

Transition from SDI to ST2110 IP and ST2059 PTP

Lessons Learned and Best Practices

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Telestream Product Portfolio Highlights



Vantage

Transcoding & media processing with Intelligent workflow orchestration



Lightspeed Servers

GPU accelerated servers for Vantage media processing



GLIM

Play 'unplayable' media in a browser over remote connections



Lightspeed Live Capture

IP and baseband video capture



Lightspeed Live Stream

Live streaming appliance for OTT



Timed Text Flip, CaptionMaker

Closed captioning and subtitling solutions



Vidchecker & Aurora

File-based QC for production and broadcast content



iQ Video Quality Assurance

Quality monitoring for OTT & IP video



Inspect 2110

SMPTE 2110 IP monitoring for production networks



PRISM

Live Signal Monitoring For SMPTE 2022-6, 2110 and SDI signals



Tektronix Video

Waveform Monitors and Sync Pulse Generators for SDI



Telestream Cloud

Live & file-based media services available on AWS, Google and Azure



Wirecast & Wirecast Gear

All-in-one live production streaming software & hardware

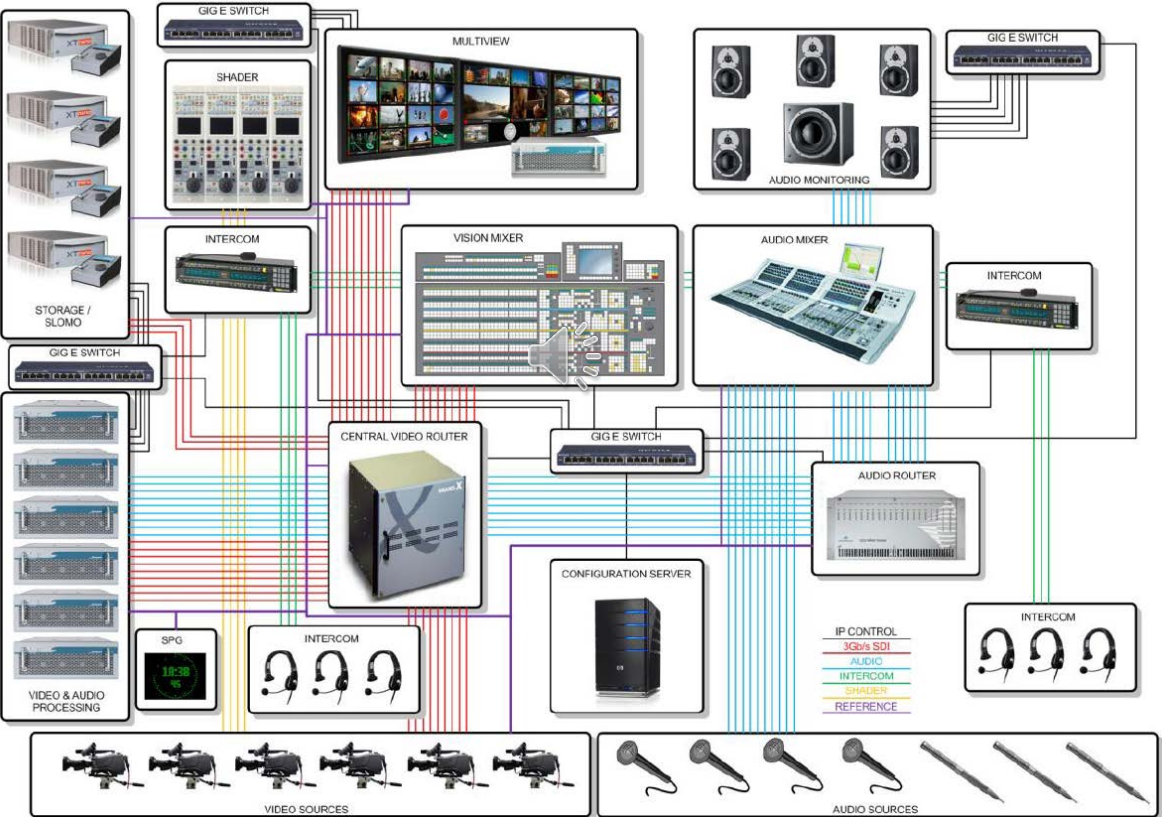


DIVA Core

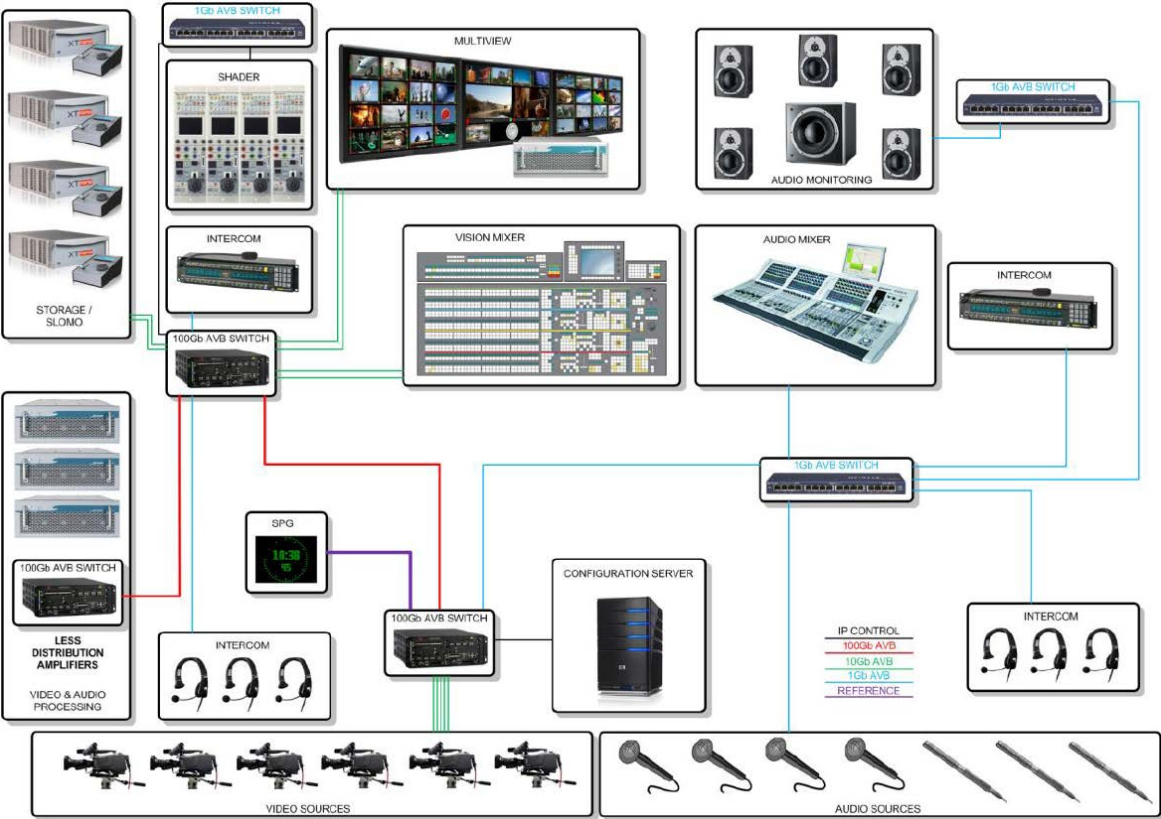
DIVA

Content storage management software

SDI Video Plant



IP Video Plant

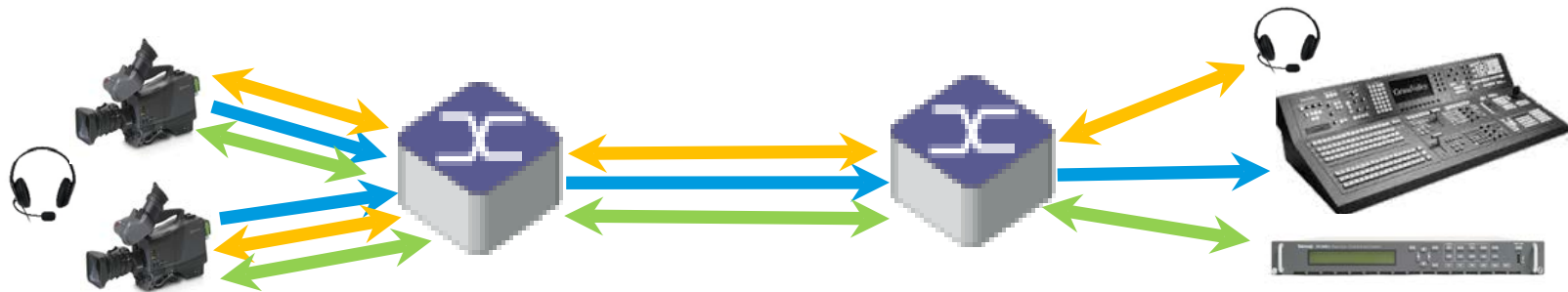
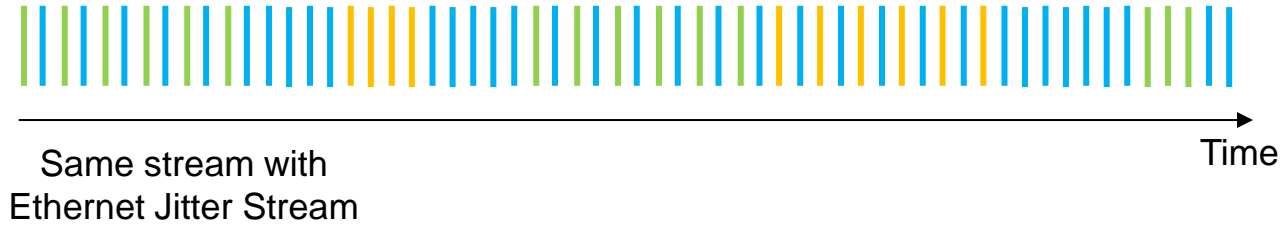


Signal Delay through COAX is Constant

| Time nsec | Length of RG-59 feet | Length of 8281 feet |
|-----------|----------------------|---------------------|
| 1 | 0.65 | 0.77 |
| 2 | 1.3 | 1.54 |
| 3 | 1.95 | 2.3 |
| 4 | 2.6 | 3.07 |
| 5 | 3.25 | 3.84 |
| 10 | 6.5 | 7.68 |
| 20 | 13 | 15.4 |
| 30 | 19.5 | 23 |
| 40 | 26 | 30.7 |
| 50 | 32.5 | 38.4 |
| 60 | 38.9 | 46.1 |
| 70 | 45.4 | 53.8 |
| 80 | 51.9 | 61.4 |
| 90 | 58.4 | 69.1 |
| 100 | 64.9 | 76.8 |
| 200 | 129.8 | 153.6 |
| 300 | 194.7 | 230.4 |
| 400 | 259.6 | 307.2 |
| 500 | 324.5 | 384 |
| 1000 | 649 | 768 |



High-Jitter on Video over IP



MERGING TOGETHER: IT AND BROADCAST ENGINEERING

Black Burst Tri Level and SDI is last holdout



Video Engineer

- SDI, Digital Audio and Analog Timing
- Black Burst and Tri Level Sync
- Importance of delivering signal quality
- QoE centric methodology with QoS
- **SDI vs IP IP is an Abstraction**
- Challenge in understanding the IT technology

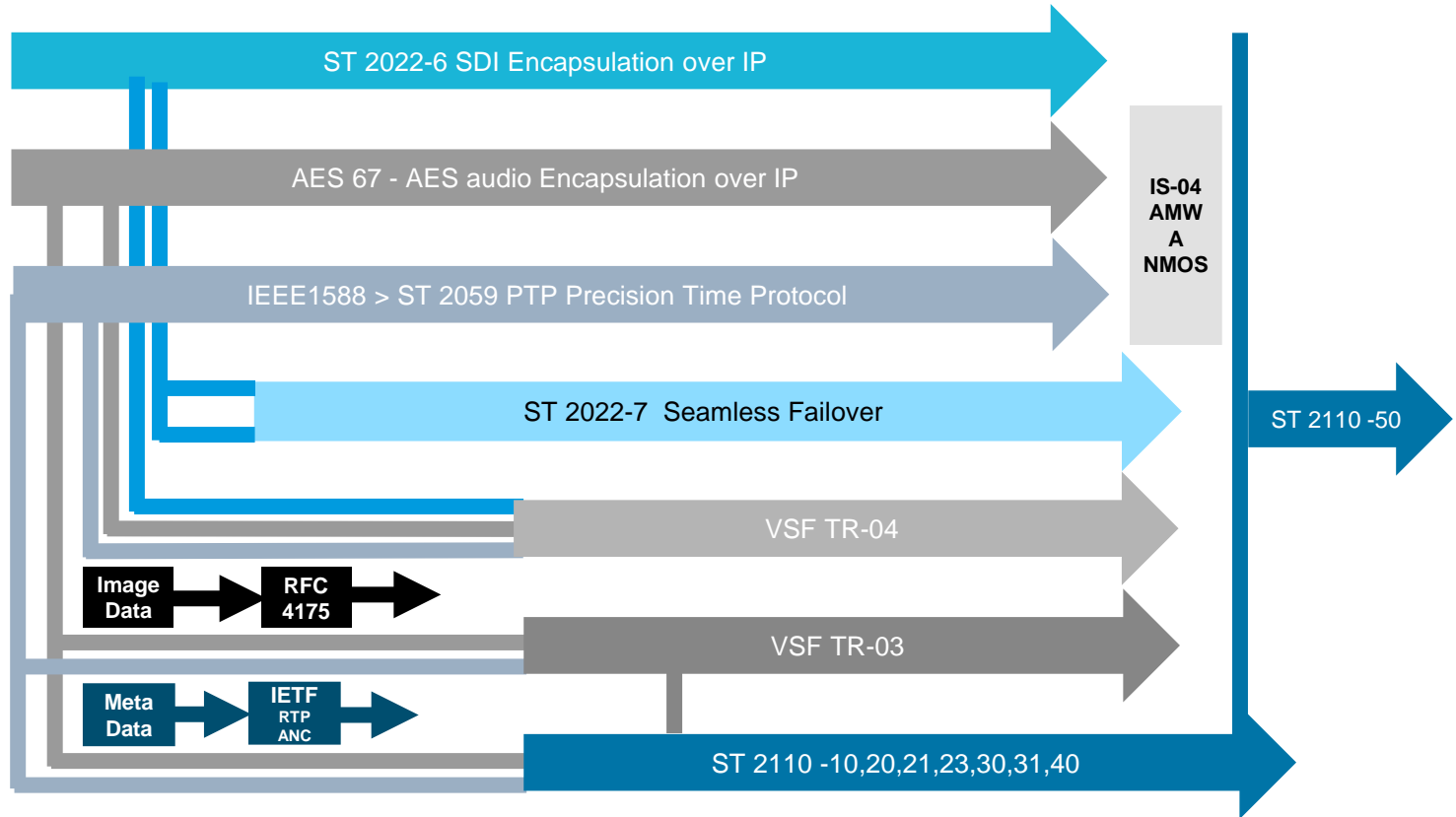


IT Engineer

- IP Flow, Protocol, Network traffic, Configuration
- NTP and PTP
- Less sensitive to the impact to the quality from a bit error
- **Data can be reset- not the case with Video**
- QoS centric mythology
- Challenge in understanding the video technology

**Need Reporting Monitoring and Analysis tools
for QoS and QoE in hybrid facilities**

Video IP Roadmap



Basics of ST2110

- OV 2110-0 - Roadmap of the ST 2110 Document Suite
- ST 2110-10 - System architecture and synchronization: essences, RTP, SIP and PTP.
- ST 2110-20 - Uncompressed video transport, based on ST 2022-6
- ST 2110-21 - Traffic shaping and network delivery timing
- ST 2110-22 - Constant Bit-Rate compressed video transport
- ST 2110-23 - Split high bandwidth single video Essence Streams into Several Lower Bandwidth ST 2110-20 (2SI and Square Division)
- ST 2110-30 - Audio transport RTP IP, based on AES67
- ST 2110-31 - Transport of AES3 PCM formatted audio
- ST 2110-40 - Transport of ancillary data
- ST 2110-50 - Seamless Protection Switching (not published or drafted- use ST2022-7)



We finally get to get rid of blanking!



IP and PTP require new implementation/operational methodologies

Lessons Learned in the New World Order

- **Continuous Learning**
- **Be Active in Professional Associations- WBA SBE SMPTE**
- **Configuration is Everything**
- **SFP Matching**
- **Fiber Cleanliness**
- **NO Patch Panels**
- **Redundancy**
- **Data Networks are Not Smooth**
- **Smooth and Stable is the Goal**

IP and PTP require new implementation/operational methodologies

Lessons Learned in the New World Order

- **Multi Layer- IP Adds Another Layer of Abstraction**
- **Switches – Multicast and PTP Aware- ST 2059 PTP Aware**
- **Stream Captures are Priceless**
- **When in Doubt – Boundary Clock!!!**
- **Your SI is the Key to Your Project Success- Not DIY**
- **Learn Wireshark**
- **Test Equipment is Your Friend**
- **Keep a Library of All Pertinent Standards**
- **Maintain a Book of Knowledge**

Getting Started

- **You need a Sandbox for the entire facility life cycle**
- You need to justify test instrument in business terms
- Every drop down, radio button and fill in the blank- correct!
- Finger pointing
- Need to drill into the abstract multilayer architecture
- Monitor your facility like an Intensive Care Ward
- Assign or become a deep diver into your switch configurations
- Ability to have intelligent conversation with SI and Vendors
- Configure your PTP system then try to break it



Ultra High Definition- High Dynamic Range- Wide Color Gamut

Lessons Learned in Enhancing the Quality of Experience

- Quality of Experience is What Executives Track – Business Case Focus
- UHD is not 4K- 3840 x 2160 not 4096 x 2160
- UHD Presents Bandwidth Challenges
 - Four Wire/Quad Link- Square Division and Two Sample Interleave
 - Single Link- 12G SDI
 - 25G ST2110
- HDR Conversation Back to SDR
- HDR Can be Annoying
- WCG Conversion Back to 709
- Test Equipment is Your Friend

Remote Connectivity

- ERemotely configure and export presets, download the event log and use Syslog for remote analysis of events and alarms.





Telestream Generator Family



SPG8000A – Hybrid PTP/SDI SPG
Every reference signal required for all synchronization applications

ECO8000 – Electronic Change Over
High Reliability Redundancy switch over solution

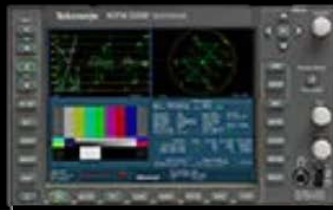
SPG700 – Baseband Sync Pulse Generator
Essential reference and SDI signals for standalone or follower environments

TG8000 – Test Signal Generator
Flexible modular test and synchronization solution



Telestream Family of SDI Waveform Monitors

WFM2300 – Portable
Engineering Trouble Shooting



WFM 5200 – ½ Rack, 3RU, 5.5" Depth
HD SDI in MCR, Technical QC, Shading, HDMI
and short depth applications

WFM7200 – ½ Rack, 3RU, 18.25" Depth
HD SDI in MCR, QC and Operations



WVR5200 – Half Rack, 1RU, 5.5" Depth



WFM8300 – ½ Rack, 3RU, 18.25" Depth
HD/4K SDI in Post Production and
Technical QC

WVR8300/WVR7200 – Full Rack, 1RU, 19.6" Depth

Remote Front Panel
Full Rack, 1RU, 4.5" Depth



PRISM – Hybrid SDI/IP Waveform Monitor



PRISM with ½ Rack, 3RU touch-screen (MPI)



Dual short depth display (trucks, Post)



PRISM full rack, 1 RU with speaker option (MPX)

Introducing 6 new members of the family designed for Live Acquisition and Production



½ Rack,
3RU touch-screen
5" Depth

PRISM MPS-100 Short Depth SDI Waveform Monitor
PRISM MPS-200 Short Depth SDI & IP Waveform monitor
PRISM MPS-300 Short Depth SDI & IP Waveform monitor with Eye

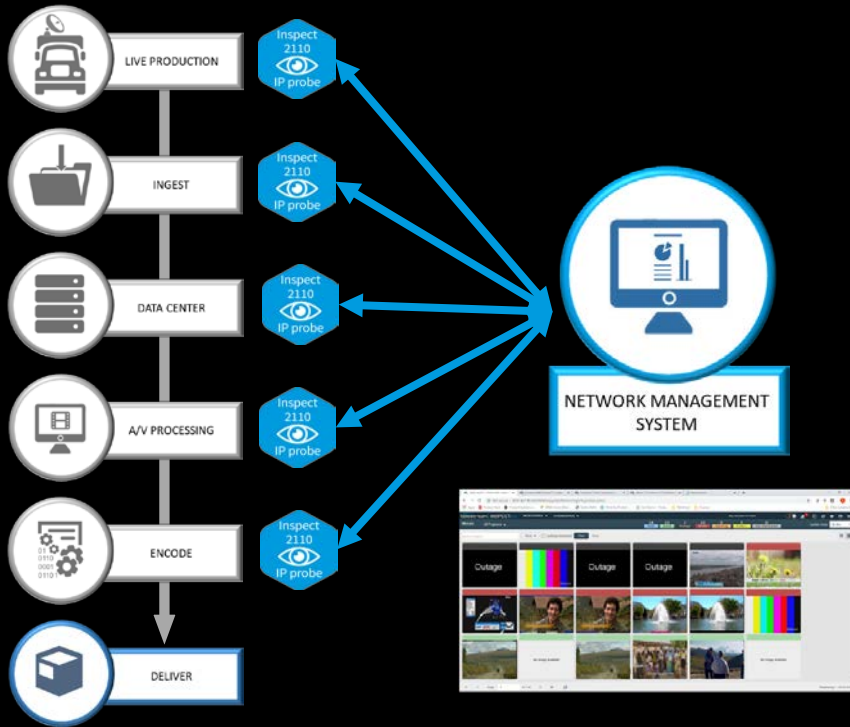


Full Rack,
3RU Dual touch-screen
5" Depth

PRISM MPD-100 Short Depth Dual Screen SDI Waveform Monitor
PRISM MPD-200 Short Depth Dual Screen SDI & IP Waveform monitor
PRISM MPD-300 Short Depth Dual Screen SDI & IP Waveform monitor with Eye

- Available with three connectivity options
 - SDI Only – SDI-SD/HD/3G as standard
 - SDI and IP – Adds ST2022-6 and ST2110 at 10G as standard
 - SDI, IP and Eye – Adds SDI physical layer measurement
- Makes use of current PRISM software option structure
- Software upgrade to support 4K/8K formats
- Software upgrade to support 12G-SDI and 25G IP
- Dual screen version is a waveform monitor not simply a display unit
- MPS Versions can be battery powered for portable applications

Inspect 2110 – large scale monitoring of ST 2110 networks



- Large scale multi-point monitoring of ST2110 networks – monitor the whole workflow
- Each probe provides a mosaic and overview of the status of monitored programs at each point
- Focused on four critical areas:
 - Ensuring PTP is trouble free
 - Redundant Streams are stable
 - Correct content being carried
 - IP network statistics and metrics
- Inspect 2110 looks at the content being carried and alarms on detected issues
- Direct connection to PRISM to provide in depth diagnostics

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