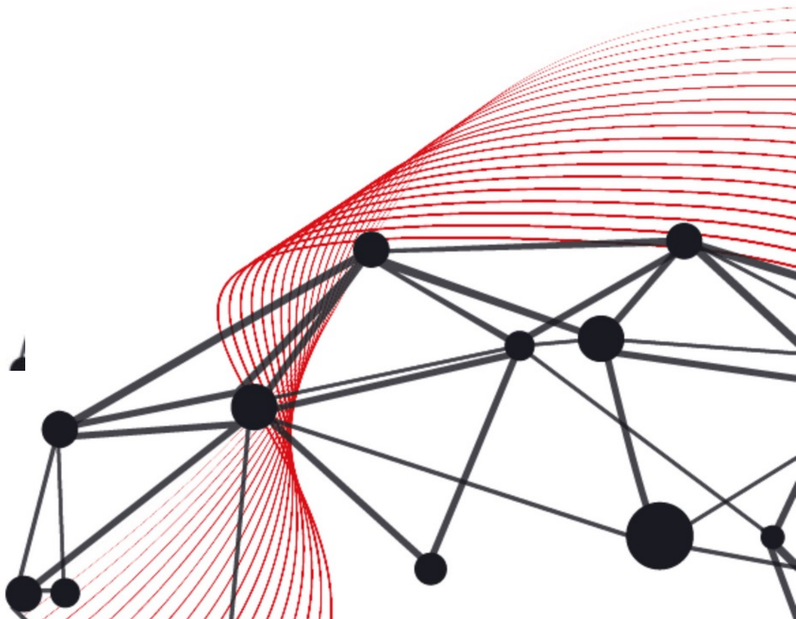
- A significant amount of control room effort & cognitive load is spent finding and resolving errors
- The faster, easier and more automated we can make that, the more creative teams can be
- Many of these issues are localised to individual requirements and workflows
- NRCS LLMs can be trained to intelligently hunt for these problems and highlight them

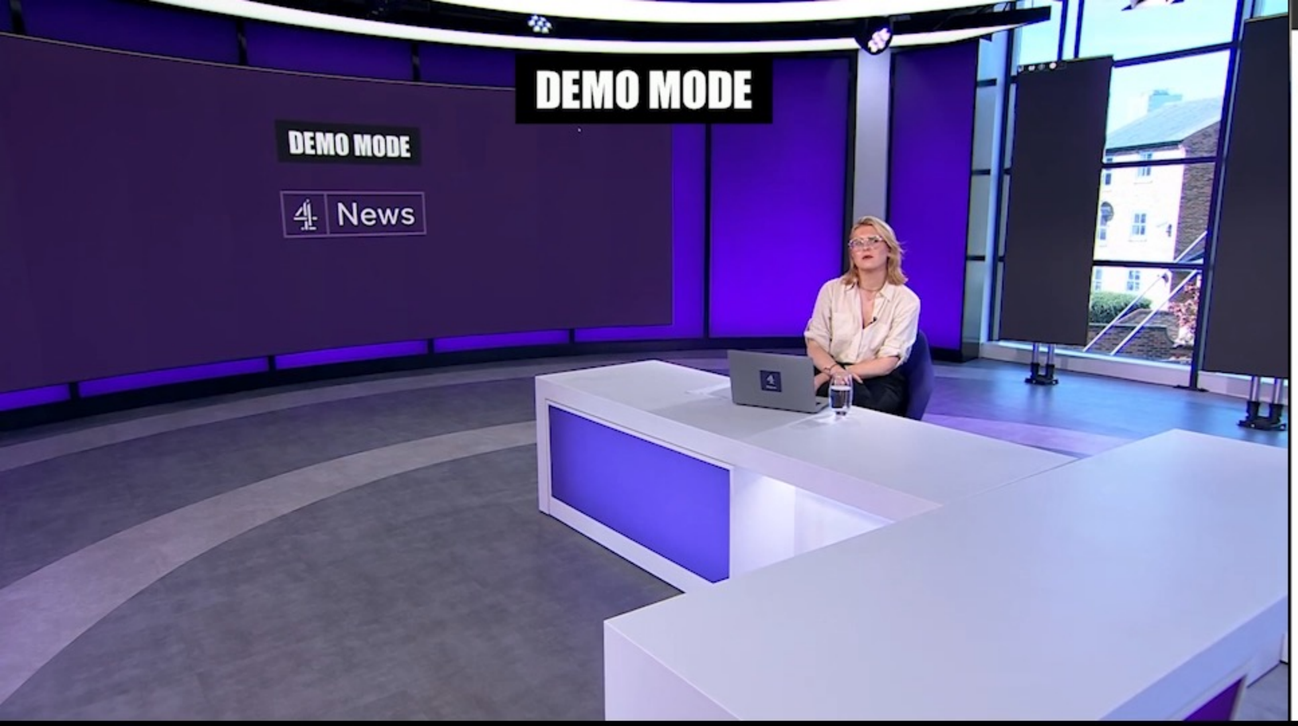
BIDEN - HILSUM live	Washington DC	OK	OK
	Lindsey Hilsum International Editor	OK	OK
BIDEN - HILSUM vtr	Janet Muriguia CEO, UnidosUS latino advocacy group	OK	**suggested:** Janet **murguia** CEO, UnidosUS latino advocacy group
	Pictures from BET News	OK	OK
	Heather Gottlieb Democratic Party Organiser, Loudoun County	OK	OK
	Buta Biberaj Democratic Party, Loudon County	OK	**suggested:** Buta Biberaj Democratic Party, **loudoun** County
	Ami Mason Bookshop Owner	OK	OK

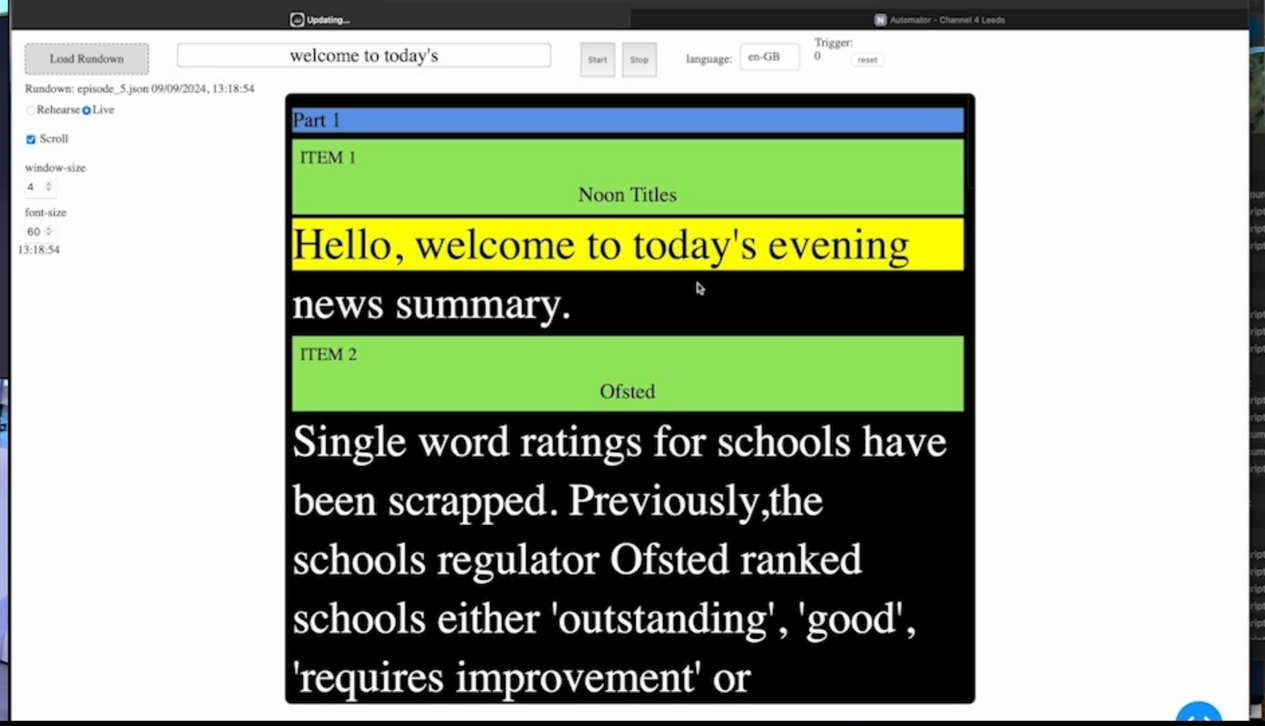


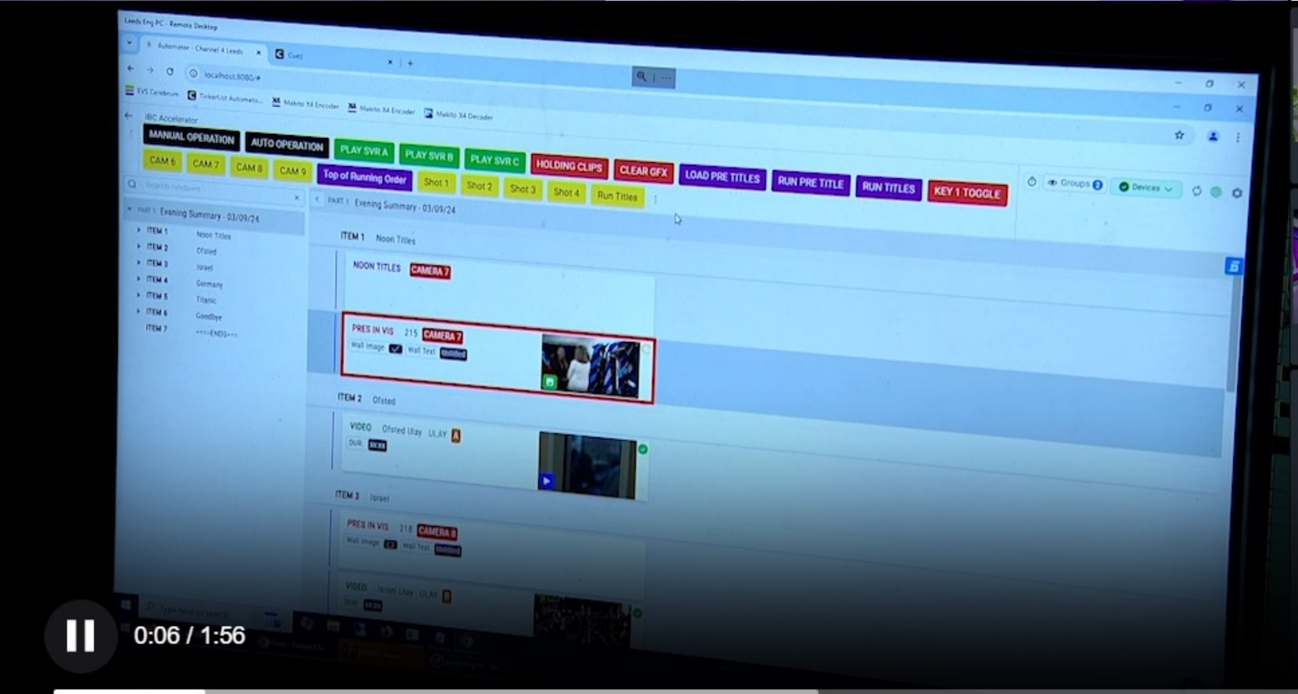
Presenter Voice Driven Automation : Deeper Device Integration enabling New UI

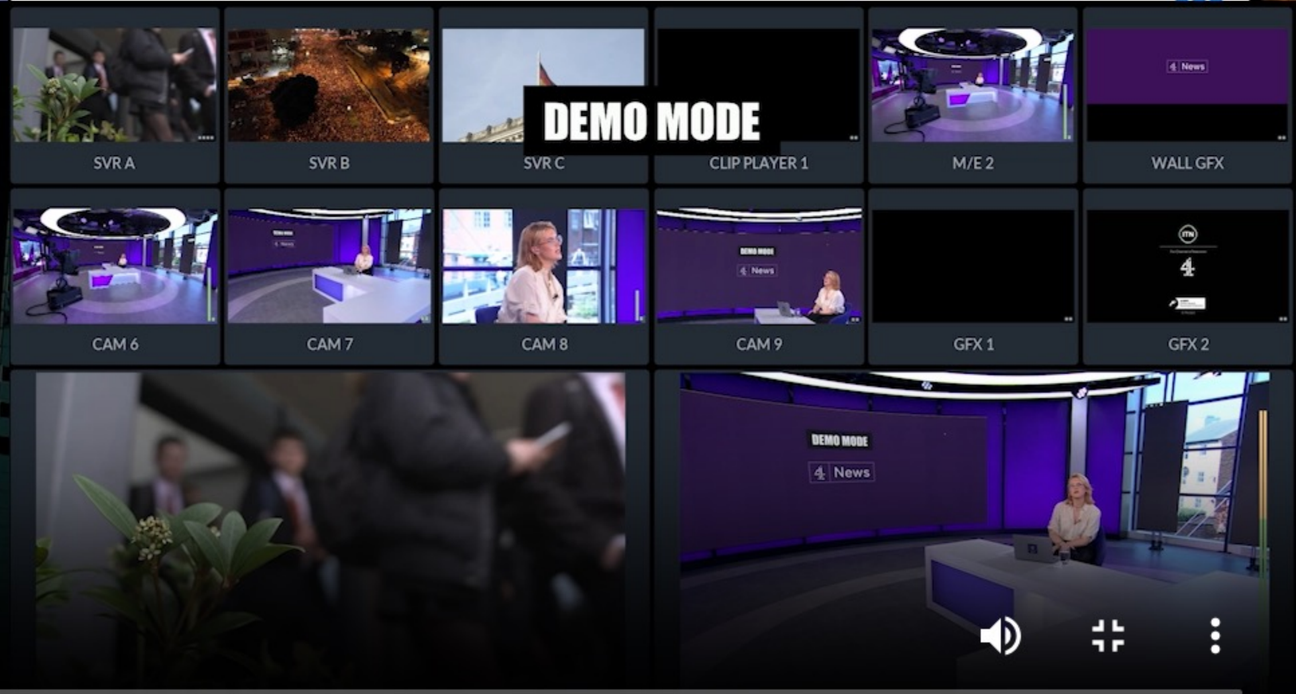





DEMO MODE
DEMO MODE
News


Updating...
Automator - Channel 4 Leeds
Load Rundown
welcome to today's
Start
Stop
language:
en-GB
Trigger:
0
reset
Rundown: episode_5.json 09/09/2024, 13:18:54
Rehearse
Live
Scroll
window-size
4
font-size
60
13:18:54
Part 1
ITEM 1
Noon Titles
Hello, welcome to today's evening news summary.
ITEM 2
Ofsted
Single word ratings for schools have been scrapped. Previously,the schools regulator Ofsted ranked schools either 'outstanding', 'good', 'requires improvement' or


MANUAL OPERATION
AUTO OPERATION
PLAY SVR A
PLAY SVR B
PLAY SVR C
HOLDING CLIPS
CLEAR GFX
LOAD PRE TITLES
RUN PRE TITLE
RUN TITLES
KEY 1 TOGGLE
CAM 6
CAM 7
CAM 8
CAM 9
Top of Running Order
Shot 1
Shot 2
Shot 3
Shot 4
Run Titles
ITEM 1 Noon Titles
NOON TITLES CAMERA 7
ITEM 2 Ofsted
ITEM 3 Israel


DEMO MODE
SVR A
SVR B
SVR C
CLIP PLAYER 1
M/E 2
WALL GFX
CAM 6
CAM 7
CAM 8
CAM 9
GFX 1
GFX 2
DEMO MODE
News

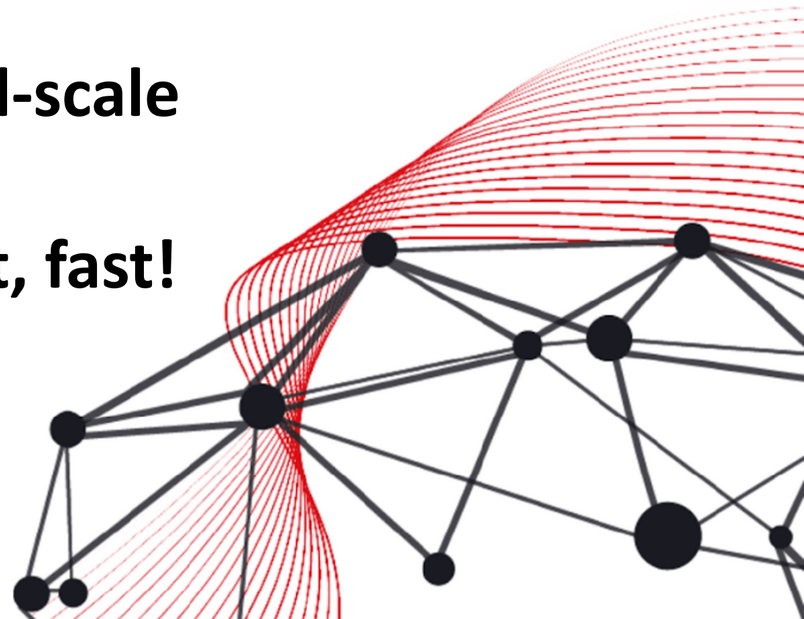
0:06 / 1:56

Use cases for Presenter voice-driven automation

- **Late night** News bulletin
- **The shifts no one wants to work -** Christmas Day, New Year's Eve, etc. **- an alternative solution.**
- Podcast studios, radio studios, new platforms and experiences, **where it doesn't make sense to have a full gallery crew**, but we want to include visuals to **enhance the audience experience**

Impact of Presenter voice-driven automation

- **Presenter doesn't require any additional technical expertise**
- **Flexibility** for the production crew
- Breaking News scenario, a **common interface** such as Cuez, allows for **remote collaboration**.
- XR control room, to **transform home office into a full-scale production gallery!**
- AI solutions to help us **source breaking news content, fast!**



TRANSMIXR Dashboard

Real-Time content exploration and Web intelligence tool with a wide range of visual analytics features, available in a LITE and PRO version

Integrating AI solutions with the NRCS can empower editorial teams and the production crew

Search for specific online articles, emerging trends or stories (= clusters of related content) over a specific date range or geographic location

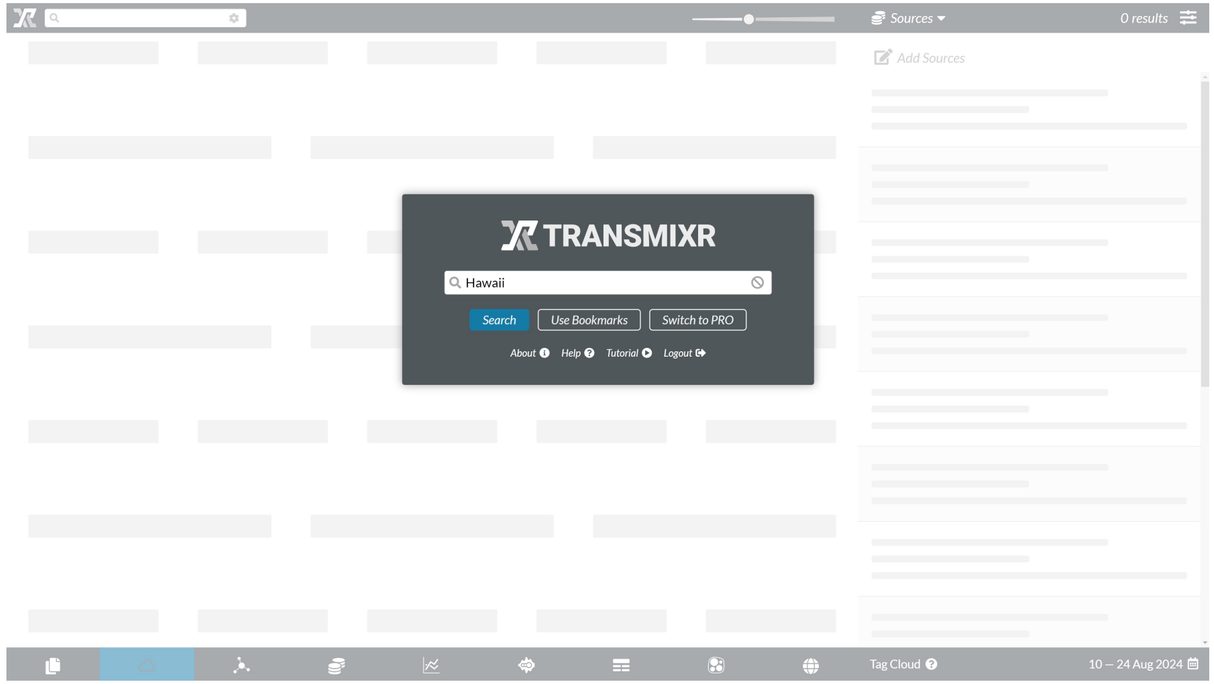
Quickly identify relevant content to enhance the production, source breaking news stories and improve the audience experience

IBC2024

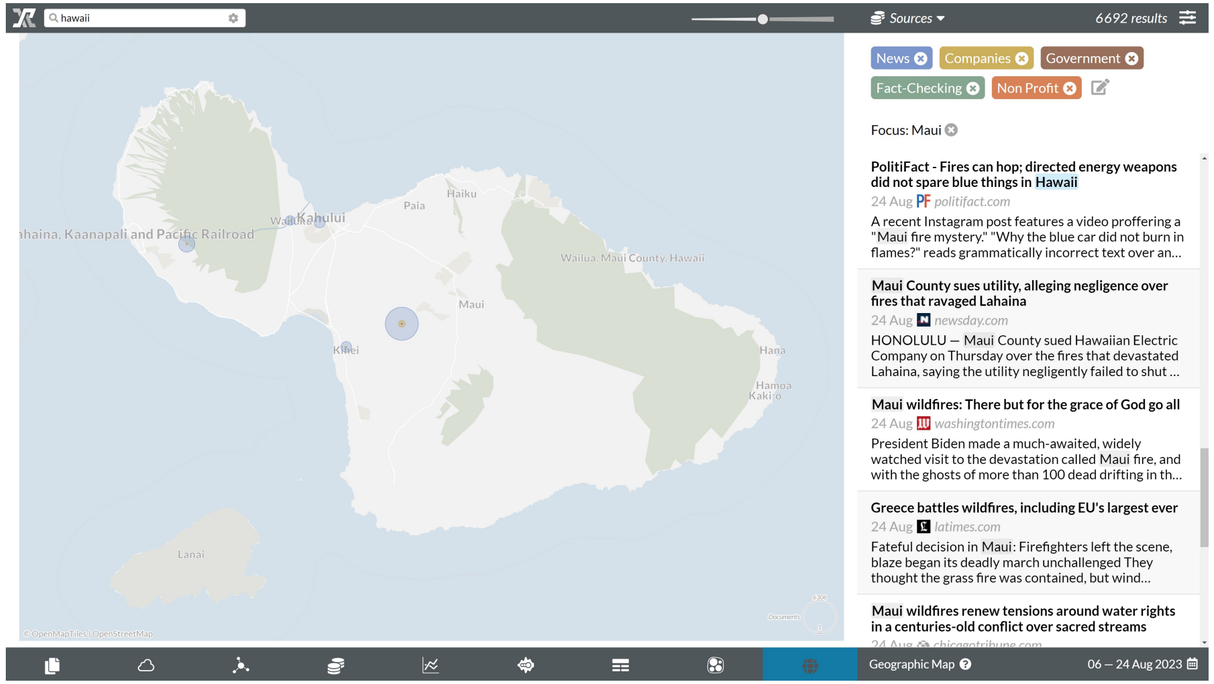
#ACCELERATORS2024

TRANSMIXR Dashboard LITE

Search query “Hawaii" between 06 and 24 Aug 2023



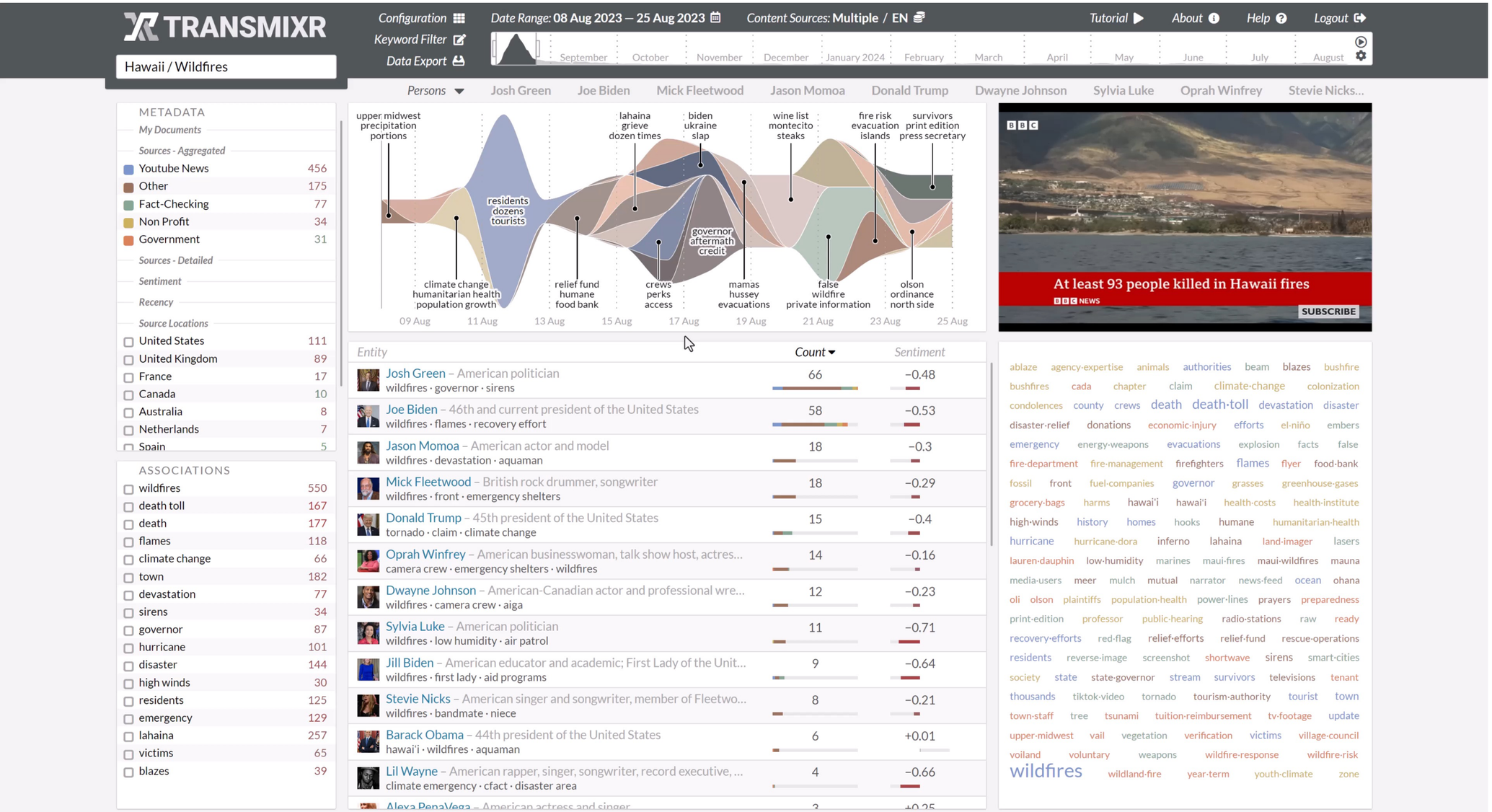
Landing Page



Geo Map

IBC2024

#ACCELERATORS2024



Storygraph with the evolution of topics

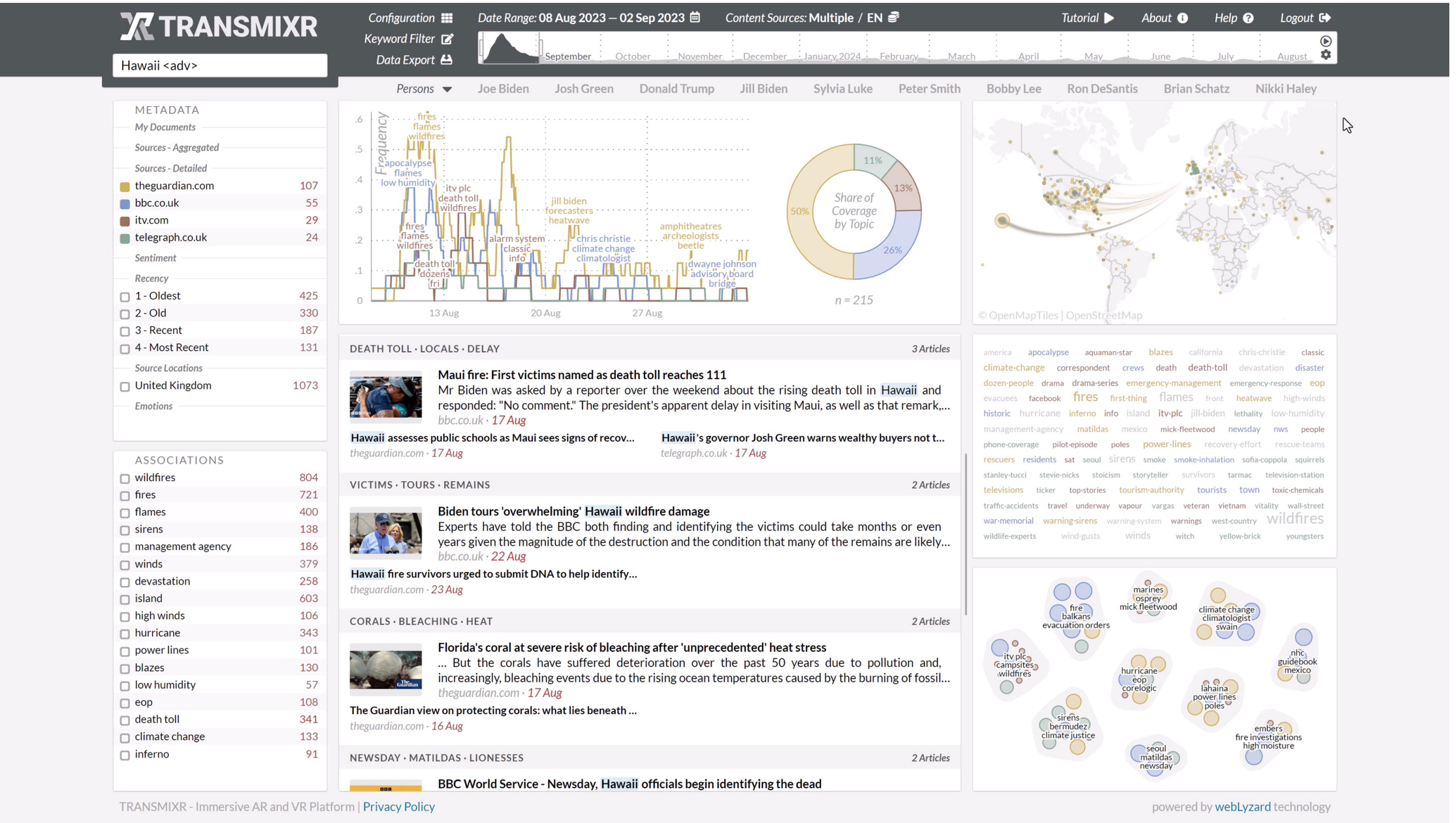
BBC video from YouTube

Tag cloud color-coded by source

List of the opinion leaders most frequently mentioned in the coverage

IBC2024

#ACCELERATORS2024



Animation generated from selected UK sources, indicating how the topics and mentioned locations for the search query “Hawaii" change between early August and early September 2023

Sp Editor

Logout Basic AS

Hawaii Wildfires 2023 TOPIC: Politics

In early August 2023, wildfires erupted in Hawaii, mainly on Maui. The wind-driven fires led to evacuations, widespread damage, and casualties in Lahaina on Maui's northwest coast. The fires spread due to dry, gusty conditions caused by a high-pressure area north of Hawaii and Hurricane Dora to the south. An emergency declaration on August 8 authorized actions including activating the Hawaii National Guard and allocating state funds for relief.

By August 9, Hawaii declared a state of emergency, and on August 10, President Joe Biden issued a federal major disaster declaration. For the Lahaina fire, the Pacific Disaster Center (PDC) and the Federal Emergency Management Agency (FEMA) estimated extensive destruction, predominantly of residential buildings and historic landmarks. The United States Department of Commerce later reported the official damage total.

The community faced significant challenges as infrastructure was heavily impacted, leading to disruptions in essential services such as electricity and water supply. Schools and businesses were forced to close, amplifying the socio-economic impact on residents. Numerous organizations and volunteers mobilized to provide immediate relief and support, including food, shelter, and medical assistance.

Explore Related Content

Tag Cloud Help

afternoon·storms alexander·mountain aloha arborists area·saturday
big·island bissen breadfruit butte cal·fire calfire canyon·fire
chief·nim commercial·lots complex·regulations conch·shells
disaster·declaration downs·horse durkee endo enough·rain
evacuations examiner fire fire·dangers fire·injuries fire·victims
firefighters·gain fork·fire hand·crews hawai'i hawaii honea
honolulu island·mayor issue·tuesday kauai kawakami lahaina
lahaina·blaze larimer leeward lynn·crawford maui mescalero
mescalero·apache mountain·fire multiple·wildfires
national·interagency·fire·center official·request oroville
other·causes palermo park·fire pressure·ulcers recovery richard·bissen
ruidoso salt·fire south·fork survivors tehama thompson·fire
top·winds ulu windward

Older Newer

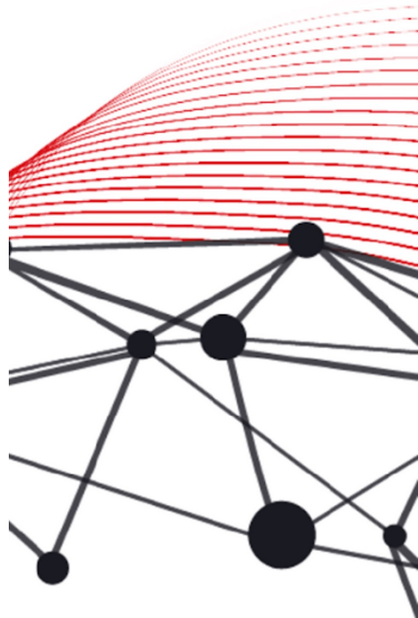
Recency

maui

Wildfire red flag warnings called off as Hurricane Hone passes Hawaii ...is Hawaiian for "sweet and soft", poked at memories still fresh of last year's deadly blazes on **Maui** which were fuelled by hurricane-force winds. Red flag alerts are issued when warm temperatures, ver... 25 Aug

Tropical Storm Hone lashes Big Island ...winds and high surf throughout the state as well as potential localized and moderate flooding in **Maui** 25 Aug

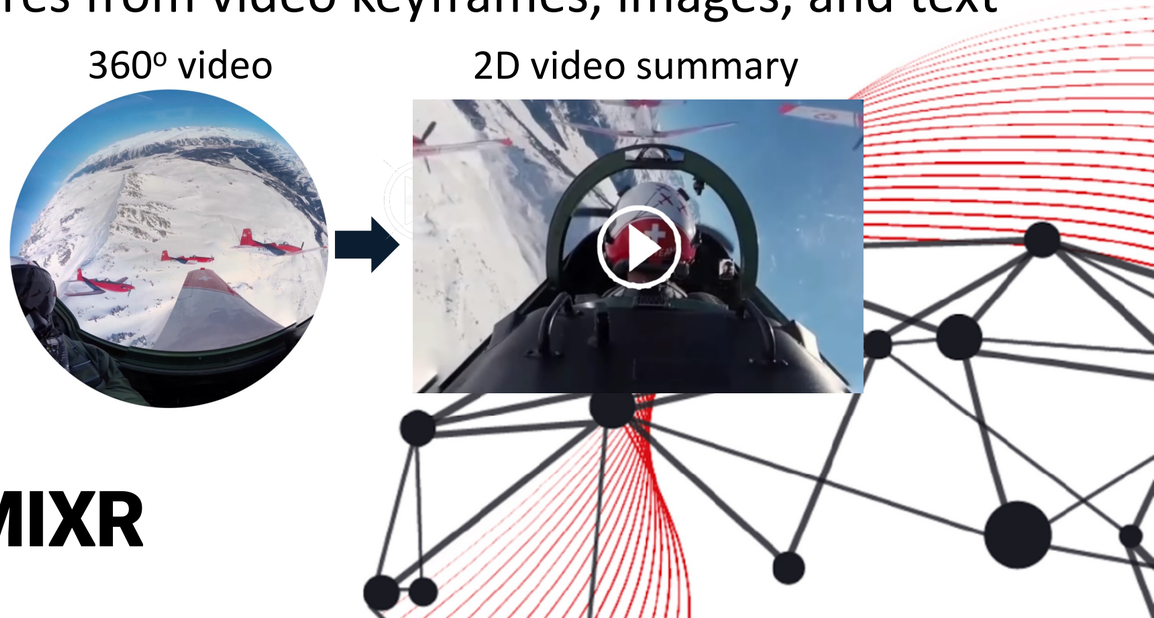
Storypact Editor
Summary of 2023 events via the *AI Toolbox*; *Tag Cloud* with related topics currently discussed; click on a keyword ("Maui") focuses on articles mentioning this location.



Video analysis REST service (CERTH) for multimodal media understanding

Utilizes state-of-the-art algorithms to extract the metadata

- **Video scene and shot segmentation**: Performs temporal decomposition of the videos into scenes and shots based on content analysis
- **Visual concept / event detection:** Annotates video shots and images with concept / event labels
- **Sentiment analysis:** Annotates with sentiment (polarity: positive/negative) images and videos
- **Cross-modal signatures:** Extracts cross-modal signatures from video keyframes, images, and text
- **Video summarization:** Generates visual video summary and selects key thumbnails
- **360 video analysis:** Detect salient events within a 360-degree video, converts it to traditional 2D video, applies the described video analysis techniques



CERTH
CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

iti IDT Intelligent Digital Transformation Laboratory

TRANSMIXR

Generated metadata enables diverse and efficient content search

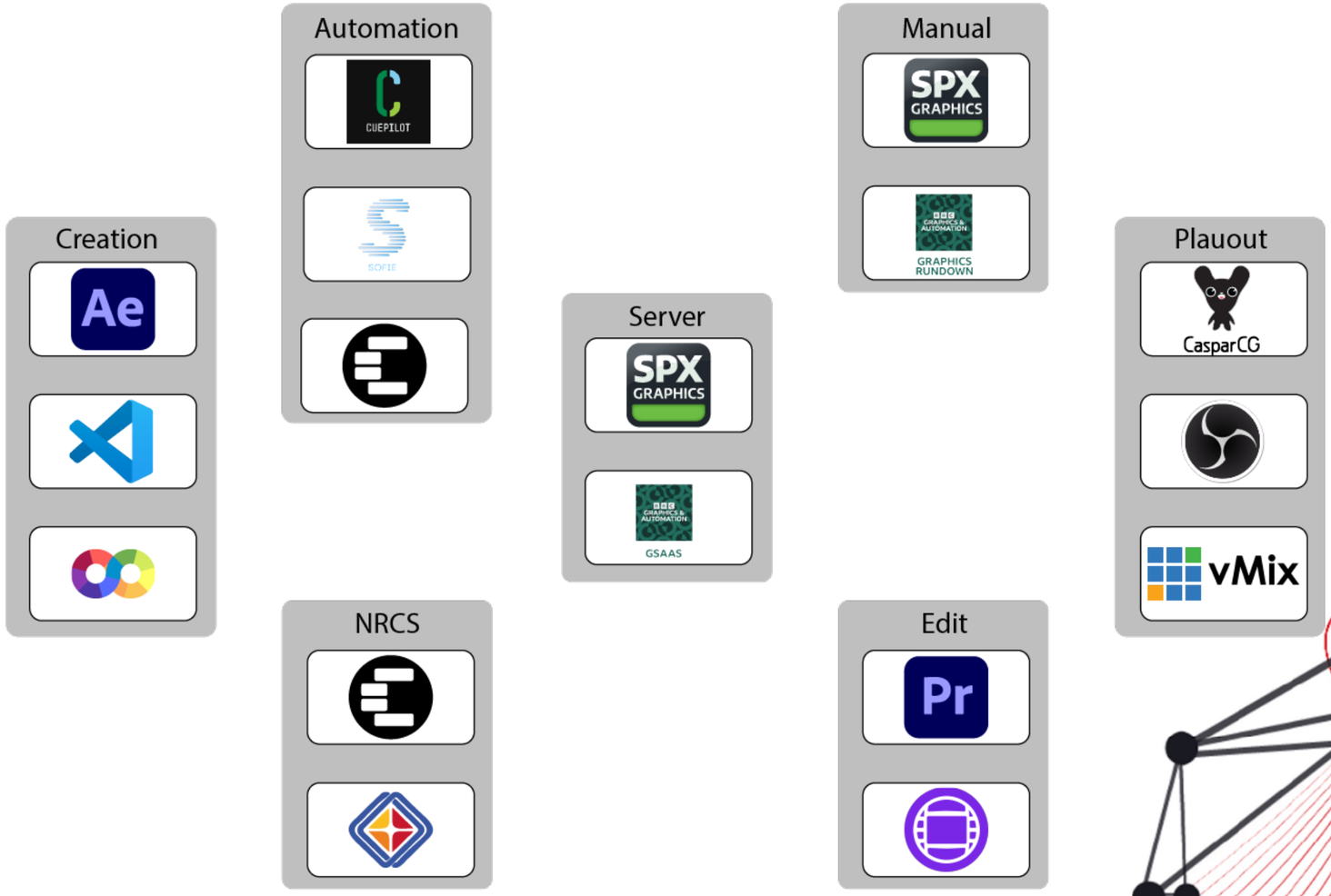
- **Keyframes & Video summary**: Enable users to search and preview video content using keyframes and automatically generated summary
- **Concept/Event detection & Sentiment analysis**: Retrieve specific videos by filtering based on detected concepts, events or sentiment
- **Cross-modal signatures**: Perform searches across different modalities, allowing free-text-based video retrieval

"ski jumping on a sunny day"

HTML Graphics

Modular approach to graphics

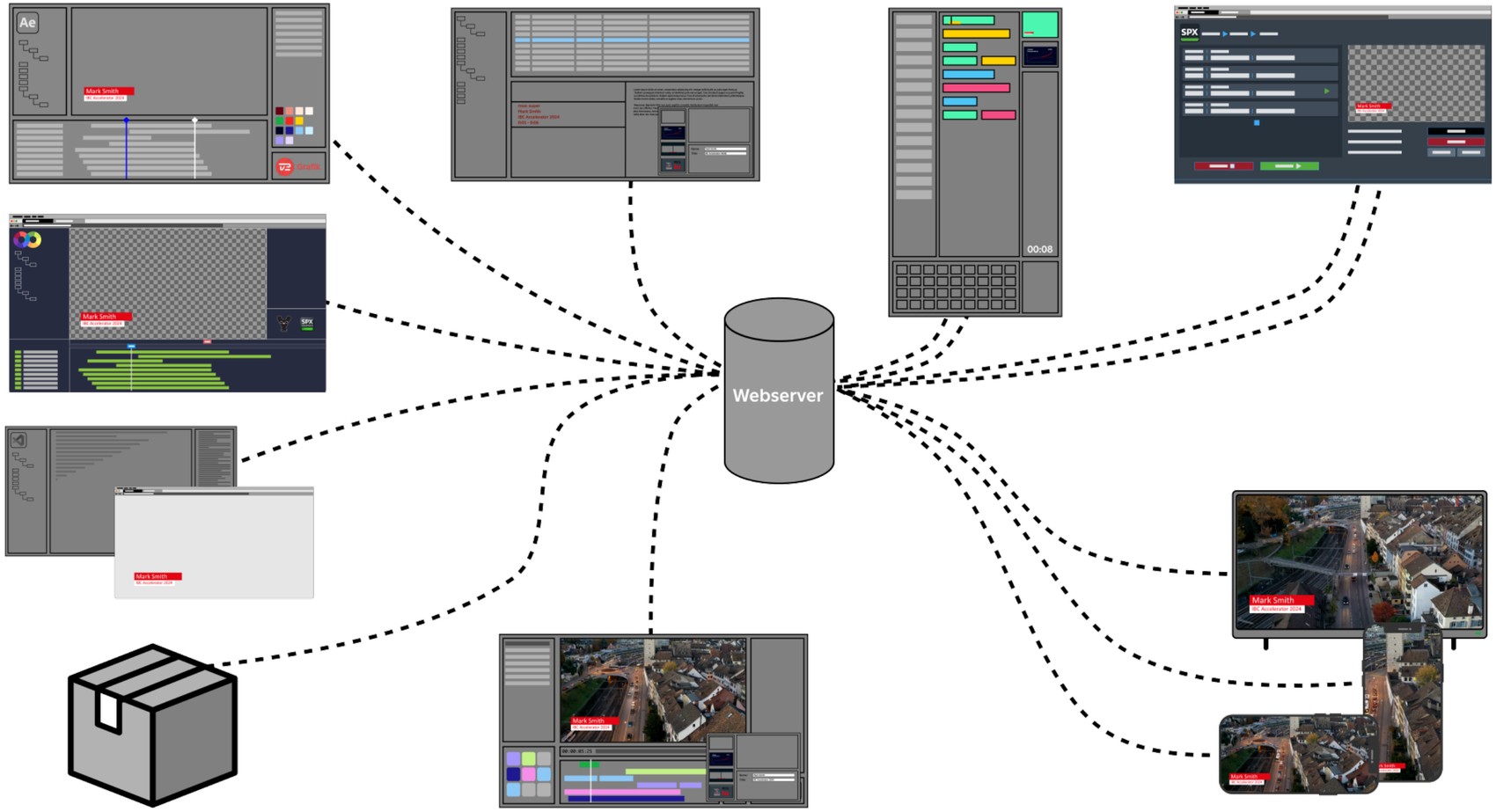
Partners in the workflow



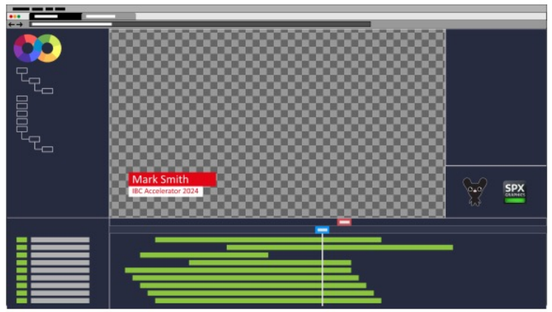
Modular

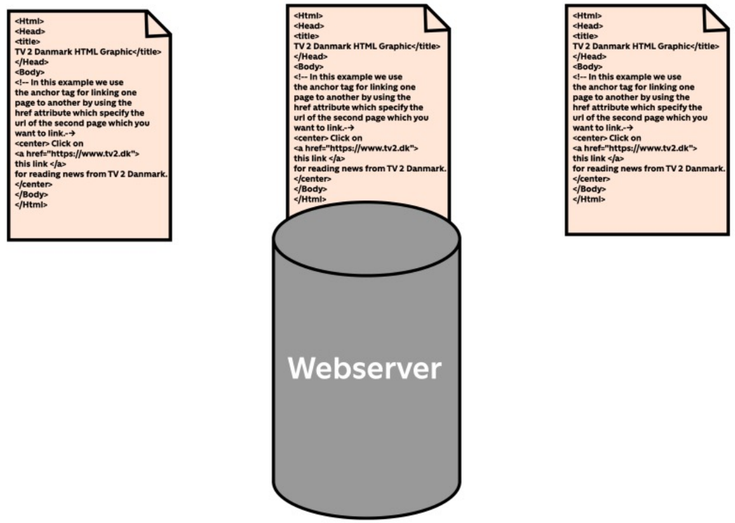
Platform
Agnostic

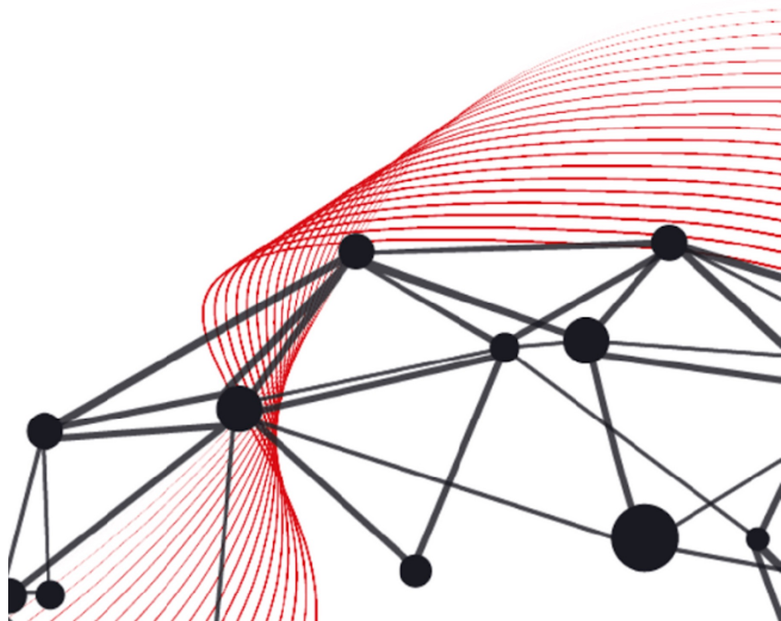
The workflow



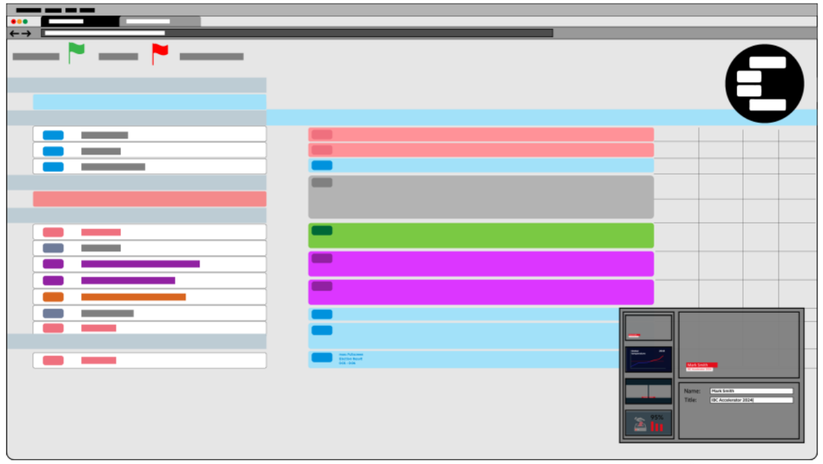
Graphics creation



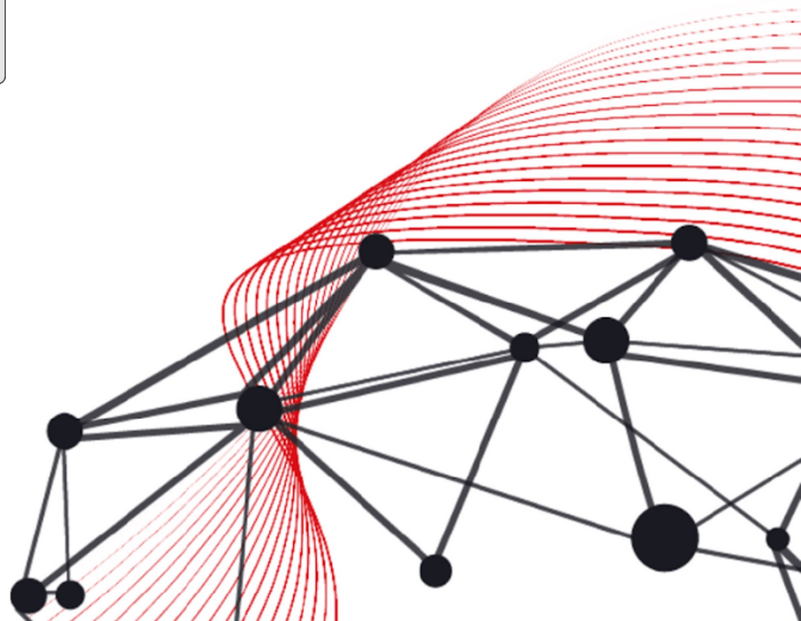




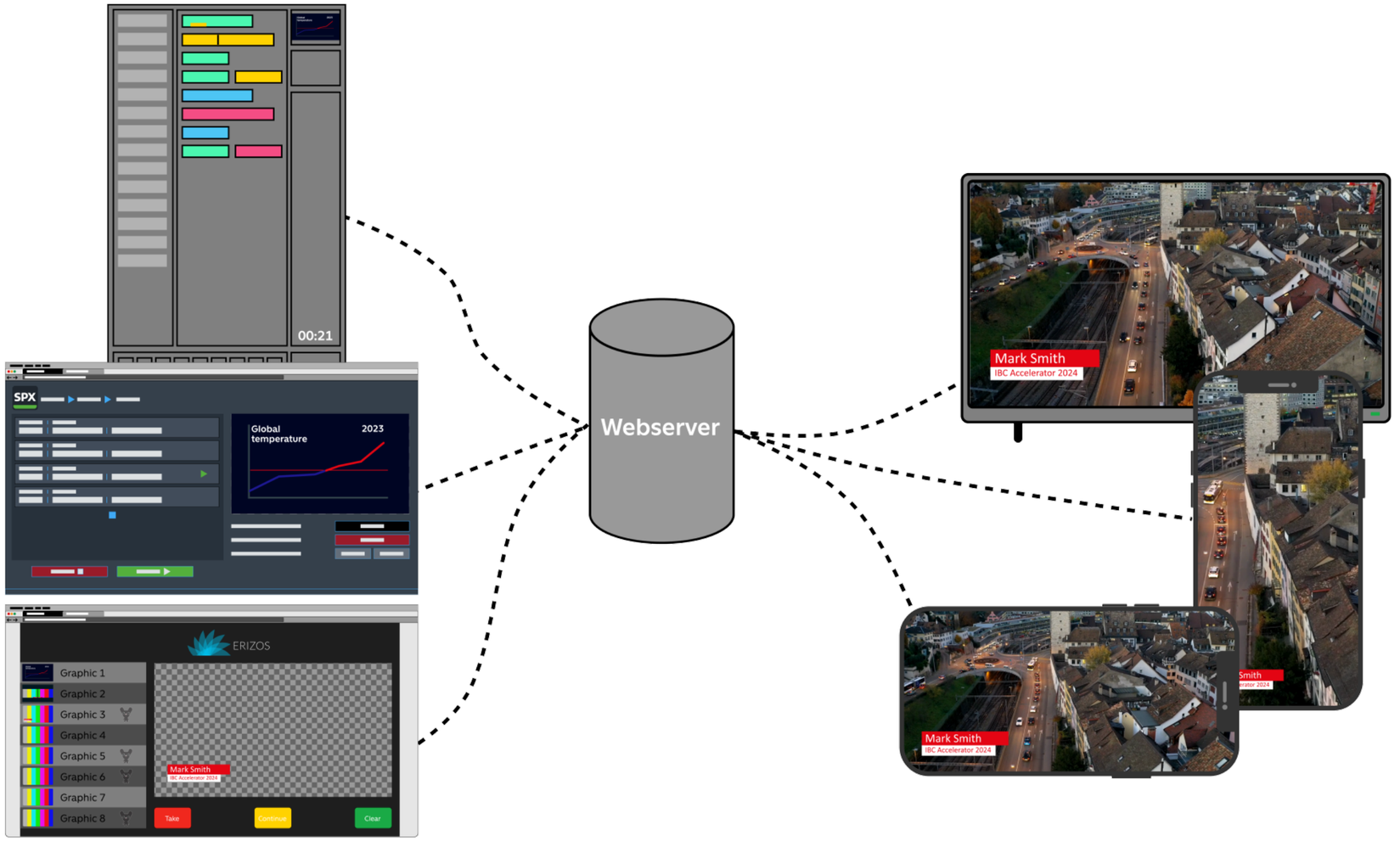
Template input



Webserver



Playback


00:21
SPX
Global temperature
2023
ERIZOS
Graphic 1
Graphic 2
Graphic 3
Graphic 4
Graphic 5
Graphic 6
Graphic 7
Graphic 8
Mark Smith
IBC Accelerator 2024
Take
Continue
Clear
Webserver
Mark Smith
IBC Accelerator 2024
Mark Smith
IBC Accelerator 2024

Industry Impact

- **Produce more for less**, scale-up and expand
- **Live multi-format output,** including emerging AR and VR platforms
- **Unified workflow & intuitive UI**
- **Reduce hardware & on-prem facilities**
- **Enables remote and flexible work**
- **Accessibility through customisable virtual workspaces**

Ethics and responsibilities of new tools

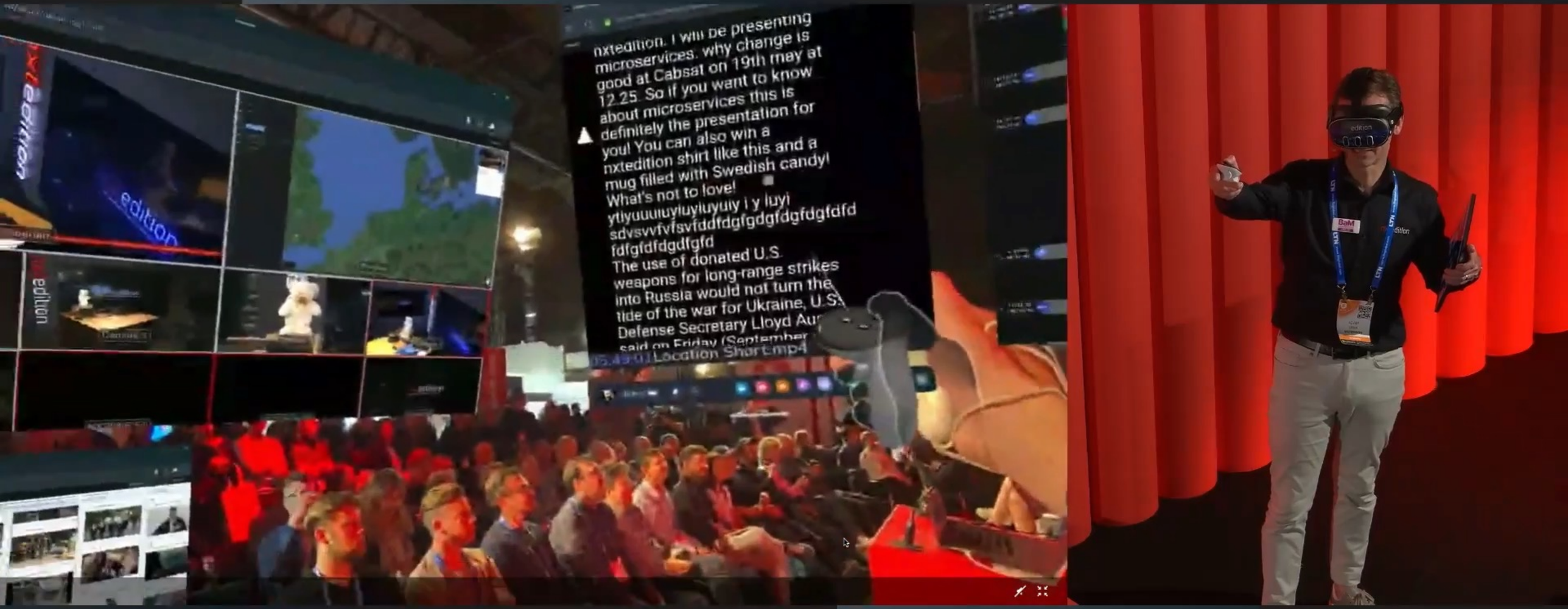
- AI is likely to transform the broadcast industry
- While it could be used to cut costs and reduce headcount, instead we should consider how it can **enable us to grow**.
- It can enable us to **reach more platforms and output formats**
- It can **assist the crew** to do more, **in easier and more flexible ways**
- AI and automation can **enhance the audience experience**, where a full production crew doesn't suit the model, such as podcast studios.
- We are more than television producers, we are multi-format, so we need more than the television production model to **reach our audience in new ways.**

Sustainability

- **Reduced** travel and transportation of equipment
- **Less** hardware dependencies
- **Enables** remote collaboration
- Distributed studios with **shared** resources

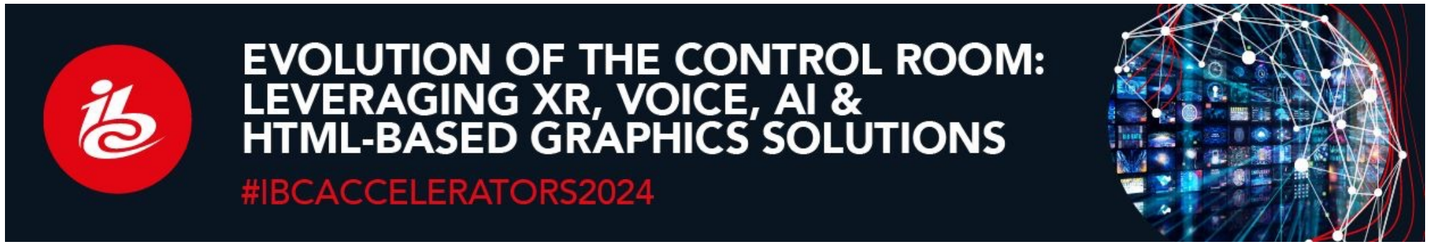
If we use the new tools in same way we used the old tools…
We will never fully realise the full potential of these new technologies

NxtEdition XR Control Room live demo – Adam Leah controlling the NxtEdition studio in Malmo, Sweden live from IBC at the RAI, Amsterdam, using a Meta Quest 3 over Wi-Fi!!!



NxtEdition’s XR/Mixed Reality Studio Gallery Control won the IABM BaM award in the Create category, and the TVB Europe Best of Show at IBC 2024

55:19 / 58:10

IBC2024

#ACCELERATORS2024