IPMX: A Profile for Pro AV

Andrew Starks, Macnica Americas

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We’re all just video again…

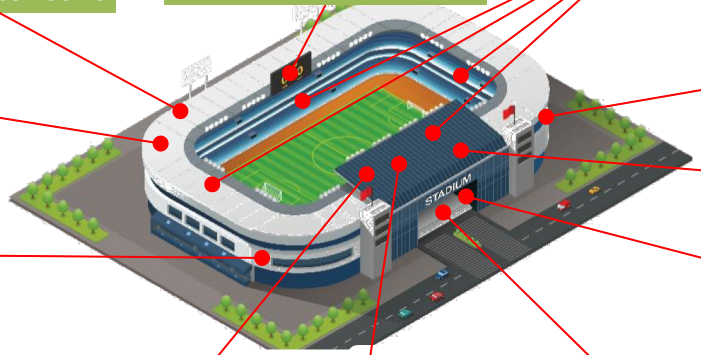
Facility

Conference Rooms

Giant Vision

Isle

Locker Room



Locker Room

Food Signages

Security

OB Truck

TV Commentary

Video Assisted Referee

Ticket

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Example Use cases

- **Digital Signage**
  - Discovery and Registration of devices (all use cases require this)
  - Interoperable compression
  - Reasonably good synchronization for video walls (<1 frame)
  - Inexpensive playout devices
- **Keyboard, Video, Mouse (KVM)**
  - USB extension (HID)
  - Automatic connection capabilities, similar to EDID (Extended Display Identification)
  - Low latency
  - Compression suitable for desktop use (4:4:4, visually lossless)
  - HDCP, to support protected content

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Example Use cases [cont.]

- **Lecture Capture, Live events, Lower-end, not-for-broadcast productions**
  - Automated, low-cost, high-volume video production
  - Compressed and stored in the cloud for later retrieval
  - Support for asynchronous sources, like laptops and non-synchronous PTZ (Pan Tilt Zoom) cameras
- **Conference room video**
  - Flexible connection abilities (EDID)
  - Flexible audio transport to handle consumer sources that have proprietary codecs

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Why does it matter to VSF?

- **Our customers are also pro AV users**
  - HDMI Monitors and GoPro Cameras are everywhere
  - Pro AV Customers do broadcast things. Examples: Caterpillar, Mayo Clinic and McDonalds have broadcast facilities
- **Manufacturers like more customers**
  - Pro AV is $89.99 billion market during the forecast period 2020-2023

    -- https://www.marketreportsworld.com/enquiry/request-sample/14116018
- **Network Effect from cross-industry interoperability**
- **There is no emerging standard for Pro AV…**

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IPMX (Internet Protocol for Media Experience) is a set of **open standards and specifications** to enable the carriage of **compressed** and **uncompressed** video, audio and data over IP networks.

It includes provisions for **control**, **copy protection**, **connection management** and **security**

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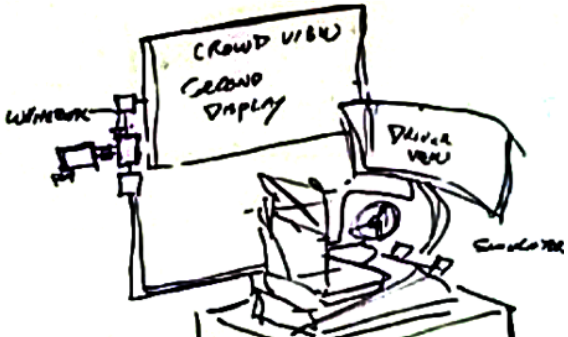
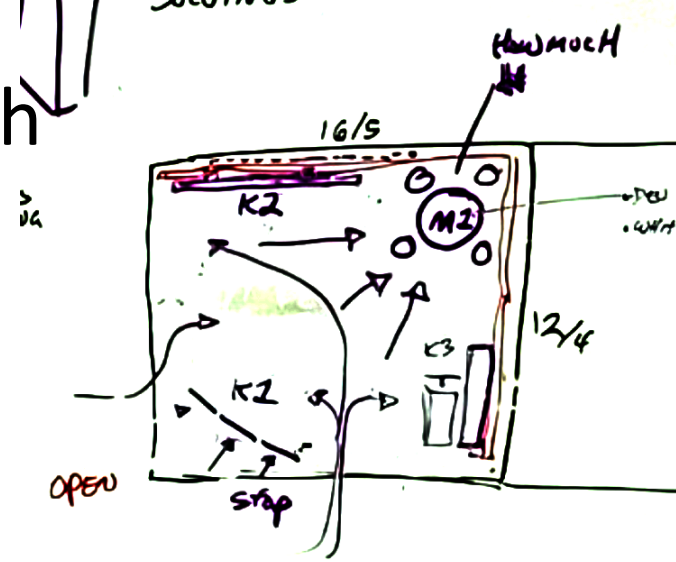
ISE 2020: The Push

- AIMS Pro AV Working Group…
  - Created name for ST 2110, NMOS, etc: IPMX (IP Media Experience)
  - Created ISE 2020 marketing campaign
  - Recruited motivated members to push a roadmap proposal through AIMS in time for ISE 2020





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ISE 2020: Results and Aftermath

- 5 Manufacturers “plan to join AIMS”
  - Harman joined on our invitation, prior to the show
- 11 Videos, 2+ Articles mention IPMX
- Sustained IPMX Campaign through InfoComm (June)
- AIMS Educational article for Sound & Communications Magazine
- Standards Activity
  - NMOS Steering Committee and Incubator
  - AIMS Pro AV Working Group and Technical Working Group
  - AIMS Control Subcommittee
  - ***VSF Activity Proposal***

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The Nice Things Open Standards Bring Us

Dilemma

- Closed proprietary technologies
- Open standard approach

Open standards

- Addresses current needs
- Future advancements

Scalability

- Agility and Flexibility
- Add capabilities without workflow rebuild
- Best-of-breed

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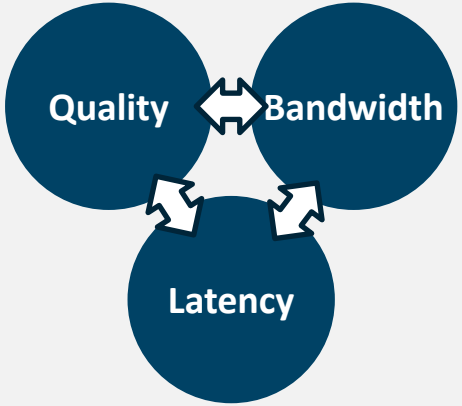
What is needed for AV over IP for Pro AV?

Flexible tradeoffs



Integrate with HDMI

HDCP, CEC, EDID, HPD, USB, …

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Success is…

Highest performance for the specific application

Simple, transparent, and **scalable interoperability**

One clean and simple API for AV over IP communications and control

It is…

better than what it replaces

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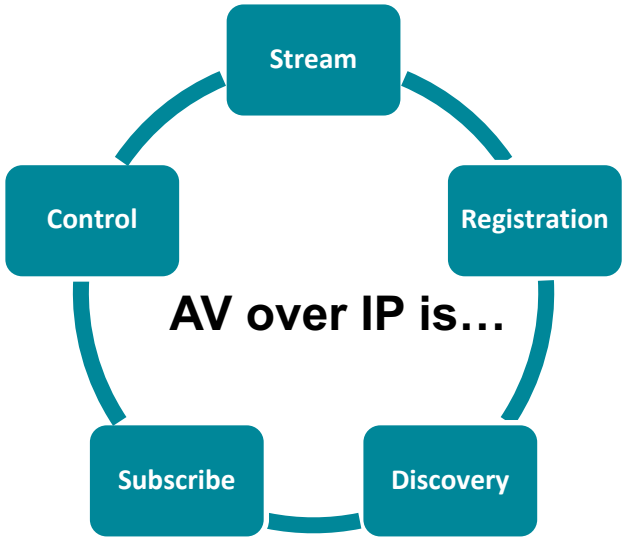
What is Meant by AV over IP?

- Move streams (audio, video, ancillary, control) through an IP network
- Synchronized (A <-> V and also different sources)
- Low-Latency (<1 Frame)
- Publish, Discover, Subscribe, Stream and Control

Could be used in place of HDMI or DisplayPort



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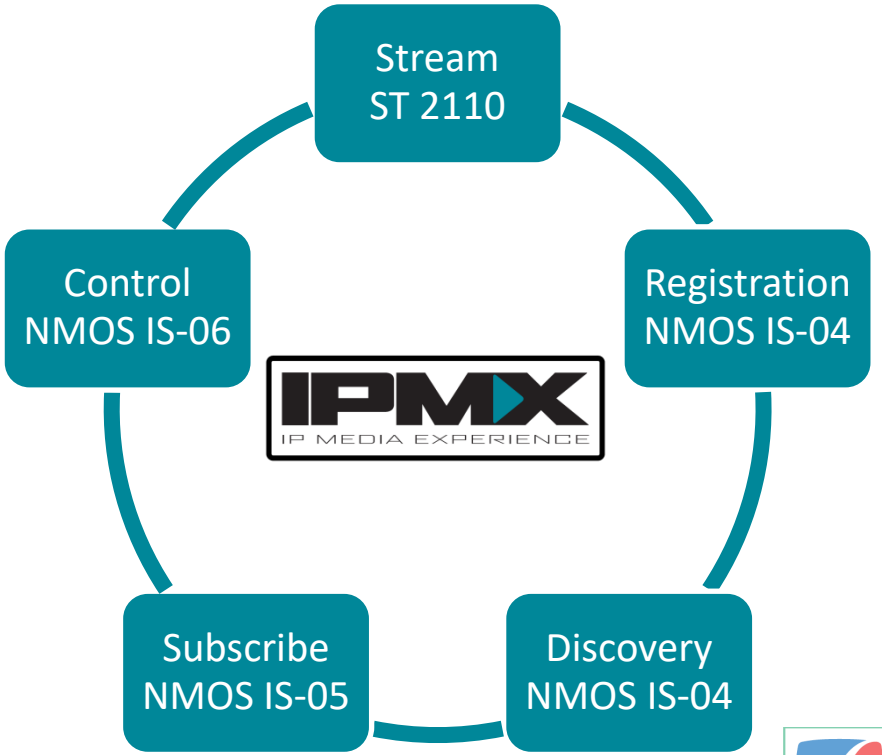
ST 2110 and NMOS

- SMPTE ST 2110 - Transport
  - Essence Streams
  - Timing
  - Description
- NMOS
  (Networked Media Open Specification)
  - Registration
  - Discovery
  - Subscribe
  - Control



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AIMS Roadmap – October 2019

SDI over IP Baseline	Audio over IP	Standardized Transport of Audio, Video, & ANC Elements	System Environment & Device Behaviors
SMPTE ST 2022-6 SDI Over IP	**AES67** Audio Over IP	**SMPTE ST 2110-10** Timing & Definitions **SMPTE ST 2110-20** Uncompressed Video **SMPTE ST 2110-21** Packet Pacing **SMPTE ST 2110-30** AES67 Audio **SMPTE ST 2110-31** AES3 Compressed Audio **SMPTE ST 2110-40**	**PTP, DHCP, LLDP, DNS-SD** Network Environment **AMWA NMOS IS-04** Discovery & Registration **AMWA NMOS IS-05** Connection Management **System Resource** Critical System Parameters
SMPTE ST 2022-6	**AES67**	**SMPTE ST 2110**	**JT-NM TR-1001-1**

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IPMX ***Draft*** Roadmap **Proposal** – February

Audio over IP	Standardized Transport of Audio, Video, & ANC Elements	ProAV Standards & Specifications	
AES67 Audio Over IP	SMPTE ST 2110-10 Timing & Definitions SMPTE ST 2110-20 Uncompressed Video SMPTE ST 2110-21 Packet Pacing SMPTE ST 2110-30 AES67 Audio SMPTE ST 2110-31 AES3 Audio Transport SMPTE ST 2110-40 Ancillary Data	*SMPTE ST 2110-22* *CBR Compression in ST 2110* *ISO/IEC 21122* *JPEG XS Codec* *NMOS IS-04 & IS-05* *Discovery, registration & connection management* *EDID / DisplayID / HPD Support**	HDCP* *Copy protection* General Purpose I/O* IR Remotes, GPIO, USB, RS232 over IP NMOS IS-08* Audio channel mapping IPv6* Network addressing *Security** Authentication, Encryption

AES67 → SMPTE ST 2110 → IPMX (IP MEDIA EXPERIENCE)

* not ratified yet by AIMS, and therefore proposed roadmap additions

Required

Optional

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The Work Ahead

- Engage: Marketing is Important!
  - Evangelize IPMX to the market
  - Engage and collect use cases from **Integrators and End Users**
- Define Base Interoperability
  I can plug IPMX device A into IPMX device B and I can see video.
  - What is an IPMX device?
  - Multiple bandwidth (Higher bandwidth eats smaller bandwidth)
- **Define New Technology**

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Technology Needs: **CODEC**

- Base Codec required for interoperability
- JPEG-XS is the current proposal
  - Implementation size
  - Low Latency
  - Very good performance today
- Uncompressed support should be present (>1GbE)
- Other codecs are allowed
- 1GbE KVM Use case:
  - KVM 4K60 444, HDMI Audio, USB HID, control traffic
  - “Visually Lossless-ish”

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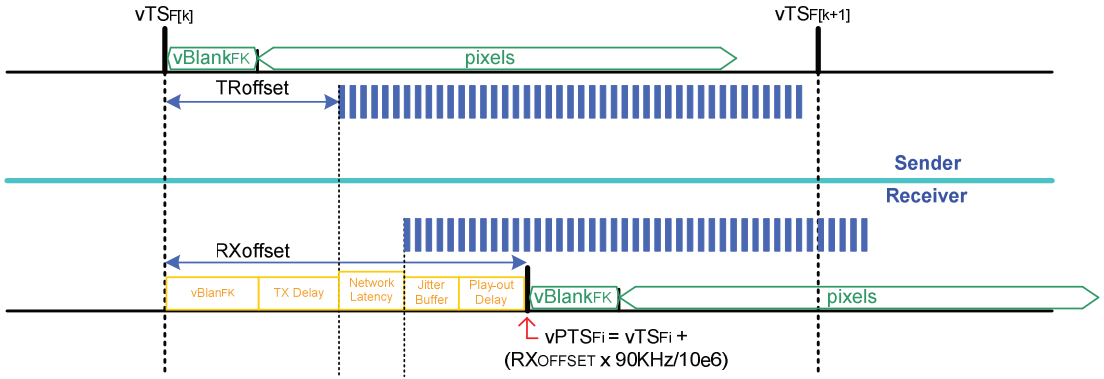
Technology Needs: **Timing**

- Timing Proposal from Matrox to AIMS Technical Working Group
- Most media are not locked to PTP – “async media”
- Low latency (<1 frame) mode from source to sink
- Adds an offset so that device can track content drift



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Technology Needs: Content Protection (HDCP)

- HDCP “compliance” over IP: Currently, Wild West
- Version 2.3 is in progress
- They are adding support for SMPTE ST 2110
- What are the limits and requirements for compliance?
- How far off will this be from content protection in RIST?

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Technology Needs: **Dynamic connection management**

- Extended Display IDentification (EDID) Re-Imagined for IP
- Multiple receivers of different monitor types
- Late joins, etc.
  - Network conditions change, adjust profile to accommodate
  - Respect limits of HDCP content dristribution
- Touches on *real-time control*

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Technology Needs: **Control**

- NMOS IS 04/05 for discovering
- Asynchronous control streams
  - Hot Plug Detect events (HPD)
  - Consumer Electronics Control (CEC)
- USB / Generic Serial
  - Keyboard Video Mouse (KVM): Core Application
  - Some patent issues with file transfers
  - Invent the whole mechanism or enable discovery and connection of existing ones?

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Spreading the Message

- Integrators and Consultants in Pro AV want open standards
- Manufacturers are mixed.
- How do we increase awareness and engagement?
- A start:
  - Host a webinar or lunch and learn for Pro AV and IT systems integrators
  - Survey their interest, concerns, ideas, etc.
  - Join AIMS to stay in touch with progress and to help us promote the effort.
  - Join VSF to help shape the emerging standard

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21st Century Gutenberg Moment

Today, we tell stories with video and now, we are defining open standards for audio and video over IP. That is, we are defining how 21st century's version of ink is applied to paper.

When we do, the impact will be transformative, not only for the Pro AV industry, but for human beings everywhere.

Replica of The Gutenberg Press
https://en.wikipedia.org/wiki/Printing_press

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Thank you!

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