IP SHOWCASE™ THEATER

ST 2110 UHD HDR facility at QVC Japan

John Mailhot, CTO Networking & Infrastructure, Imagine Communications
Jon Panneman, SVP Emerging Technologies, Diversified

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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

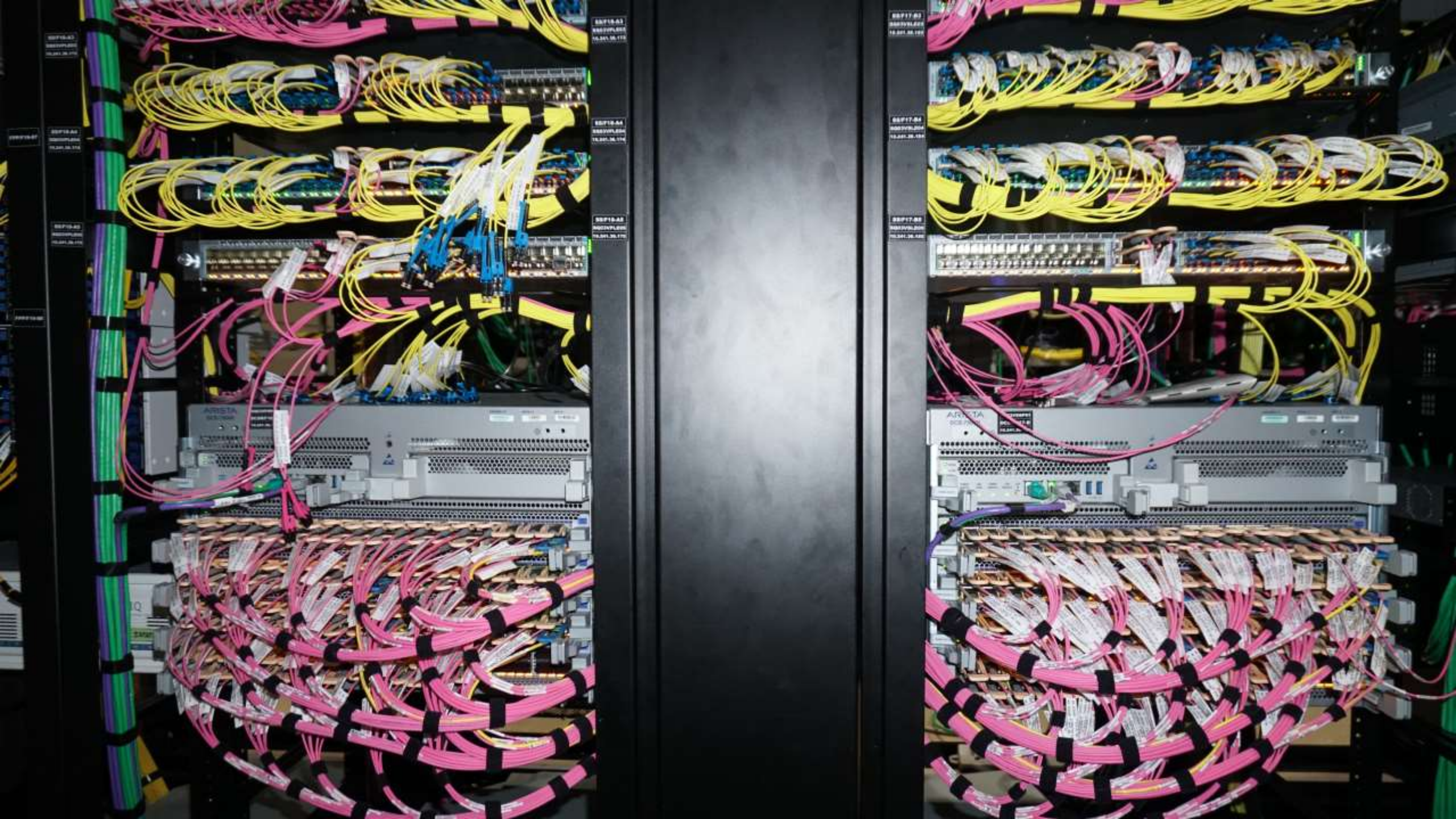
Why IP ? Which IP?

- 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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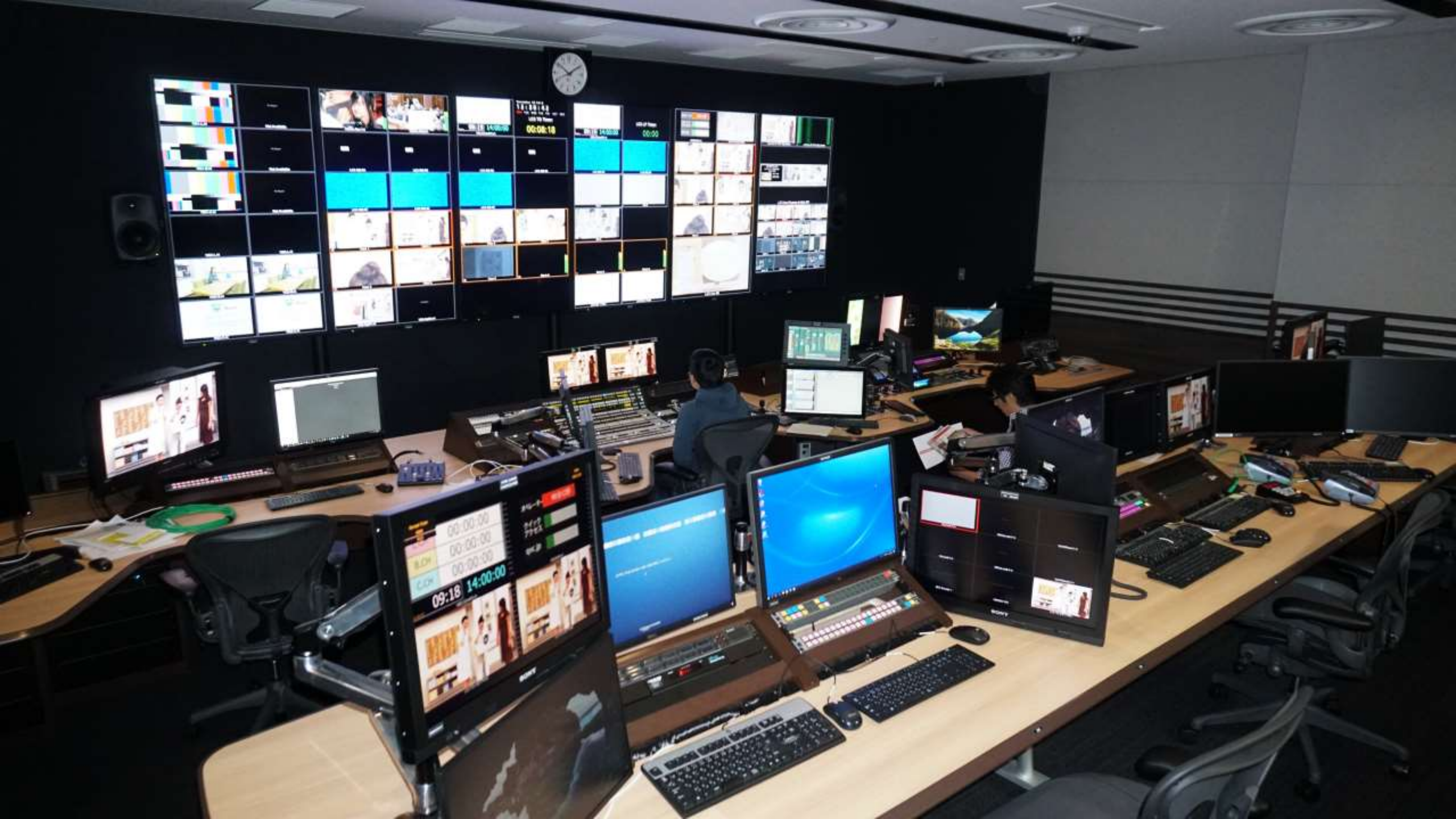
IP Stream Switching

- 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 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



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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 switchers
- Imagine EPIC-MV Multiviewers
- Harmonic UHD servers
- Ikegami UHD Cameras
- Evertz UHD Downstream Keyers

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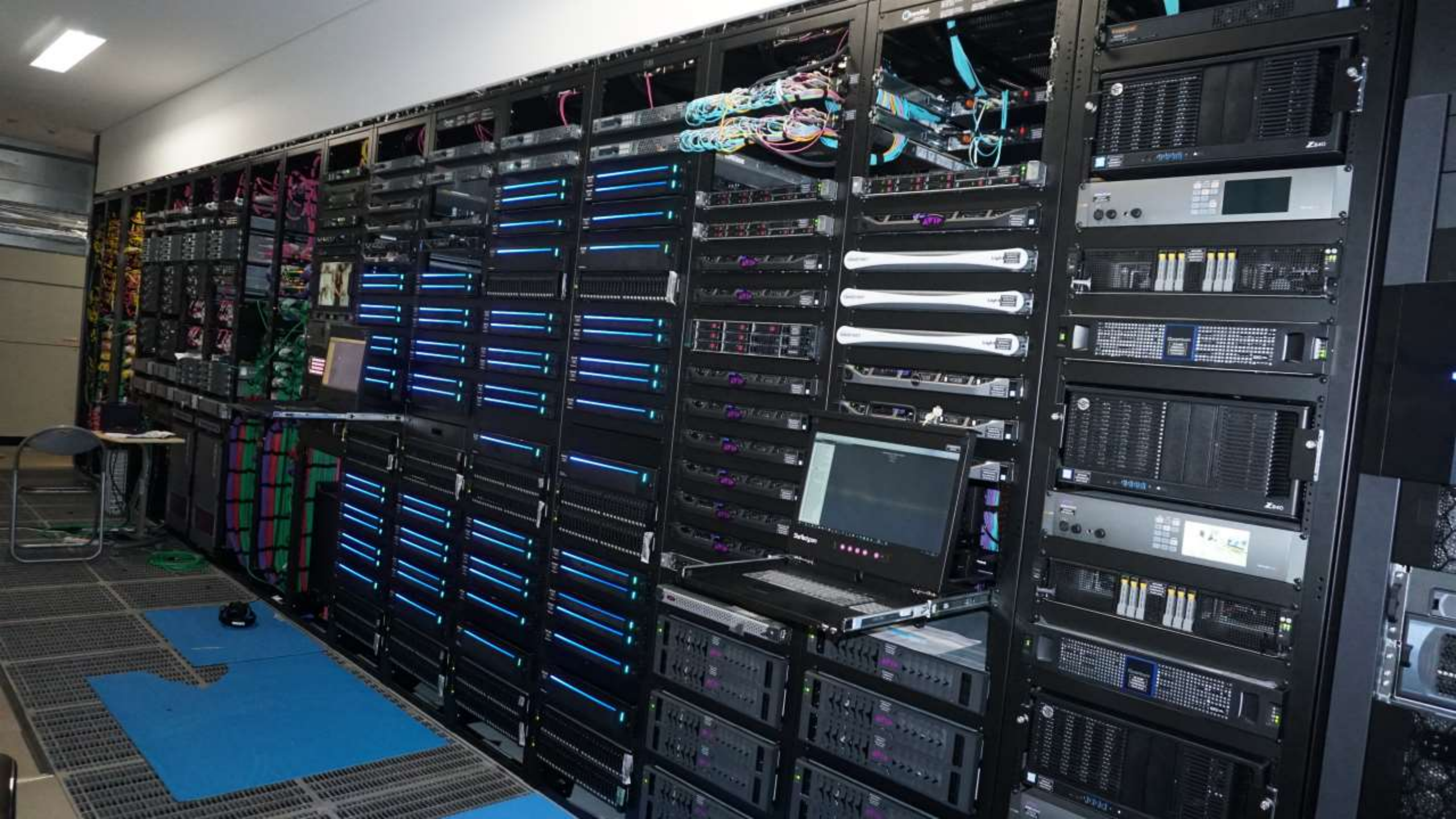
More Equipment

- Ross “newt” back-of-monitor conversion
- Evertz PTP generators
- DirectOut Montone42 MADI/IP
- Tektronix Prism test equipment
- And some others



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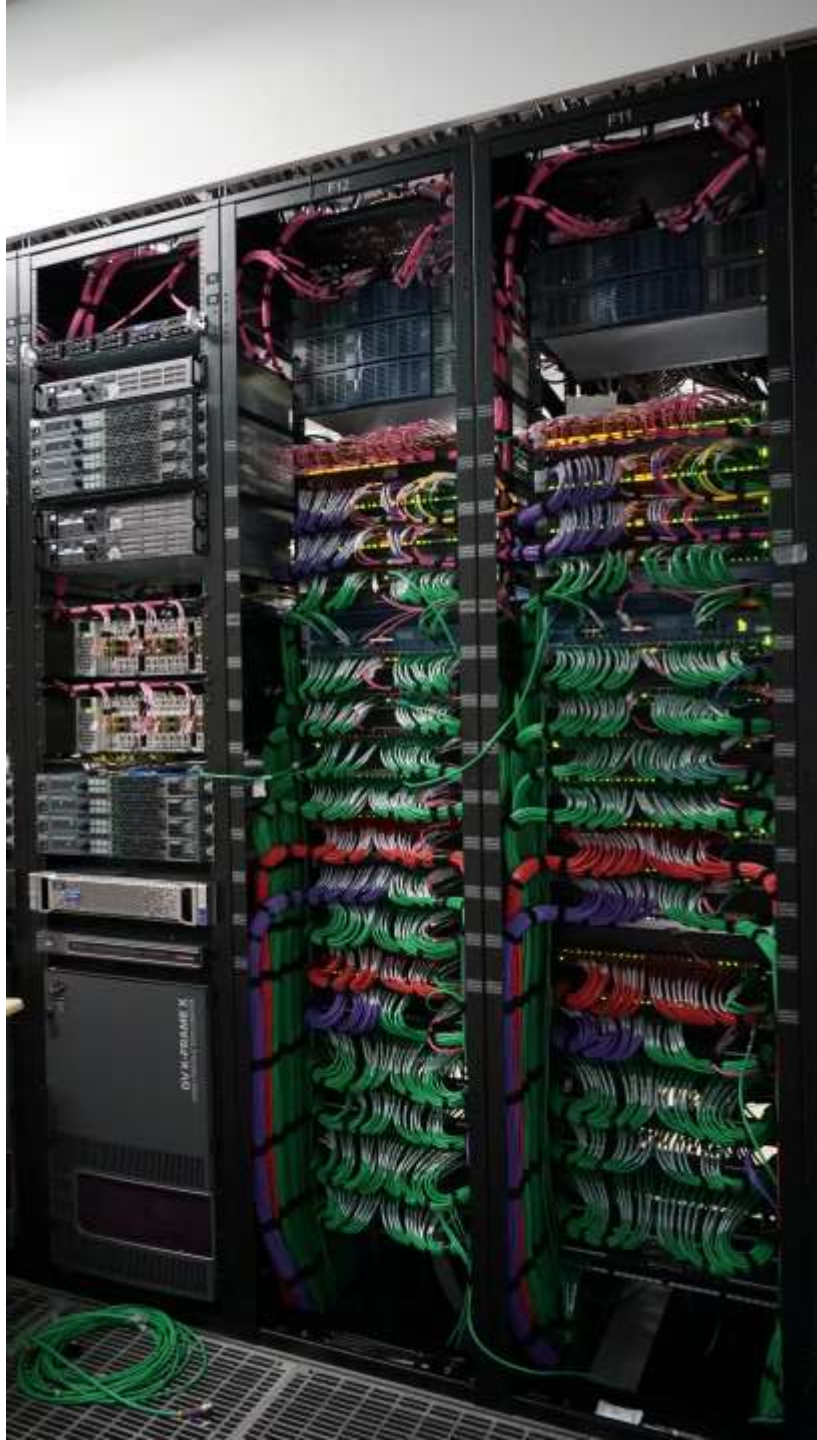

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By the Numbers

- 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

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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?

John Mailhot, CTO, Networking & Infrastructure
Imagine Communications

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Diversified