

IPMX & Live Production

Andrew Starks



IP SHOWCASE



**Open standards AV over IP for Pro AV
built on existing broadcast standards:
ST 2110 & NMOS**



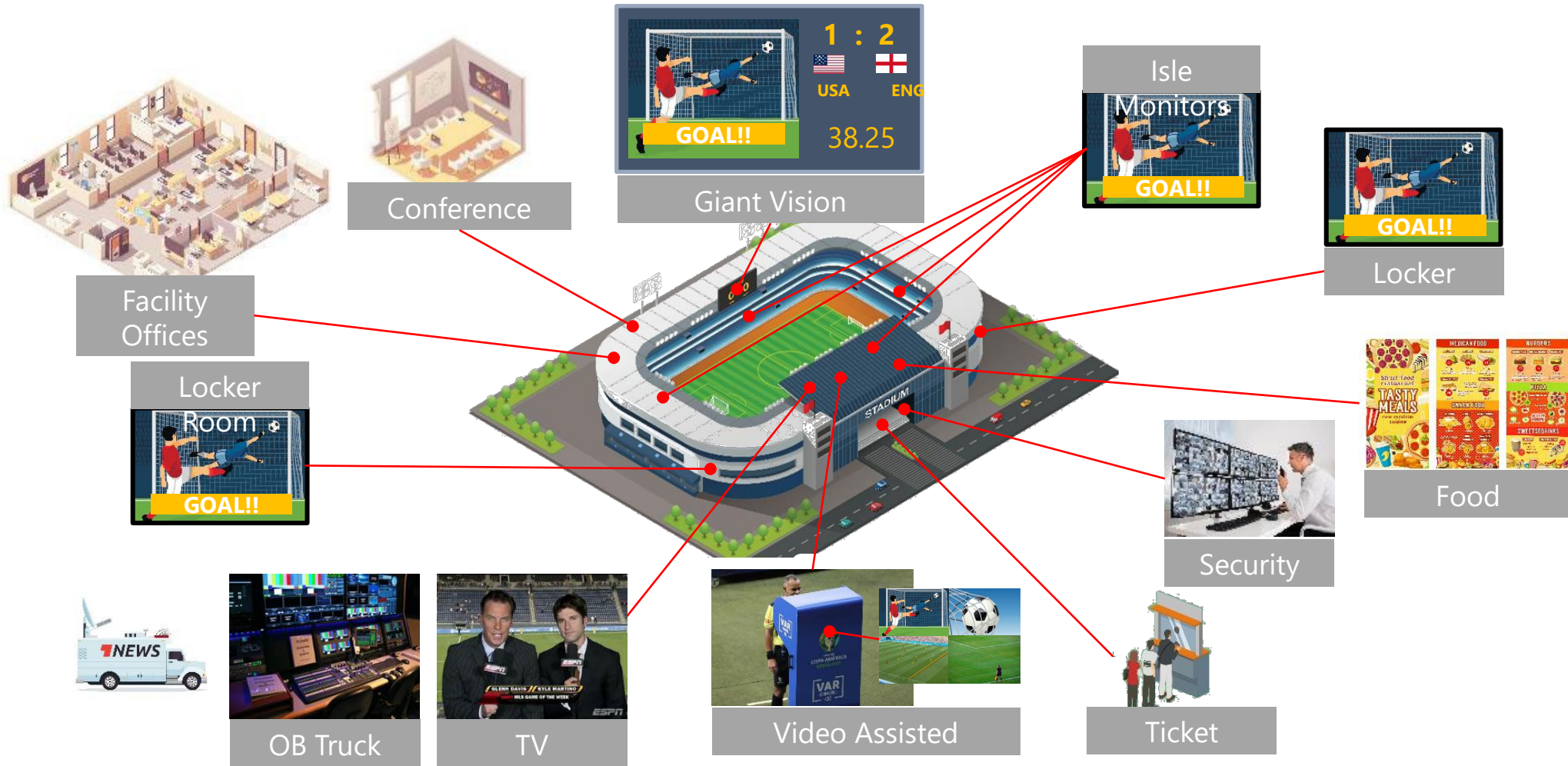
What does Pro AV mean?

Pro AV is...



The market for audiovisual (AV) communication equipment used in professional, industrial, commercial, and retail environments to communicate with people.

We're all just video now...



Currently in Pro AV...



- Excellent Quality
- Low latency
- Stable Operation

...and incompatible

- Discovery
- Connection
- Transport

Single-Source Chip/Library
(Proprietary) Multi-Vendor
Interoperable Transport



Proprietary Ecco Systems

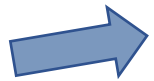
DM NVX®

NAV
PRO AVoIP

SVSI

more than a dozen others...

Built on Existing Standards



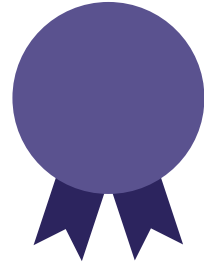
Integrated
Systems
Europe



IPMX brand launched at
ISE 2020 Show
(Feb 2020)

2018
Pro AV WG Starts
ST2110 + NMOS +
additional functions

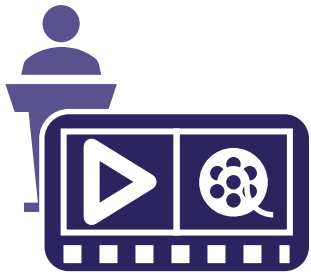
What does Prov Need?



A Real Standard



Cloud & Premise



Presentations &
Productions



Economical for
Today



Ready for
Tomorrow



Established

ST 2110 and NMOS:
Thousands of deployed devices



Transport

Multicast & Unicast,
Based on ST 2110 (Elementary)
UDP, RTP, 1-100+ GbE



Open API

Registration & Discovery,
Registry or P2P, Control



Timing

Optional PTP, Asynchronous
and Synchronous



Video

SD → 32K, JPEG-XS, EDID/HPD
Compression, Uncompressed



Audio

AES 67, Common Pro AV &
Consumer Formats



Security

Oath2, HTTPS, and HDCP 2.3



Control

USB/KVM, CEC, Serial,
GPIO Extension

JT-NM Pro AV Roadmap

(not official, see official version on the [JT-NM website](#))



	in progress	phase 1	phase 2	
control	<ul style="list-style-type: none"> ✓ Discovery, Registration, Connections NMOS IS-04 🔄 Dynamic Connections NMOS IS-05 & 07, Receiver Capabilities, EDID / HPD 	<ul style="list-style-type: none"> Network Services and Node Behavior ProAV version of TR-1001-1 Audio channel mapping NMOS IS-08 Support for Legacy Integration ARC, CEC, IR Remotes, GPIO, RS-232 🔄 Network addressing IPv4/IPv6 	<ul style="list-style-type: none"> Training and Certification Curriculum and AVIXA Renewal Credits Device / Content Control Open, public control framework USB – HID Registration, Discovery, and Connection with support for Touch Screens 	true plug & play
media	<ul style="list-style-type: none"> ✓ Uncompressed Video & Audio ST 2110-20 & 30, AES67, AES3 🔄 Compressed Video Open, Freely Available CODEC ✓ Precise Timing SMPTE ST 2110-10, ST 2059 🔄 Simplified Timing VSF-TRxxx, Async & Relaxed timing 	<ul style="list-style-type: none"> Forward Error Correction VSF-TRxxx ProAV Audio Formats VSF-TRxxx 	<ul style="list-style-type: none"> WAN & Internet Compression Codecs widely implemented in the AV over IP market WAN Error Correction Automated Return Request (RIST or SRT, tbd) Access Services (e.g. Closed Captioning) SMPTE ST 2110-40 or 41 	full flexibility
security	<ul style="list-style-type: none"> 🔄 Access, Authentication & Control Encryption NMOS IS-10 	<ul style="list-style-type: none"> 🔄 Copy protection HDCP 2.3, VSF-TRxxx Content Encryption VSF-TRxxx 		secure by design

Complete
 In Progress

Momentum for Open Standards AV over IP



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Pro AV WG Starts
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additional functions

Integrated
Systems
Europe



IPMX brand launched at
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(Feb 2020)



- AIMS Pro AV Working Group dramatically increases promotion



- VSF and AMWA become involved in new technical specifications

MAGEWELL[®]

joined AIMS
(June 2020)

infocomm
OCT. 27-29, 2021 - ORLANDO, FL



More general acceptance
of the need for IPMX by
InfoComm 2021 attendees
and exhibitors
(Oct 2021)



ANALOG WAY[®]

PANDUIT[®]

joined AIMS
(Mar, Aug 2021)

infocomm



Multi-vendor Interop at
InfoComm 2022
(June 2022)

intel

NETGEAR

XILINX[®]

joined VSF
(Feb 2022)



BARCO

joined AIMS
(Apr 2022)

Okay, what are the differences?
What about live production?



The Differences that Lower Cost



	ST 2110 	
2110-20 Uncompressed	Optional, Typical	Optional
2110-22 with JPEG-XS	Optional	Optional, Baseline
Precision Time Protocol (PTP)	Required, ST 2059-1 & 2	Optional reduced accuracy & request interval minimums
RTCP Sender Reports	—	Required for async sources
Wide Sender (-21 Type W)	Optional	Required

The Tweaks & Additions



	ST 2110 	
YUV 4:2:2	Assumed	Required
RGB 4:4:4	Optional	Required
Audio	2110-30 (AES76)	2110-30 (AES76)
48, 44.1 & 96 kHz audio	Optional, Optional, Optional	Required, Should, Should
NMOS (IS 04, 05)	Optional	Required
IS-11 (EDID and Dynamic Connections)	Optional	Optional
HDCP 2.3 Support (HKEP)	—	Optional

What does it mean for live production?



- Supports synchronous and asynchronous sources directly.
 - Add asynchronous devices to a synchronous production and retain timing info.
 - Helps manage latency within the system.
- PTP that is easier to deploy
 - Similar to AES67 requirements. Low-cost switch and device compatible
- NMOS as the baseline control protocol grants universal discovery and registration
 - EDID (IS-11) Support useful for like multiviewers
- KVM support is useful for supporting controller interfaces
- JPEG-XS as the baseline codec (TR-10-11 IPMX Compressed Video)
 - Near-perfect 4K60 4:2:2 over 1GbE
 - Subframe latency
 - Very low CPU/GPU usage
 - Other codecs supported
- Delivers software-friendly live production
- Retains interoperability with ST 2110

Any Questions?

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Slide no bullets



Content – no bullets.

Slide with bullets



- Bullet 1
- Bullet 2
 - Bullet 3
 - Bullet 4

Image slide



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Image caption if
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