The Future of Audio and Video over IP in Education

The role of standards, experiences and perspectives

• Rob Moodey, Matrox Video

about IPMX, a new, open standard (no subscription) method for moving video content over modern networks

- Jeremy Nelson, University of Michigan, USA on SMPTE 2110
- Mathy Vanbuel, ATiT, Belgium AV over IP, exploring (the) options

What Video over IP are you using?

What do we mean?



- 1. The use of an encoder to convert the audiovisual material to a bitstream
- 2. The use of an Internet Protocol (IP) network to carry that bitstream encapsulated in a stream of IP packets
- 3. The use of a decoder to reconvert the bitstream into the audiovisual material

Why do we need AV over IP?

- 1. From analog to digital
- 2. IP infrastructure exists (no need for dedicated video infrastructure)
- 3. Scalable and cost effective
- 4. Flexible (quasi unlimited routing, multiple devices)
- 5. Efficient use of bandwidth (adaptive bitrates where applicable)
- 6. Ease of management (remote, automation, analytics...)
- 7. Secure
- 8. Standards

Where does this apply?

- Production
 - Studio
 - Contribution
 - Transmission, distribution
- (Storage)
- (Display)
- (Conferencing)

Not one size fits

Production

- From analog to digital: higher quality, easier to handle, more efficient to transmit
- 1980: SDI (Serial Digital Interface), SMPTE standard for various developments up to 12G-SDI (4K, UHD, 60p, 12Gbps, <16 CH A)
- 2002: HDMI (High-Definition Multimedia Interface), proprietary audio/video interface for transmitting uncompressed video data and compressed or uncompressed digital audio (consumer, prosumer)
- AV over IP

2015: Network Device Interface (NDI)

- Video and audio signals over standard ethernet networks
- High-efficiency, low-latency codec
- Minimal delay, for live production and interactivity
- Allows remote production
- Plug and play and auto discovery
- Synchronisation
- Industry standard? Cross platform support and SDK available NDI 5 : reliable UDP (over wans)

2015: Network Device Interface (NDI)

- High bandwidth requirements; requires HQ networking, manages switches...
- Latency is not 0 and not always stable
- Requires expertise to set up and operate, especially troubleshooting
- Compatibility and vendor lock in Licenses required Need for converters
- Conversion cost
- Processing power

2017: SMPTE 2110

• 2017: SMPTE 2110 describes how to send digital media over an IP network (Video Services Forum)

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2017: SMPTE 2110



- suite of standards developed by the Society of Motion Picture and Television Engineers for professional media over IP networks
- transmission of individual media: video, audio, and ancillary data (separate streams, Essence Based, PTP)
- Uncompressed and compressed video
- Flexible and scalable
- Interoperable standard, future-proof

2017: SMPTE 2110

- Requires HQ network (latency, jitter, congestion)
- Complex technology
- Conversion cost

Other standards?

- srt
 - Industry standard (Haivision)
 - Reliable video transport over unreliable networks (including the Internet)
 - Adaptive bitrate and relatively low latency
 - Balances quality and reliability
 - complexity

Other standards?

- WebRTC
 - W3C and IETF owned (Google development)
 - Real time AV communication between browsers and devices
 - Peer to peer (low latency)
 - Open for developers (APIs)
 - Interactive
 - Not for production but for conferencing and/or contribution, proctoring...

Other standards?

• IPMX

