IP SHOWCASE™ THEATER

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2110-based OB Solution

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The Challenge

- Design a COTS based infrastructure solution for UHD HDR Outside Broadcast
- Customers core requirements:
  - COTS based infrastructure – Arista
  - Standards based – ST-2110, ST-2059, IGMP V3
  - Mixed Reference Environment – Black Burst and PTP
  - Signal agnostic – HD 1080i 50 and UHD 2160P50
  - Future-ready – HDR (High Dynamic Range) and 1080p
  - Simplified wiring – multi-mode and single-mode fiber

The Challenge

- Technical requirements:
  - 8+ Simultaneous Productions
  - As Much IP at the Edge as Possible
  - IP Switchers
  - Very large IP multi-viewer requirement 960x80
  - Extensive IP Connectivity with Video & Audio Processing
  - Remote Production Requirement
  - Flexible FPGA processing

The Challenge

Key that the users don’t know or care about the technology

I.e. it needs to feel the same as an HD-SDI production for the operators

How did we do it?

- COTS IP Core
  - Arista 7508R
    - Customer required COTS core
    - Large Single Chassis allows for simple non-blocking architecture, delivering the same performance as SDI routing
    - Different levels of 2022-7 redundancy for 2110 flows – dual chassis, dual line-card, or no redundancy for non-critical flows
    - Use of 25/50/100GbE led to ~40% total cost reduction compared to legacy 10/40GbE technology

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How did we do it?

- Gateways
  - Small failure block was key to high availability solution design
  - Flexible FPGA core
  - SDI↔ IP gateway, MultiViewer, broadcast NAT/firewall, etc.

How did we do it?

- IP Multi-viewers
- IP Switchers / Vision Mixers
- SDN Control and Flow Management
- Unified facility monitoring and configuration
- As much IP at the edge as possible

Solution Topology

IP SHOWCASE THEATRE

- Solution Comprised of three designs
  - Broadcast Center
  - Remote Fly Packs
  - Mid-Sized Production Truck

IP SHOWCASE THEATRE

Broadcast Center Overview

IP SHOWCASE THEATRE

Broadcast Centre

Control Panels

Configuration / Control Clients

Upstream Client Control Network

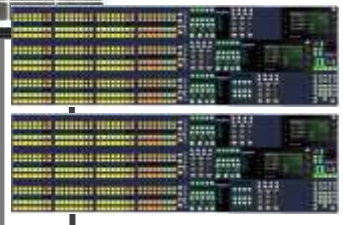
IP Edge Control Servers

2x Arista 7508R

IP Switches fitted with 6x line cards:
1x 36 40G ports
5x 36 100Gports

Kahunas 1-3

Kahuna 4 (x2 Panels)



PTP / Sync Generator

PTP generation from TEK SPG8000A – use Meinberg Slave unit to circumvent high client count issues

I/O Trunk

40/50GbE links

40/50GbE links

100/25GbE links

40/10GbE links

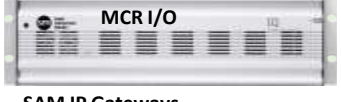
100GbE links

MADI Conversion & Audio processing (IQAMD4010 x4 / Audio Live x2)

960x Multiviewer Resize Engines

80x Multiviewer Head Ports (exp to 240)

20x MV-820 IP Multiviewers



SAM IP Gateways
SDI I/O IQUCP25 x61, IQ Frames x7

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Remote Site Overview

FLY PACKS 1 of 4

IP SHOWCASE THEATRE

Configuration

Upstream Client Control Network

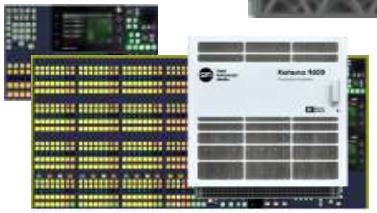
Control Panels

Arista 7508R

IP Switches fitted with 4x line cards: 4x 36 100Gports

IP Edge Control Servers

PTP / Sync Generator



100GbE links

GV IP Gateways
SDI I/O IQUCP25 x32
(256x256 3G)
3 Frames

5x MV-820 IP Multiviewers
240x Multiviewer Resize Engines
Up to 60x Outputs

MADI IQAMD4010 Cards can be distributed as required between Fly Packs

AUDIO LIVE (Software Shuffler)

FLY PACKS 2 of 4

Configuration

Upstream Client Control Network

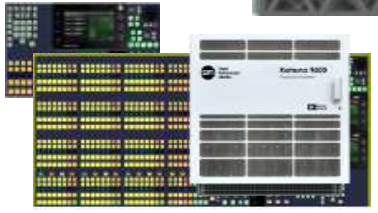
Control Panels

Arista 7508R

IP Switches fitted with 4x line cards: 4x 36 100Gports

IP Edge Control Servers

PTP / Sync Generator



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AUDIO LIVE (Software Shuffler)

FLY PACKS 3 of 4

IP SHOWCASE THEATRE

Configuration

Control Panels

Upstream Client Control Network

Arista 7504R
(Additional Frame
Existing Line Cards)

IP Switches fitted
with 4x line cards:
2x 36 100Gports
2x 36 40Gports

IP Edge Control Servers

PTP / Sync Generator

100GbE links

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AUDIO LIVE (Software Shuffler)

FLY PACKS 4 of 4

Configuration

Control Panels

Upstream Client Control Network

2x 1U IP Switches
fitted:
32x 100G ports
4x 10Gports

2x Arista 1RU Switches
DCS-7260

IP Edge Control Servers

PTP / Sync Generator

2x Panels as
required

100GbE links

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AUDIO LIVE (Software Shuffler)

IP SHOWCASE™ THEATER

Mid-size UHD HDR Remote Truck

24 Camera OB Truck Example

IP SHOWCASE THEATRE

Configuration / Control Clients

10x 71 Key 2U LCD

Control Panels

10x 39 Key 1U LCD

IP Monitoring

Upstream Client Control Network

IP Edge Control Servers

PTP / Sync Generator

PTP generation from TEK SPG8000A

1x Arista 7504R

IP Switches fitted with 2x line cards:
2x 36 100Gports

Configured with Redundant Line Cards for "-7"

IP Kahuna 6M/E (Format Fusion)

4M/E 32 source Maverik Panel

2x UHD1100 (4K DC)

I/O Trunk

100/25GbE Links

40/10GbE links

40/10GbE links

100GbE links

GV IP Gateways
- 23x SDI I/O IQUCP25
- IQ 4U Frames x3

7x IQVDA02 - Analog Ref and Wordclock Distribution

MADI/IP Conversion
- 2x IQAMD4010 (redundant)
- 1x IQ 3U Frame

Audio shuffling & processing
- Audio Live (redundant)

192x Multiviewer Resize Engines

5x MV-820 IP Multiviewers

Main Areas
x16 Heads/ 12 Tiles per head

Secondary Areas
x12 Quad Splits

OPTION: Emergency Cut SDI Router Vega 30 - 34x34

Challenges

- Audio Routing
  - How do you feed proper audio to IP endpoints
  - Audio Channel Swaps
  - Multiple 2110-30 Levels in play
- Flexible FPGA platform
  - Licensing

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Thank you!
Questions?