ST 2110
From Theory to Reality
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WHY?
The 3 Typical Reactions When I say IP is ready TODAY

A: 😊 ah really, cool?! Please show me; would be great but vendors typically overpromise and don´t talk about the problems that’s why I present here our strategy and our experiences

B: 😞 hmm – maybe – but it’s too expensive, too complicated to build and maintain and simply I do not have personnel for it fair points – let’s look into these in more detail

C: 😞fine – but I hope I will be retired when it hits my company... great plan – please share how you do and finance it and I will follow up
SDI vs IP Core ~256² UHD / 1024² HD

SDI
~$1,5M
PRICE

IP
~$0,7M

Mux/Demux
SIMPLE

RU
56
8

7
kWATT
250

KG
90

COMPLEX
News-, Sports- and Technology Building

1st floor: Operations

2nd floor: News

3rd floor: News/Sports

4th floor: Sports

Ground floor: Studio Landscape

Basement: Media Data Center

Master Control Room

Ingest

Playout

Presenter Area

Radio Studio

Post Production

Presenter Area

Editorial Staff

Editorial Staff

Editorial Staff
Project Perimeter of “Metechno”
Project Perimeter of “Metechno”

Building Block 1
Acquisition
(Ingest, MCR)

Building Block 2
Post-Produktion
(medm)

Building Block 3
Studio-Produktion
(Studio, PCR)

Building Block 0
Transport
Backbone (Full-IP) & Monitoring

Building Block 4
Aggregation
(Playout)
AV Signal Transport in the News-, Sports- & Technologycenter will be Full-IP

- In-house SMPTE 2110
- External Connections via SMPTE 2022
- SDI Peripherals via Gateway – No hybrid SDI Infrastructure

Why now?

- Commitment to Project and Company Goals ➔ Flexibility, Scaleability, future-proof
- Benefits of the «greenfield approach»
- Risks are getting smaller (AIMS, SMPTE 2110 standard approved, AMWA)

Benefits for operation

- Get your signals easier
- Process optimization and automation
The Core Format for HD & UHD

ST 2110-10  System Timing
ST 2110-20  Uncompressed Video
ST 2110-21  Traffic Shaping Uncompressed Video
ST 2110-22  Compressed Video Essence
ST 2110-30  PCM Audio
ST 2110-31  AES3 Transparent Transport
ST 2110-40  Ancillary Data
ST 2022-08  Integration with ST 2022-6
Metechno Technology - Full-IP SMPTE 2110 Decision Process

Summary of what evolved in the last year

Update risks and chances of the Full-IP decision

Metechno internal assessment

External assessment (EBU)
UHD-1 HDR

- Length: 16.5 m; 54ft
- Width: 2.5/5.6m; 8.2/18.4ft
- Weight: 39t; 165k lb
- Power: 2 x CEE 63
- Up to 24 UHD-Cameras
- 288 Audio Channels (5.1)
- HD/UHD opt. HDR
Technical Overview UHD-1 HDR

- **Skyline Dataminer**
- **Lawo VSM**
- **Imagine SDNO**
- **Connection Management**

**Equipment:***
- **Sony HDC-4300**
- **Sony XVS 8000**
- **EVS XT3/XT4K**

**Networks:**
- **Red & Blue Network SMPTE ST 2022-7 Redundant**
- **HD/UHD over IP (ST 2110) 10/100 GE**

**Connected Devices:**
- **Arista 7504R Arista 7050TX**
- **sonoVTS HDQ**
- **Stagetec Avatus Tektronix Prism Imagine EPIC MV Multiviewer Monitoring**
- **GM1 Tek SPG8000A**
IP Concept

No SDI or AES Router → Full IP Backbone
Compared to SDI: ~184x184 UHD Videomatrix
Extensions can be made easy
SDI / AES3 Sources via Gateways to ST 2110
Full IP to EPIC Multiviewer
COTS Network but Datacenter Class
Non-Blocking Network Architecture (Building will be Blocking!)
Uncompressed Video (up to 12GBit/s)
“Proxy” Generation of each source → Orchestrator switches i.e. Proxy to Multiviewer
No IS-04 or IS-05 in the Truck → More than 50k Multicast IP-Adresses!
Redundancy

• What if a Switch Fails?
• What if the Optics Fail?
• What if a cable Fails?

• ST 2022-7 Redundancy
  • Send *Two Copies*
  • On *Two Interfaces*
  • To *Two Switches*
  • Join and Receive from both
  • Packet-by-packet merge
  • Also used for all parts of SMPTE ST 2110!
ARCHITECTURE

Orchestration Layer

Broadcast Controller 1

Orchestrator

SDN-Controller

Broadcast Controller 2

Peripheral Systems
The «MATRIX»

- 11 Tb/s max throughput
- 108 x 100GE ports (x2)
- In theory: 1000 x 1000 UHD (if fully loaded)
Gateways

- Signal Processing and Format conversion will be made with Imagine Selenio™ Network Processor
- Interfacing from 4x 3GBit SDI / 12 Gbit SDI / SMPTE 2022-6 / NAT to 100GBit/s SMPTE 2022 and vice versa
- 4 independent Processor blocks per unit
- Generates “Proxy” while processing to IP
SNP processor personalities (modes of operation)

**SYNCHRONIZER**
- SDI/IP Gateway
- HD/3G/UHD over ST 2110
- Supports 2SI (UHD)
- Video Proc Amp
- Audio Proc/Shuffle

**UHD REMAP**
- SQD-SDI UHD
- SDI/IP Gateway
- UHD Over ST 2110
- Video Proc Amp
- Audio Proc/Shuffle

**CONVERSION**
- Video Format Conversion
- HD/3G <-> UHD
- Video Proc Amp
- Audio Proc/Shuffle

**HD PROXY**
- 1080i Version of Processed UHD Signal

**HDR PROCESSING**
- SDR-HDR
- SLog3, KLG, PQ
Experiences with UHD1 HDR

Realtime Network runs stable and solid
No Capacity or Bandwidth issues
Due to Elementary Streams
  – Latencies i.e. A/V Runtimes need attention again but are stable and predictable
  – Gateways have to modes: Low-Latency or Sync-Mode (like Framestore)
  – Audio Mixes are available in the Network in different Timebases
No Embedding or De-Embedding anymore
  – Virtualised Embedding in the Orchestrator, Maximum of Flexibility in Audio Handling
Multiviewer Flexibility
  – Every Audio / Videosource can be routed to every Monitor, no fixed connection from Multiviewer to Monitor
Experiences with UHD1 HDR

PTP
- Not stable in the beginning
- PTP is less stable than Blackburst or Tri-Level-Sync
- No problems if you stay in IP but Wander if you convert to SDI

Directors Experiences
- No negative feedback because of IP but positive feedback due to the higher flexibility

Training
- Basic Network training for all Operators
- Super-Users have deeper training
- i.e. IP-Address Conflicts can be solved from normal Operator
- Couple of unicorn’s (Hybrid of IP, Audio, Video Experts)
Experiences with UHD1 HDR

UHD and HDR
- Soccer Europa league and Champions league → UHD SDR
- Cultural Events like Ballets or Concerts → UHD HDR
- Other Productions mainly 1080i/25 SDR

HDR Experiences
- HDR is more challenging for Vision-Engineers
- We have the SONY Workflow: Matching in SDR
- Master-Controller is controlling the HDR
- Clear and strict Workflows are necessary

Focus Control of Cameras
- Again more challenging than in HD
UHD1 HDR – Main Products

IP Realtime Network and Orchestration

Broadcast Controller

IP Gateways & Processing

Cameras and Vision Mixers

Graphics

Audio System

Umbrella Monitoring
Metechno Technology – Main Products

IP Realtime Network and Orchestration

Broadcast Controller

IP Gateways & Processing

Post-Production System and Cameras

Robotics

Studio Automation and Graphics

Vision Mixers

Umbrella Monitoring
Conclusion

IP in ST 2110 works in reality
Expected flexibility fulfilled
Format agnostic approach works
No IP-Experts needed in production → Change is possible and not as hard
Compromises (Gateways) in the truck, much less in the building
Experiences are very helpful for the planning → IP-Lab
Close relationship to manufacturers is needed
Very motivated Employees!
Thank You

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