IBC2022

ACCELERATOR MEDIA INNOVATION PROGRAMME

Cloud Based Live Events & Low Latency Protocols

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CLOUD BASED LIVE EVENTS, ANALYTICS AND LOW LATENCY PROTOCOLS

CHAMPIONS

PARTICIPANTS

Aspirations

- How far could we go with live production in the cloud?
- What do we need to migrate our most valuable content to full cloud-based?
- What level of production complexity without impacting quality and stability?
- How could we leverage this technology to enhance the customer experience?

Background Challenge on Accelerator

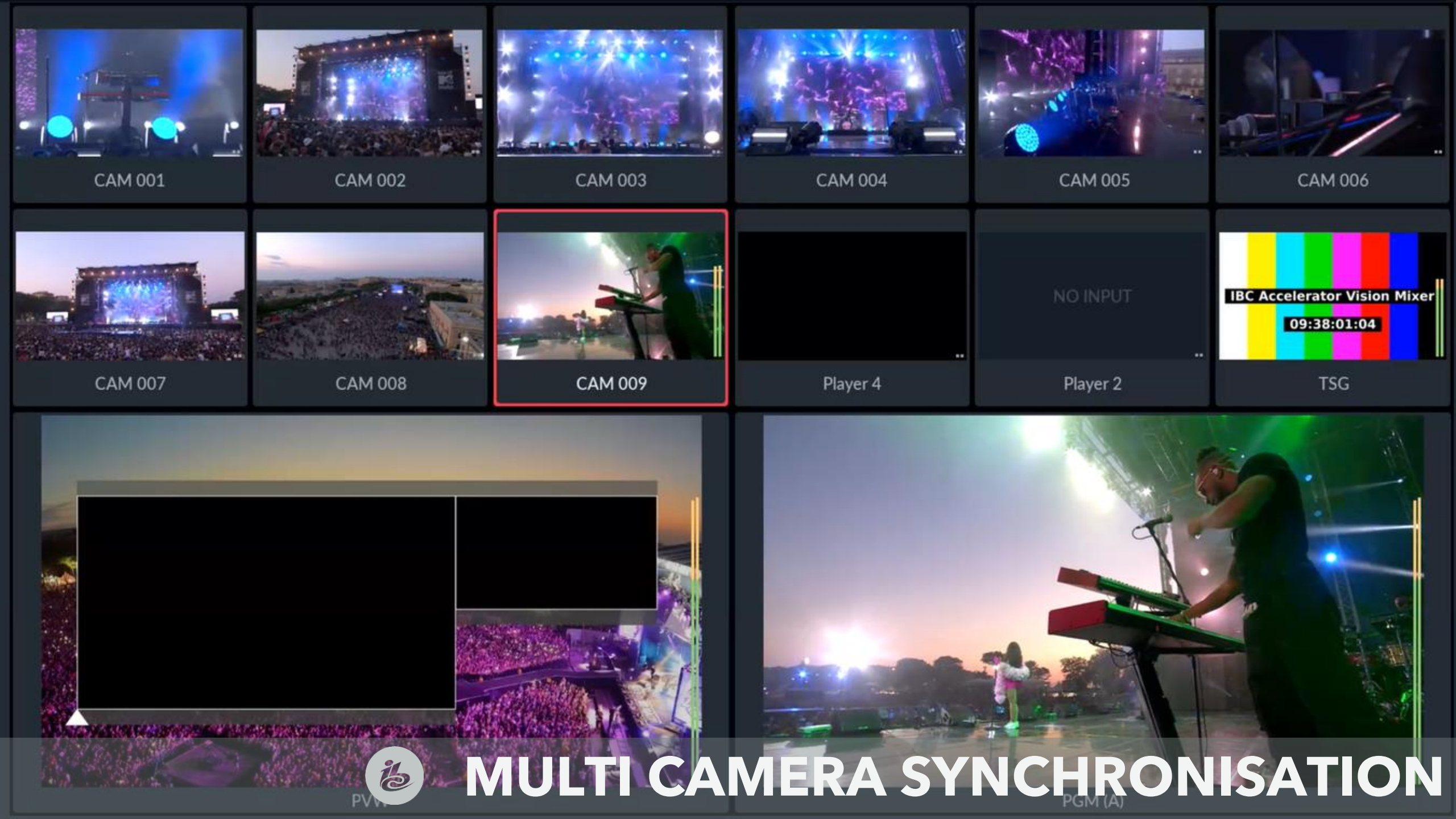
- Could we transport feeds into and out of the cloud?
- Could we synchronize the cameras?
- Could we create multiple outputs in multiple protocols?
- Could we create UHD and HD feeds?
- Could we maintain an HEVC workflow throughout?
- What changes to quality would we impact by changes in technology would we face?

LIVE CLOUD PRODUCTION IS HERE
Cloud Based Live Events

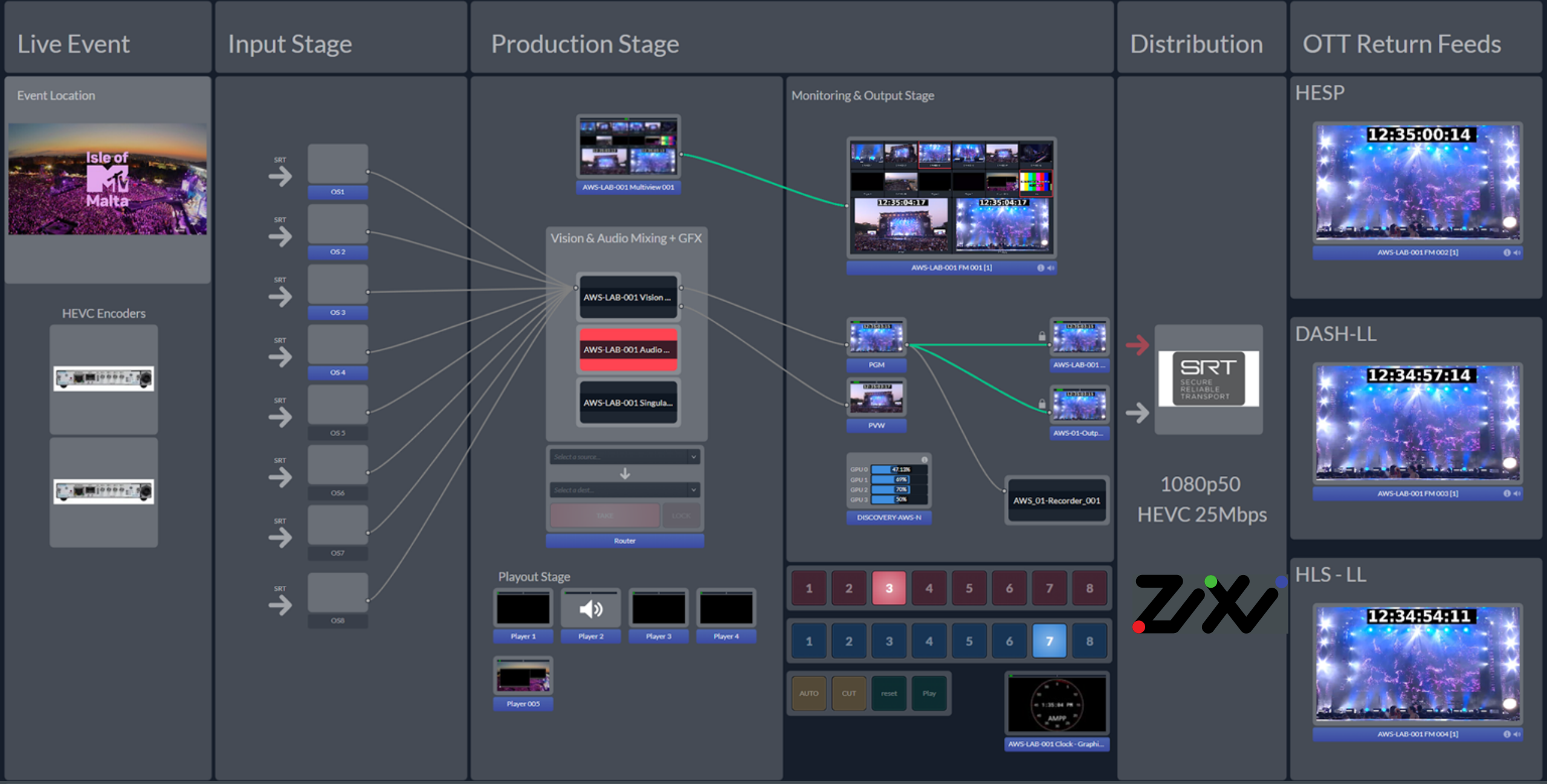
BE BRAVE
Cloud Based Live Events

Achievements

1. End to End Cloud
2. Multi Camera Production
3. UHD/HDR
4. Low Latency



MULTI CAMERA SYNCHRONISATION



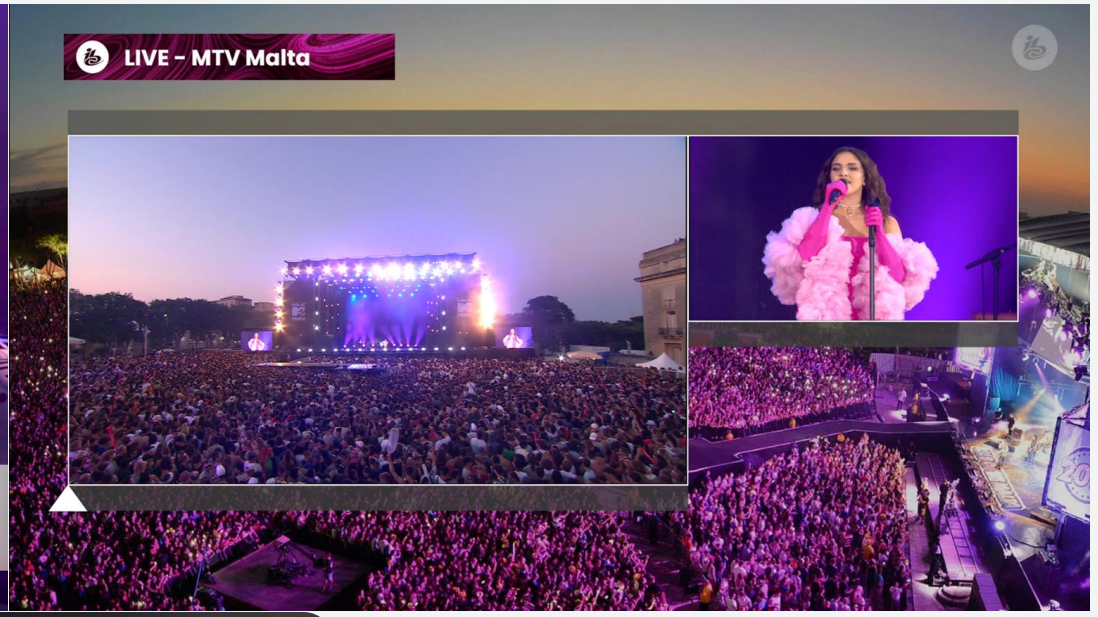
Cloud Based Live Events

WORKFLOW

Benefits and Flexibility Demonstrated

1. Graphics
2. Automation
3. Redundancy

Cloud Native Graphics



Automation


```
[
 {
  "uuid": "ef7763e8-1536-4aa3-bb9a-d44560a5ce6e",
  "command": "gotostart",
  "application": "ClipPlayer",
  "workloads": [
   "4bcbab37-dea7-48a0-b4ea-aebaeb71f45e"
  ],
  "payload": {}
 },
 {
  "uuid": "ea9d4f54-8a79-4cc7-9afb-f594d12b2cb0",
  "command": "channelstate",
  "application": "AudioMixer",
  "workloads": [
   "e12e5194-436c-486a-b1f7-6ca6493e2a11"
  ],
  "payload": {
   "Index": 12,
   "Level": 0
  }
 },
 {
```

#ACCELERATORS2022

IBC Accelerator Vision Mixer
21:36:47:15
TSG
OS 2
Player 1
Player 2 Music
Replay
Player 001
Player 002
TSG (A)
PVW
PGM (A)
PGM
System Dashboards
IBC Project
Cloud Production Lab 001 Dashboard

REDUNDANCY

TS Player

Input Stage

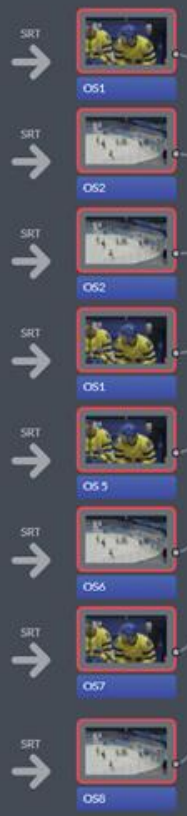
Production Stage

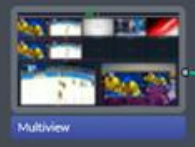
Distribution

Endpoints

Event Location

2160p50 HLG
HEVC 90Mbps





Playout Stage

2160p50 HLG
HEVC 90Mbps

DASH-LL

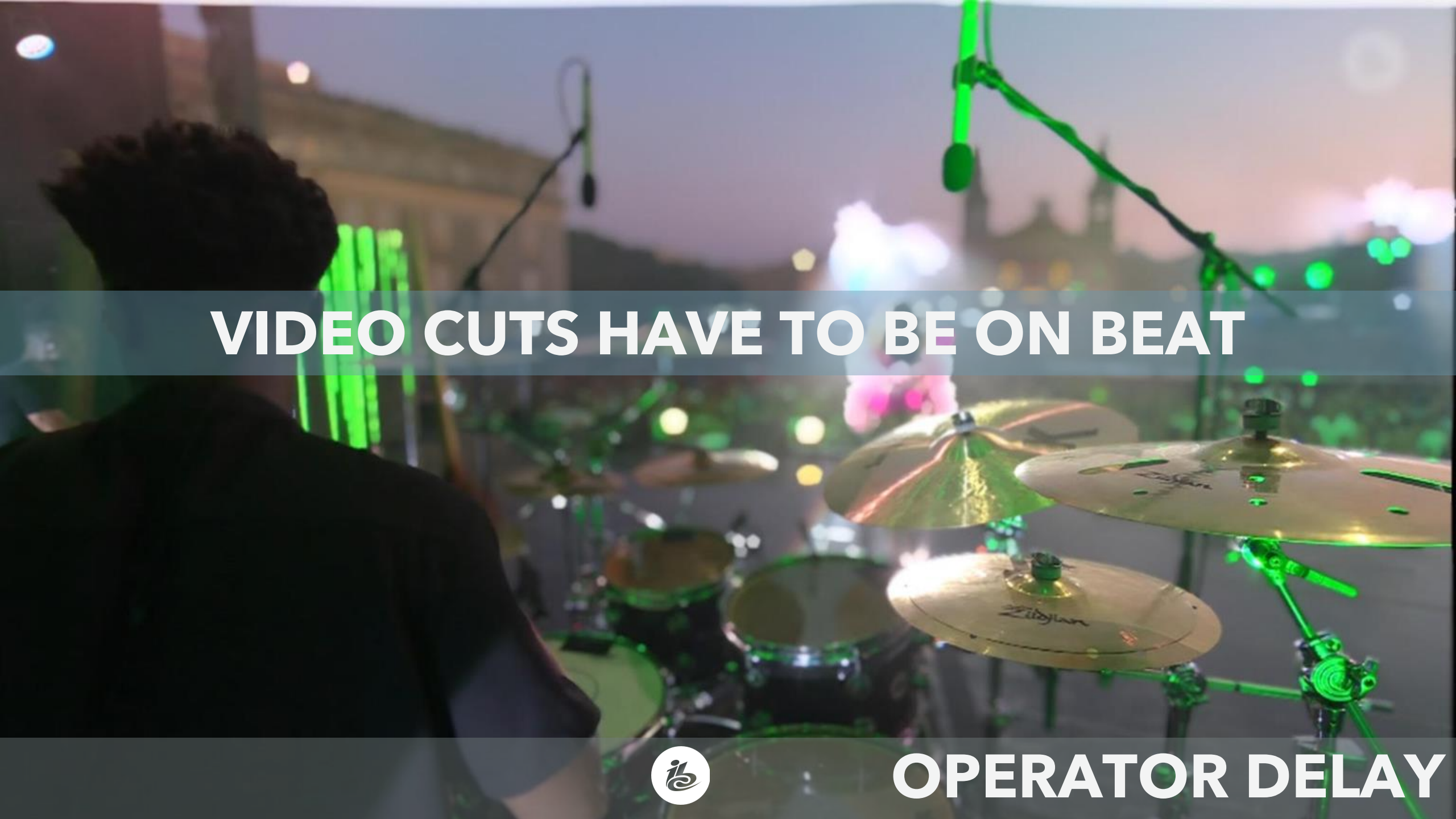
2110 On-Premise Decode

UHD Cloud Based Live Events

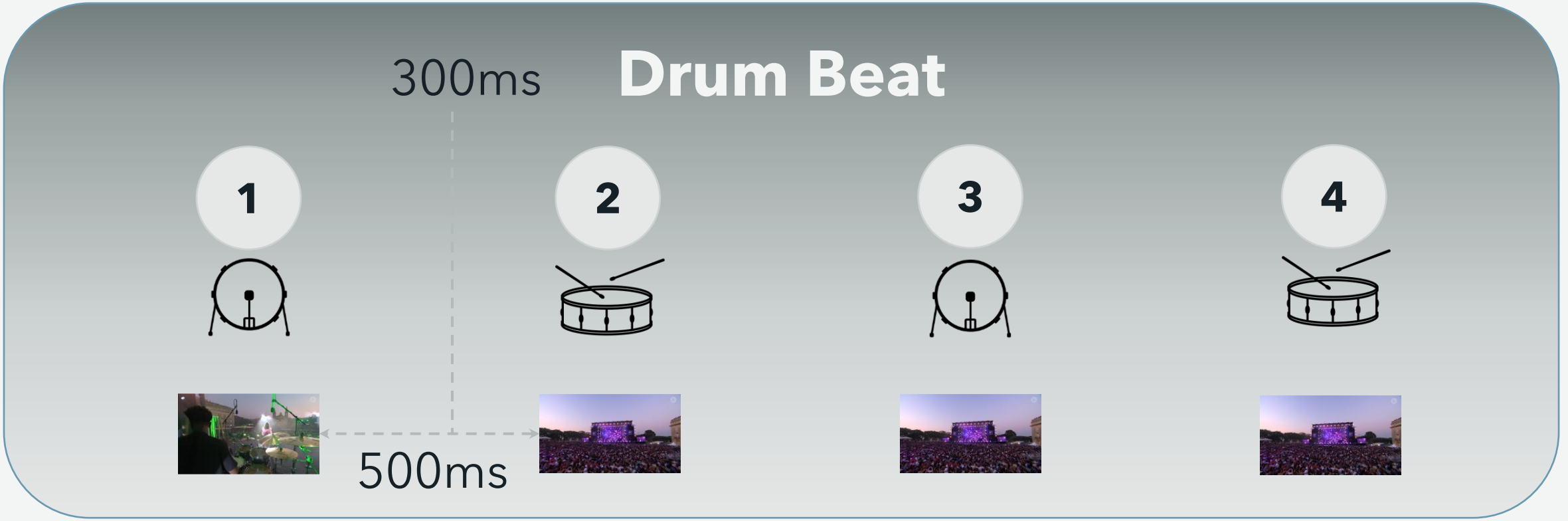
UHD WORKFLOW

The Challenge

Operator Delay


VIDEO CUTS HAVE TO BE ON BEAT
OPERATOR DELAY

Operator Delay



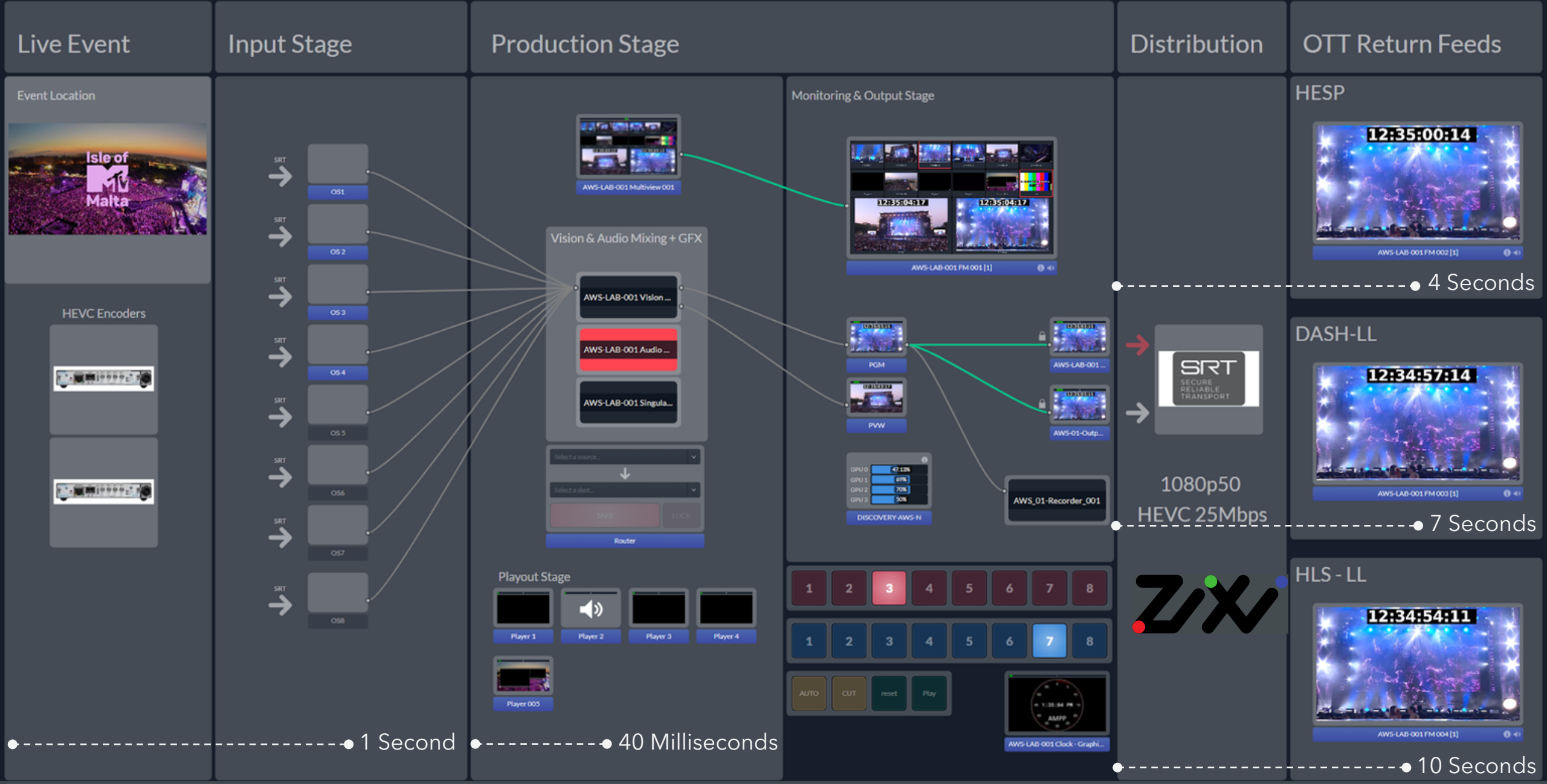
120 BPM = 1 beat every 500ms

What Could Solve This?

Video Line Latency
(Below 1 video frame)

IP IS SOLVING THE LATENCY CHALLENGE

Cloud Based Live Events

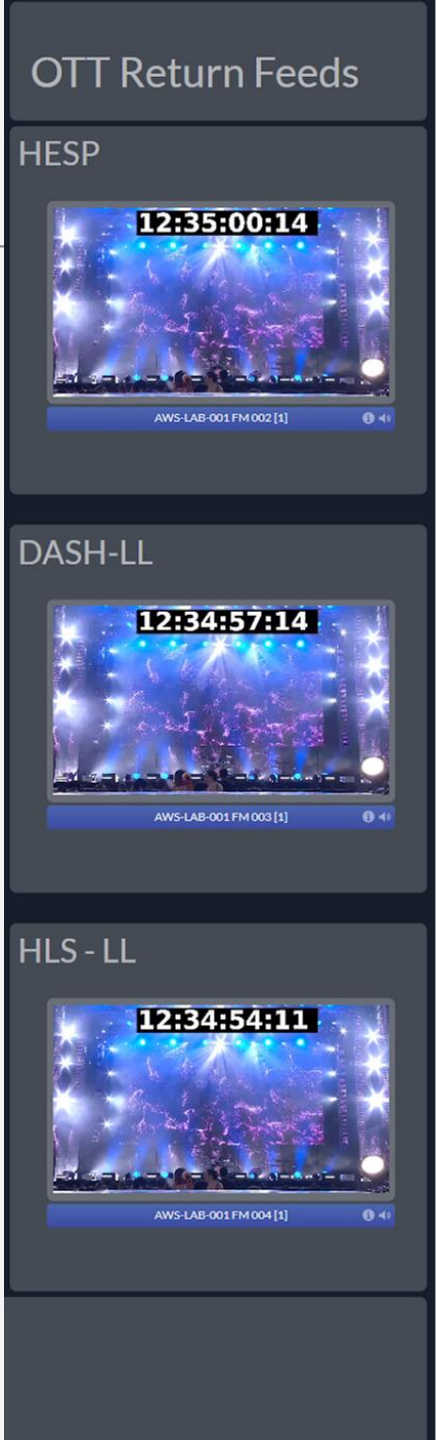

Live Event
Input Stage
Production Stage
Distribution
OTT Return Feeds
Event Location
Isle of MTV Malta
HEVC Encoders
SRT
OS1
OS 2
OS 3
OS 4
OS 5
OS6
OS7
OS8
Vision & Audio Mixing + GFX
AWS-LAB-001 Multiview 001
AWS-LAB-001 Vision ...
AWS-LAB-001 Audio ...
AWS-LAB-001 Singula...
Select a source...
Select a dest...
TAKE
LOCK
Router
Playout Stage
Player 1
Player 2
Player 3
Player 4
Player 005
Monitoring & Output Stage
AWS-LAB-001 FM 001 [1]
PGM
PVW
AWS-LAB-001 ...
AWS-01-Outp...
GPU 0 47.18%
GPU 1 69%
GPU 2 70%
GPU 3 50%
DISCOVERY-AWS-N
AWS_01-Recorder_001
1 2 3 4 5 6 7 8
AUTO
CUT
reset
Play
AWS-LAB-001 Clock - Graphi...
SRT
SECURE RELIABLE TRANSPORT
1080p50
HEVC 25Mbps
HESP
12:35:00:14
AWS-LAB-001 FM 002 [1]
4 Seconds
DASH-LL
12:34:57:14
AWS-LAB-001 FM 003 [1]
7 Seconds
HLS - LL
12:34:54:11
AWS-LAB-001 FM 004 [1]
10 Seconds
1 Second
40 Milliseconds
Cloud Based Live Events
END TO END LATENCY

Low Latency on the OTT side

- HESP (4 Seconds)
- DASH-LL (7 Seconds)
- HLS–LL (10 Seconds)

Source Clock

Real time measurement from cloud vision mixer to OTT return feed



Impact to Quality

- Some player drift in low latency modes
- Some options no b frames
- Segment size change buffering behavior

Learnings

- Cloud production is possible, but requires a significant design and confidence building stage before adoption
- HEVC adoption makes sense over AVC in cloud, It has quality benefits and no real processing impact over AVC
- UHD & HD are equally accessible, but higher quality requires more design consideration to maintain quality of service

Learnings

- Operator delay matters and can require the lowest encoding latency possible to maintain creative intent (Sub 40ms)
- Recovery mechanisms (Zixi, SRT) are strong
- Protocols can be tuned to help decrease latency while maintaining quality of service

Learnings

- NDI is very useful within the cloud, but not so easy to integrate from ground to cloud.

What's Next?

- Improve the stability
- Improve the quality (Higher resolutions HDR)
- Lower System Operational Latency
- Multiple format distributions
- Wider industry trial and testing to drive acceptance

LOW LATENCY LIVE CLOUD PRODUCTION IS HERE
Cloud Based Live Events

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THANK YOU

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