AWS re:Invent

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MDS203

Transforming broadcast production, playout, and fan experiences

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Agenda

AWS for M&E Broadcast highlights

Discovery Communications' TCO study for linear cloud playout

Discovery Sports' next-generation audience experience

ViacomCBS' live sports production journey

Why AWS for broadcast?

Latency

Reliability

Flexibility

Video quality

Cost

AWS media services and products

THE MOST PURPOSE-BUILT CAPABILITIES FOR MEDIA AND ENTERTAINMENT OF ANY CLOUD

Amazon Interactive Video Service (Amazon IVS)

AWS Elemental MediaConnect

AWS Elemental MediaConvert

AWS Elemental MediaLive

AWS Elemental MediaPackage

AWS Elemental MediaStore

AWS Elemental MediaTailor

Amazon Kinesis Video Streams

AWS Elemental Appliances and Software

AWS M&E Partner community

MORE THAN 500 AWS PARTNERS FOR MEDIA AND ENTERTAINMENT

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Building sustainable production facilities in the cloud

Problem statement

Sky News UK required a production facility, closely matching their current production environment, to produce live coverage of the 12-day COP26 Climate Conference

Challenges

- No traditional facilities available
- Limited time and budget to build new facilities
  - Only 6 weeks from first conversation to on-air
- No time to re-train staff on “other solutions”
- Quality, resiliency, and low carbon footprint was critical
  - Key sponsor at COP26 with commitment to NCZ by 2030

Building sustainable production facilities in the cloud

- Results
  - Designed and delivered in 6 weeks
  - Limited training required
  - Like-for-like Sky News output
  - 96 hours of live coverage with 100% success
    - Across DTH, OTT, and Sky Glass
  - Near-zero latency
    - 120 ms round trip
  - Repeatable
    - With a few lines of code, technology environment available to other lines of business

Building sustainable production facilities in the cloud

Estimated sustainability success metrics

Sky's traditional production gallery

3827.226 kg CO2e

Sky's cloud production gallery

257.387 kg CO2e

93% reduction!

Vizrt Live Production Solution

Cloud-first live solution using

Viz Vectar Plus for 4K video switching

Viz Trio for real-time graphics playout

Viz Engine for rendering and composition

Viz Mosart for studio automation

Business benefits

Replace traditional hardware restrictions with cloud-hosted software freedom for greater flexibility, scalability, and redundancy in your productions

Use the best talent for the show, every time, with studio control from anywhere

Easily and quickly adapt to the growing need to produce more live content and better stories with the same sources

Better cost management with less up-front investment than traditional studio setups

Extreme scalability to quickly react to changing production needs

Incredible flexibility to easily access your cloud-hosted studio production tools from anywhere in the world

Powered by AWS

Amazon EC2 • Amazon S3 • Amazon NICE DCV • AWS Elemental MediaConnect

AWS and Discovery Sports: Transforming how track cycling is presented

Discovery Sports and UCI (Union Cycliste Internationale)

The journey

Enhancing the fan experience

What’s next

How did Discovery Sports get here?

- Worked backwards with AWS and developed a strong partnership with Discovery+ Sports events
- AWS Data Driven Everything (D2E) Program – workshops designed to get us thinking and looking at the program as a whole
- AWS Professional Services offered the expertise to deliver for our fans

Enhancing the fan experience

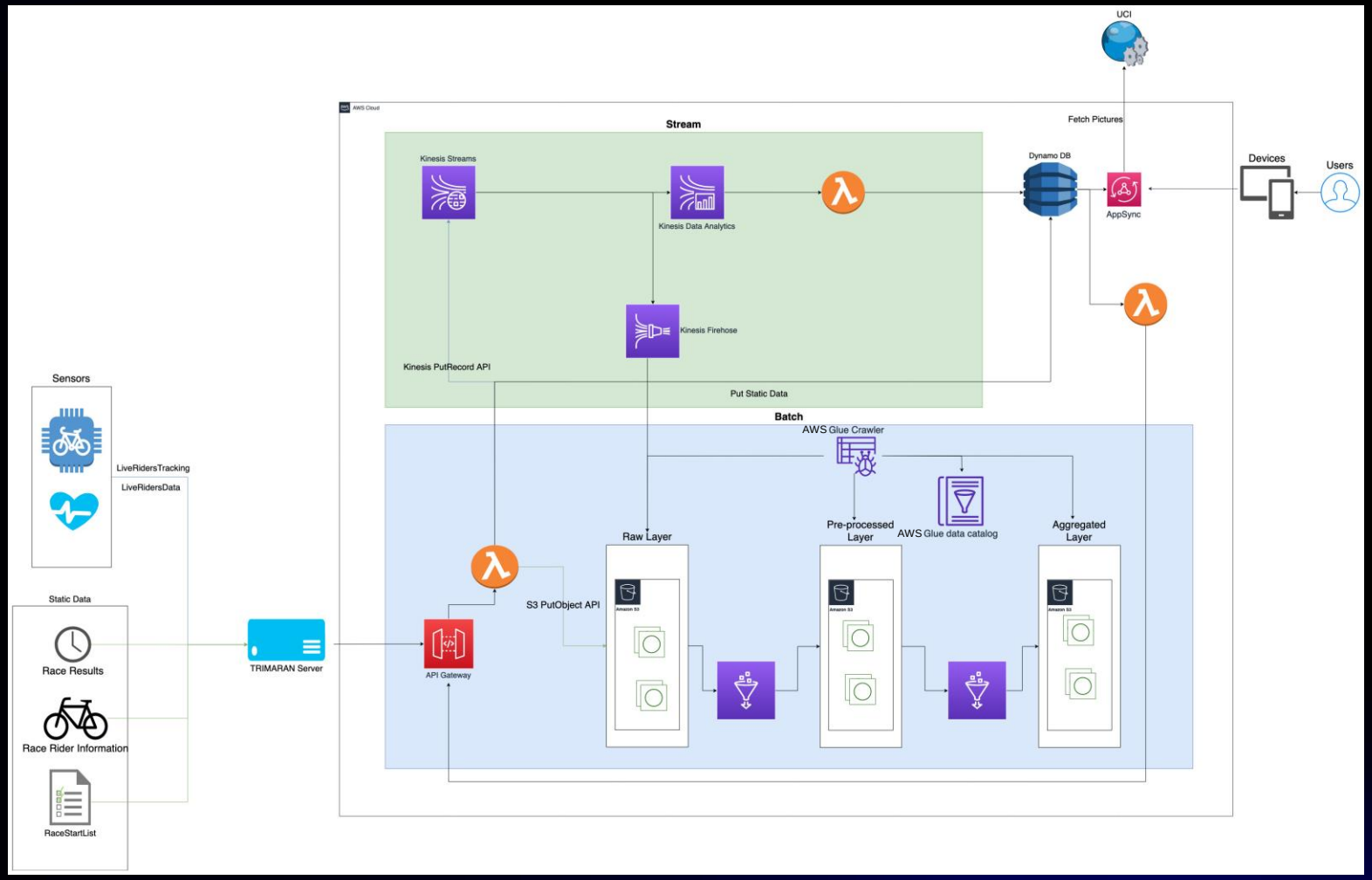
- Rider stats are important to show what's going on with the athletes
  - Heart rate
  - Bike RPM
  - Bike watts generated
  - Likelihood for overtake
- Data lake foundations
  - Fans, riders, and sensors
    - Data that must be stored, cataloged, and accessed

Examples

Data ingest architecture

- AWS native services provided Discovery+ Sports quick and proven ways to collect real-time streaming data

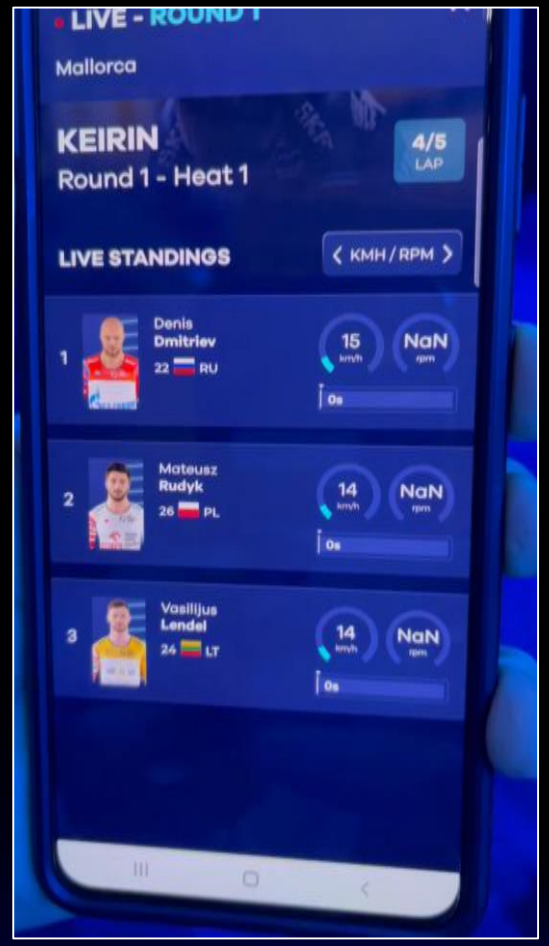
- Data ingest solution
  - Amazon Kinesis
  - Amazon API Gateway
  - Amazon S3
  - Amazon DynamoDB
  - AWS Glue
  - AWS Lambda
  - AWS AppSync



What’s next?

Next steps

- Year 1 (starting now)
  - Expanding the fan app
    - Including interactive elements
  - Draft score and CFD (computational fluid dynamics)
    - Working with riders and AWS to create a metric on how aerodynamic a rider may be
  - Remote live production
    - Onsite production across velodromes
- Years 2–4
  - Long-term projects and expansion



CBS Sports Digital's ongoing evolution of live sports production

CBS Sports Digital

The average day

Condition and stream more than 30K live events annually

- Hundreds of daily concurrent events, some days more than 500
  - Workload mix and workflows vary
    - Large-scale events
    - Long-tail events
    - Pop-up events (press conferences)
    - Audio-only events
- Dynamically maximize/minimize infrastructure as needed per event
  - Benefits
    - Elasticity and cost optimization for daily bursts
    - Resiliency for the unexpected (welcome to live)
    - Scale quickly with new deals

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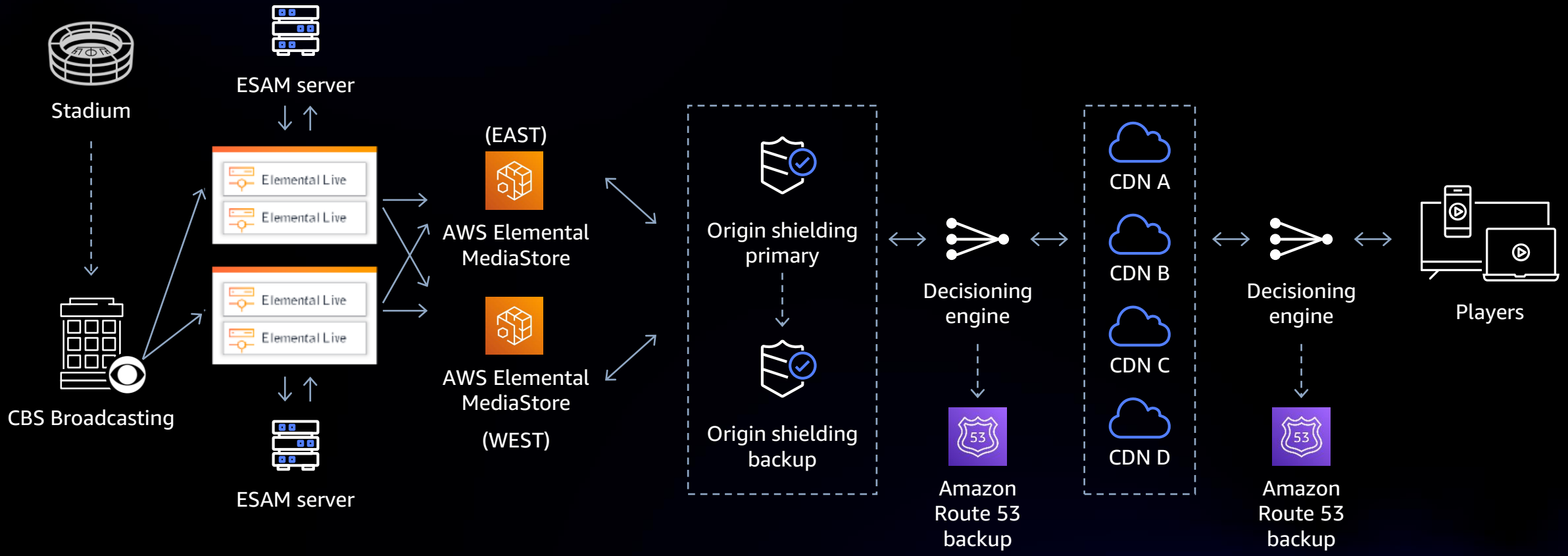
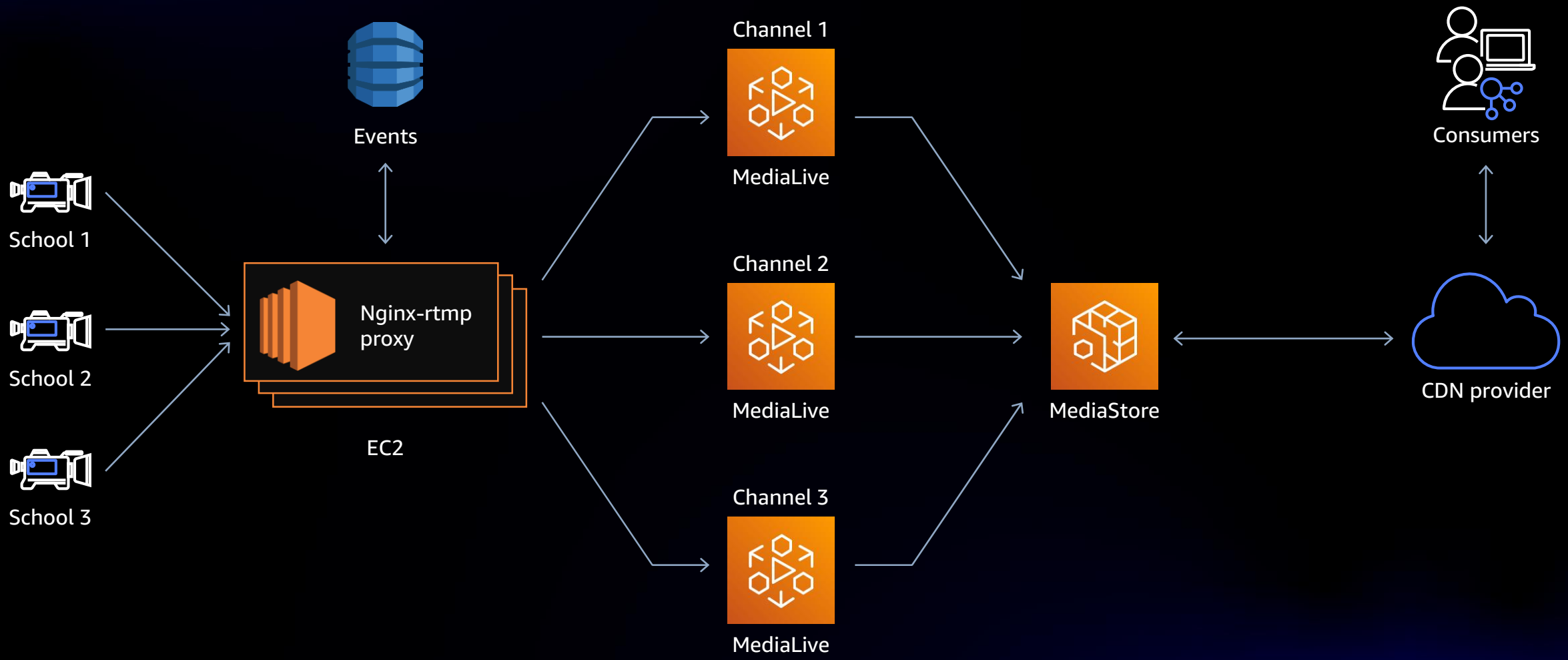
CBS Sports Digital's evolution



CBS Sports Digital's evolution



CBS Sports Digital's business opportunity

U.S. home for international football (soccer)

- More than 2,000 live soccer matches annually across Paramount+ and CBS Sports Digital and linear platforms.
- Soccer competitions from 145 national team associations across 5 continents

CBS hitting stride on soccer coverage with Champion's League — AP

CBS takes its soccer coverage to a new level with the UEFA Champions League and Concacaf Nations League — The Philadelphia Inquirer

CBS sees soccer as "perfect" for streaming strategy — SBJ Sports Business Journal

Clint Dempsey returns from the wilderness to give CBS's USMNT coverage something unique — The Athletic

The challenges

Speed-to-market (deal to first match in 6 months)

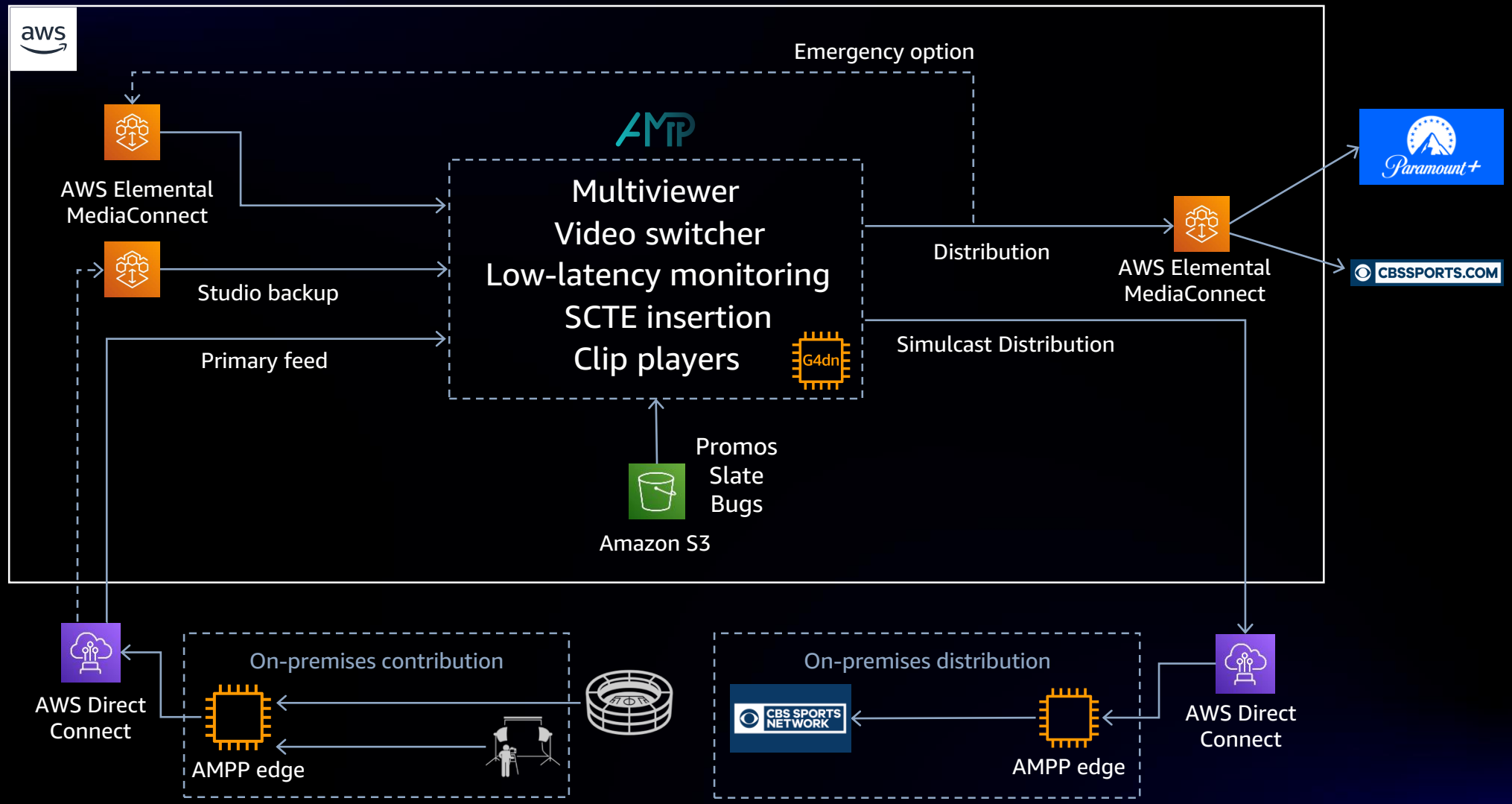
- Honing the latency
  - First hybrid implementation
    - On-premises studio in the middle
- Ease for operations
  - Different operator coverage models
  - One operator with multiple responsibilities
- Solving the supply chain challenges
  - Lead times for operational equipment

CBS Sports Digital's solution

Partnered with Grass Valley on AWS

- Agile Media Processing Platform (AMPP)
  - Signal timing
  - Clip playback
  - Video switching
  - Graphic insertion
  - Multiviewer
  - Tallies
  - Frame accurate SCTE insertion
  - Monitoring and control

CBS Sports Digital's architecture



Honing the latency

Honing the latency: Challenges

First hybrid master control environment

- Previous events were switched either all on premises or all AWS-based
- No requirement for timing outside of the environment

Hybrid implementation

- 3* different studio locations
  - Needed control of variable signal latency
  - Studio talent
    - Hear and see the contribution feeds/on-air feed at the correct time
  - On-premises and studio master control countdowns

Honing the latency: Solution

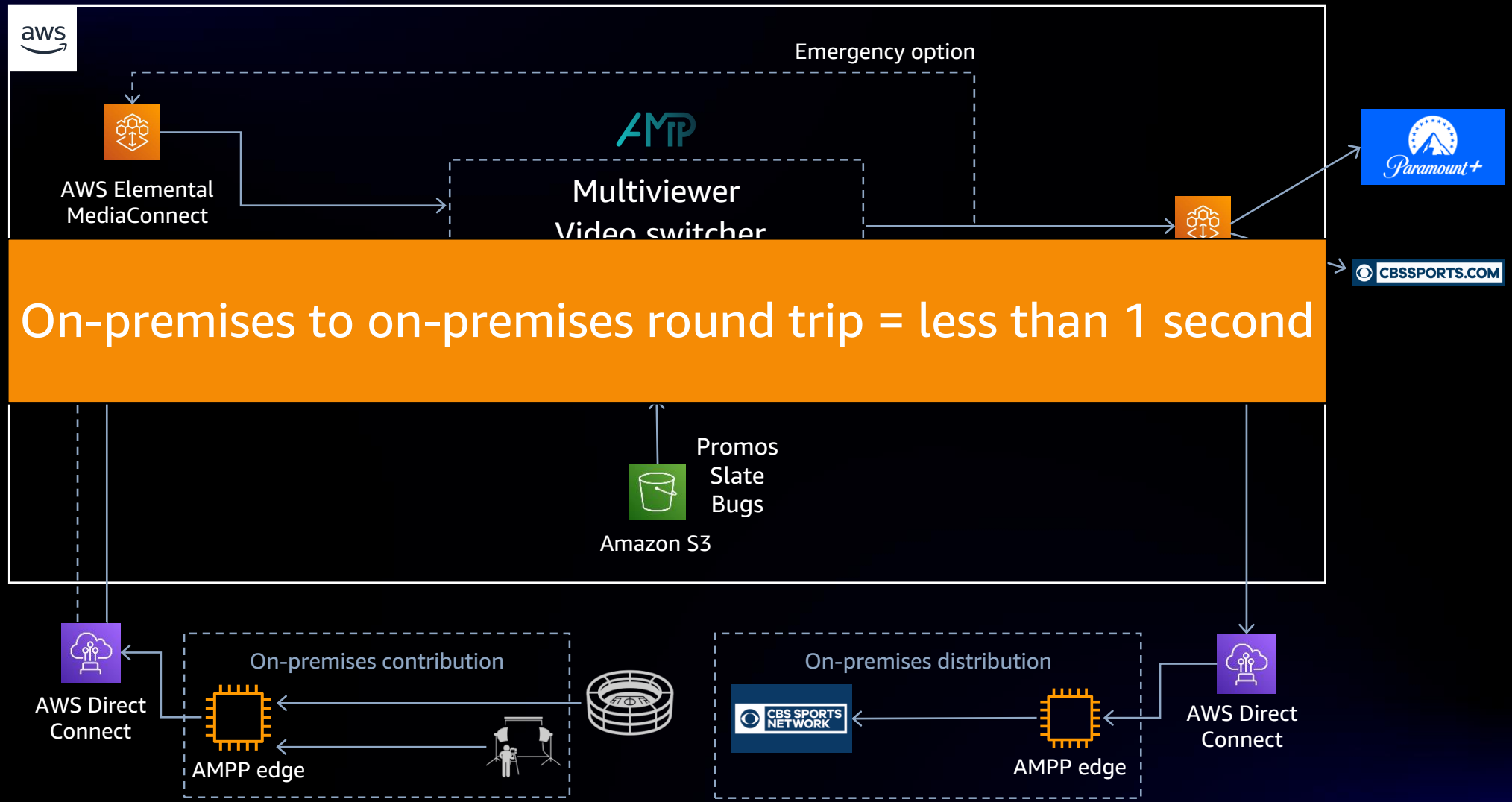
Provided an enterprise control layer of encoding timing

- Syncing across nodes in AWS with on-premises nodes
- Dynamically adjusts each node in real time
  - Matching timing for a node that receives a signal early with nodes that receive the signal later

Low-latency protocols

- Reliable Internet Streaming Transport (RIST)
  - Contribution into AWS and distribution out of AWS

CBS Sports Digital's architecture



Ease for operations

Ease for operations: Challenges

Economy of scale (requirement)

- Different operator models for different tiers of games
  - 1 operator : 1 match
    - Video switching (event and studio)
    - Precise SCTE insertion
    - Graphic insertion
    - Countdowns (studio and on-premises master control)
  - 1 operator : 4 matches
    - Video switching (event and studio)
    - Precise SCTE insertion
- Intuitive tooling necessary to enable operational success
- Push button spin up and down of infrastructure

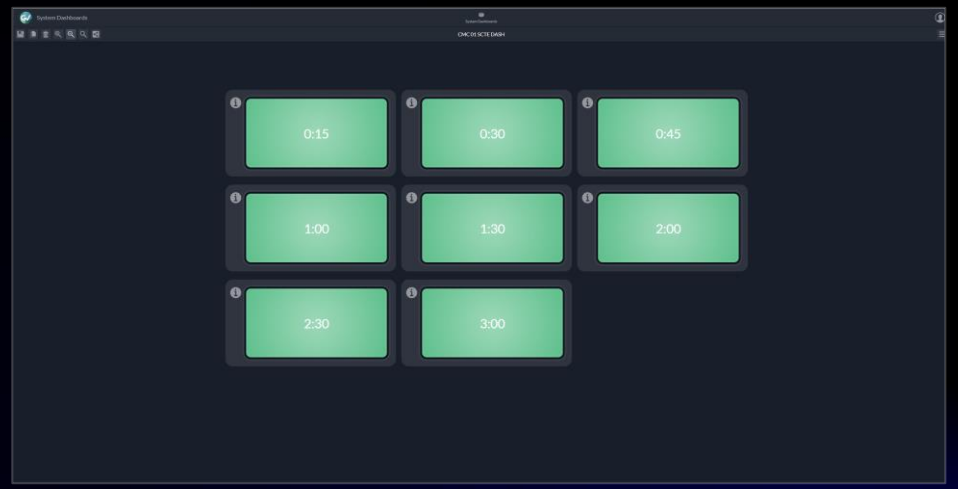
Ease for operations: Solution

Grass Valley control plane

- Support and integration with third-party on-premises hard device with GV's AMPP environment
  - Including intuitive thumbnail feedback from GV video producers
  - Just need an internet connection

Ad insertion

- Easy way for operators to insert custom SCTE payloads
- GV integrated frame accurate SCTE insertion for ad triggering
  - Customized SCTE panel for ad break duration
  - Ability to deliver a clean ad break experience for the end user



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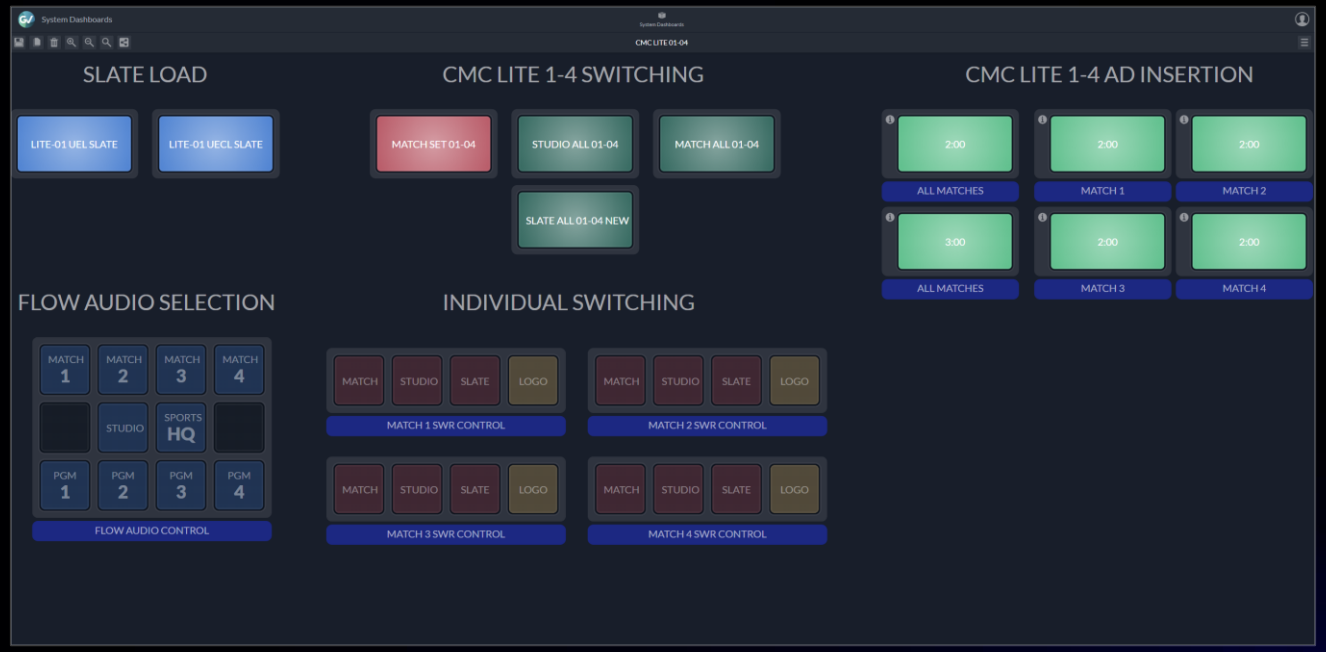
Ease for operations: Solution

1 operator : 4 matches

- Events requiring feed switching and ad insertion
- Ability to control matches individually or all simultaneously



Supply chain issues

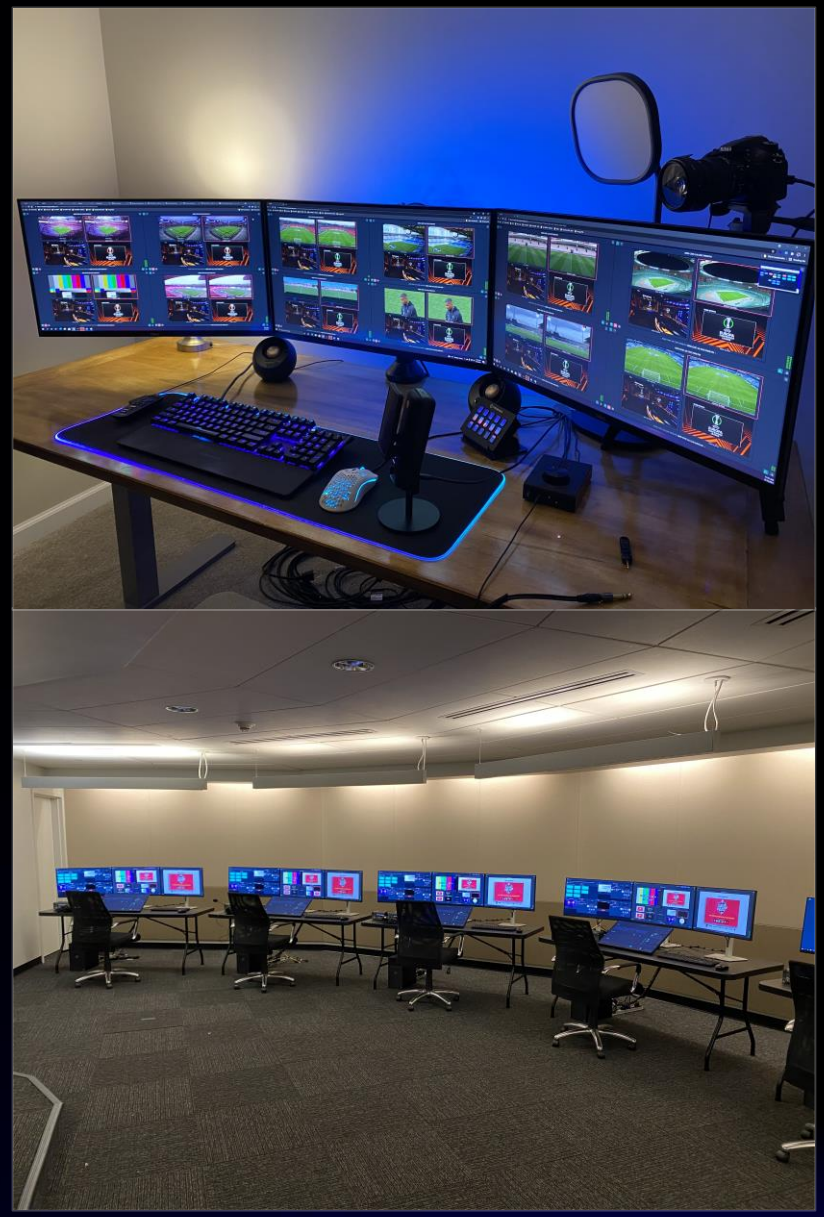
Supply chain issues

Difficult to get required operational equipment

- Keyboard, monitors, mice, touch panels, graphic cards

Space completion (mid-November)

- Permanent furniture
- QA monitors



Results

Results

Multiple operator configuration based on game tiers

- 1 operator : 1 match
  - One G4dn.12XL instance
  - Up to 16* inputs/16* outputs, switching, clip player, multiviewer, SCTE insertion
- 1 operator : 4 matches
  - One G4dn.12XL instance
  - Up to 8 inputs and 8 outputs, switching and SCTE insertion

Average production = 4 hours

Infrastructure control

- AWS Identity and Access Management (IAM) access and AMPP
  - Empowers operators to independently spin up/spin down their stations

Both CapEx and OpEx savings

- Limited on-premises infrastructure

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Next steps in live production evolution

Next steps in live production evolution

Existing workflows

- Repeatability for the future
  - Template for new events for distribution
    - No more on-premises builds
    - More control to ensure a better end-viewer experience
- Continue to push the boundary to optimize latency

Expanding our cloud-first strategy

- Continuing to evolve linear channel playout in the cloud
  - Playout and MAM
- Tackling live studio production control rooms

Thank you!