ST 2110 UHD HDR facility at QVC Japan

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What makes this project interesting?

• Full-Chain Requirements
  • Multiple Live Studios with 20+ cameras
  • Dual Production Control Rooms (fully mirrored)
  • Dual Network Master Control (fully mirrored)
  • 24 MV canvases (re-entrant) with 216 unique pips
  • Multiple regional variations downstream
  • 24x7 full production requirements

• All in UHD and HDR
Why IP? Which IP?

- IP Networks can scale to the required size

- SMPTE 2110, fully uncompressed, lowest latency

- ST 2110-20
  - UHD (Single-Stream) video streams
  - HD video streams

- ST 2110-30 audio
  - Streams sized to reflect real mixes

- ST 2110-40 ANC data
General Architecture

• Dual IP Cores (Arista 7504R)
  • 100G “universal” ports
  • Devices with high port utilization are direct-to-core
  • 7 Leaf switches (per core) are used to aggregate monitors, audio, and other low-utilization signals

• PTP Boundary Clock in the Core
  • Dual PTP generators (Evertz) via leafs
IP Stream Switching

• UHD signals are single-stream in this network
  • 10.1 Gbits/sec per UHD stream (2160p59)

• Devices in the air-chain support make-before-break switching model

• Utility devices (test, monitoring) may not
Redundancy

• This is a 24x7x365 live multi-studio production
  • Feeding live master control
  • Feeding regional variations with complex graphics

• There is redundant equipment including full production-control-room redundancy

• 2022-7 hitless redundancy of all signals provides redundancy and maintainability of the core IP plant
Principle Equipment

• Arista 7504R (and other smaller) IP infrastructure
• Imagine Selenio Network Processor
  • SDI/IP gateways for UHD and HD
  • Up / Down Conversion including HDR conversion
• Grass Valley K-frame UHD switches
• Imagine EPIC-MV Multiviewers
• Harmonic UHD servers
• Ikegami UHD Cameras
• Evertz UHD Downstream Keyers
• Ross “newt” back-of-monitor conversion
• Evertz PTP generators
• DirectOut Montone42 MADI/IP
• Tektronix Prism test equipment
• And some others
• 200 unique UHD signals in the network
• 200 unique HD signals (plus HD versions of UHD)
• 710 unique audio streams (multi-channel streams)
• 175 unique ANC data streams
• 1485 (primary) multicast groups (plus 2x secondary)

• 200 by 200 (UHD video) routing system
• 400 by 200 (HD video) routing system
• 710 by 1600 (audio stream) routing system
• 175 by 500 (ANC Data) routing system
• Adding 75 more UHD src & dest soon
What did we learn?

• Japan is a wonderful country with friendly people and great food.

• And trains that work perfectly
What did we learn technically?

• PTP – the backbone of everything. Get it right, check it often, have a monitoring approach

• There will be lots of multicast addresses – have a plan and follow it and keep it accurate

• Test equipment is not optional – at the video layer and at the IP layer
Questions?

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