Transitioning to IP with Hybrid SDI-IP Facilities

Scott Barella
CTO, Utah Scientific, Inc.
Deputy Chairman of AIMS Technical Work Group
Evolution of Video

- Black & White to Color (NTSC/PAL)
- Analog to Digital (SDI via SMPTE 259)
- SD-SDI to HD-SDI (SMPTE 292M/274M) & Audio Embedding
- HD-SDI to 4K/8K (?)
• Alliance for IP Media Solutions
• Formed December 2015
• Support for implementation of TR-03
• Foster adoption of TR-03 (SMPTE 2110)
Interoperability drives the move to IP

AIMS leads the way...
NAB 2017 – SMPTE 2110 comes to life!

• SMPTE 2110 Moving toward full ratification
  • 2110-10
  • 2110-20
  • 2110-30

• SMPTE 2110 Draft Group
  • 2110-21
  • 2110-40
  • 2110-31
  • 2110-50
Joint Task Force – Networked Media Roadmap
IP + SDI = Hybrid Environments

- The migration from SDI to IP will not be sudden
- SDI and IP will work together for years
- Hybrid Islands will appear
- Workflows will gradually adopt
Conversion Methods

• External Conversion
• Internal Conversion
External Conversion

- SDI inputs converted to IP outputs
- IP inputs converted to SDI outputs
- Flexible signal selection
- Modular architecture
SDI to IP / IP to SDI

INPUTS

IP Converter ENGINE

OUTPUTS

IP Converter ENGINE

SFP

SFP

SFP

SFP

SFP
Internal Conversion

• Router based Conversion (Twelve 3G signals /card)
• Replace input or output cards with new cards that supply IP conversion and allow SDI to pass-through
• 40Gbe QSFP+ Connections allow maximum conversion
• **MAINTAIN** all current 3G/HD router inputs and outputs
‘Pass-Through’ Conversion card

- SDI passes just like normal I/O cards
- Signal is SPLIT
  - Split 1 goes to SDI
  - Split 2 goes to IP
- QSFP allows 40 Gb/s ports
- SDI + IP inside the router
Emerging Hybrid Islands

- Multi-Viewing
- SDI-IP Tie Lines
- Hybrid Master Control on Servers
- Long Haul, Compression, Tie Lines
IP Monitoring

- Low Latency the key for Live Production monitoring
- IP becomes a ‘pool’ of source signals
- Relieves congested SDI router outputs
- Low risk ‘sandbox’
Multi-View Monitoring Application

- ROUTER
- Conversion
- IP Switch Fabric
- Multi-Viewer 1
- Multi-Viewer 2
- Multi-Viewer 3

Conversion

Multi-Viewer 1
Multi-Viewer 2
Multi-Viewer 3
IP Tie-Lines

• Tie-Lines can bridge between multiple SDI routing platforms

• IP becomes the means to large aggregation sources

• Allows smaller SDI routing cores
Tie-Line Application
IP Channel-in-a-Box

- IP ‘pool’ can be directly accessed by the Channel Server
- Scalable to accommodate multiple ‘Channels’
- Eliminates PCIe SDI capture cards
- Can use larger capacity NIC’s such as 100 Gb/s
- Inputs AND Outputs on the same cable
Channel-in-a-Box Application

Router
Conversion
IP Switch Fabric
Station #1
Station #2
Station #3
Station #4

Conversion

STATION #1
STATION #2
STATION #3
STATION #4
IP Compressed/Uncompressed + SDI

- Long Haul may use IP
  - Uncompressed 2110 or 2022-7 hitless
  - Compression using 2022-2 (TS) or RTP direct
- Ability to switch IP formats
- Convert to and from SDI
- Hybrid will most likely dictate the next decade
Tie Lines and Long Haul Applications
Basic IP Architectures

- Simple “dual-switches” model
- 2022-7 style redundancy
- Devices register via IS-04 IGMP between devices and switches
- Switches organized into VLANs as needed to organize traffic
- Single PTP Domain
- Control System leverages IS-04 to manage connections/routes
Block Diagram

- Registration
- Control
- Essence Switches
- Control Switch
- PTP Grand Masters
- Router Control Server
Let’s Begin the IP Video Revolution!

scott.barella@utahscientific.com