IPMX vs. SMPTE 2110: Understanding the Differences and Use Cases

The shift to IP-based media workflows has transformed broadcasting and professional audio visual (pro AV) industries, with SMPTE 2110 and IPMX emerging as key standards for transporting video, audio, and metadata over IP networks. SMPTE 2110, developed by the Society of Motion Picture and Television Engineers, is a cornerstone for broadcast production. While IPMX, created by Alliance for IP Media Solutions (AIMS), Video Services Form and Advanced Media Workflow Association, Inc. (AMWA) extends these principles to pro AV applications like corporate events and live installations. In 2025, as broadcasters and pro AV integrators adopt these standards, understanding their differences and use cases is critical for selecting the right solution. This article compares SMPTE 2110 and IPMX, exploring their technical foundations, strengths, challenges, and ideal applications, with a critical perspective on their implementation.

What Are SMPTE 2110 and IPMX?

SMPTE 2110

SMPTE 2110 is a suite of standards for professional media over IP, designed to replace Serial Digital Interface (SDI) in broadcast environments. It separates video, audio, and metadata into independent streams, or "essences," transported over IP networks using Real-time Transport Protocol (RTP). Key SMPTE ST 2110 Standards:

- ST 2110-10: System Timing and Definitions
- ST 2110-20: Uncompressed Active Video
- ST 2110-21: Traffic Shaping and Delivery Timing for Video
- ST 2110-22: Constant Bit-Rate Compressed Video
- ST 2110-30: PCM Digital Audio
- ST 2110-31: AES3 Transparent Transport
- ST 2110-40: SMPTE ST 291-1 Ancillary Data
- ST 2110-41: Fast Metadata Framework
- ST 2110-43: Timed Text Markup Language for Captions and Subtitles

SMPTE 2110 prioritizes quality and flexibility over bandwidth efficiency, supporting high resolution formats for live production. It was built on Video Services Forum’s TR-03 and

TR-04 recommendations and finalized in 2017, with updates in 2022.

IPMX

IPMX, or Internet Protocol Media Experience, is an open standard based on SMPTE 2110, tailored for pro AV applications. Developed by AIMS, VSF and AMWA, IPMX extends SMPTE 2110's capabilities with features like HDMI support, HDCP for content protection, and USB connectivity. It maintains compatibility with SMPTE 2110 but adds flexibility for environments without PTP, targeting installations like LED walls, corporate events, and education. IPMX aims to broaden AV-over-IP adoption by simplifying configurations and supporting custom resolutions.

Key IPMX Technical Recommendations

(https://vsf.tv/technical-recommendations/): TR-10-0: General Organization

TR-10-1: System Timing and Definitions

TR-10-2: Uncompressed Active Video

TR-10-3: PCM Digital Audio

TR-10-4: SMPTE ST 291-1 Ancillary Data

TR-10-5: HDCP Key Exchange Protocol

TR-10-6: Forward Error Correction

TR-10-7: Compressed Video

TR-10-8: NMOS Requirements

TR-10-9: Requirements for System Environments and Device Behavior

TR-10-10: HDMI InfoFrame Packet Transport

TR-10-11: Constant Bit-Rate Compressed Video

TR-10-12: AES3 Transparent Transport

TR-10-13: Privacy Encryption Protocol (PEP)

TR-10-14: IPMX USB

Key Differences Between SMPTE 2110 and IPMX

1. Target Markets

• SMPTE 2110: Designed for broadcast production, such as TV studios, sports, and news, where uncompressed, high-quality streams and precise synchronization are critical. It's used in controlled, high-bandwidth environments.

• IPMX: Targets pro AV, including corporate events, digital signage, and live installations. It suits less controlled environments, like conference centers or universities, where ease of setup and HDMI compatibility are valued.

2. Synchronization

• SMPTE 2110: Requires PTP for sub-microsecond synchronization, using grandmaster clocks to align streams across devices. This is essential for live broadcasts with multiple cameras and audio tracks.

• IPMX: Supports PTP for compatibility with SMPTE 2110 but allows operation without a common reference clock. It uses RTCP to signal timestamps relative to an internal clock, enabling simpler setups in environments lacking PTP infrastructure.

3. Switch, Network and Bandwidth Requirements

• ST 2110 demands higher bandwidth, strict synchronization, and complex configurations, while IPMX offers flexibility and cost savings.
• ST 2110 networks range from small studios to large broadcast facilities, requiring scalable designs like spine-and-leaf for high-density connections. ST 2110 network switches must be managed, high-performance, low-latency switches with 10Gbps+ (e.g.,10Gbps, 25Gbps, 100Gbps, 400Gbps) ports capable of handling PTP, IGMP/PIM, QoS, NMOS (IS-04 and IS-05), and ST 2022-7 (seamless protection and redundancy). These switches are typically Commercial Off-The-Shelf (COTS) but require specific features and configurations to meet ST 2110's demands for uncompressed media (e.g., 2.7 Gbps for 1080p, 10.5 Gbps for UHD, 20.1Gbps for DCI). ST 2110-22 supports low latency JPEG XS compression with bandwidths typically less that 800Mbps. • IPMX networks in general are much simpler than ST 2110 since they are designed for applications like corporate presentations, education, digital signage, broadcasting, and live events. IPMX networks typically use managed high-bandwidth low-latency Audio-Visual over Internet Protocol (AVoIP) Switches with 1Gbps/10Gbps or 1Gbps/10Gbps/25Gbps ports capable of

handling both compressed media (usually less than 800Mbps) and uncompressed media (2.7 Gbps for 1080p, 10.5 Gbps for UHD), optional PTP, IGMP, multicast traffic, PoE and NMOS (IS-04, IS-05, IS-11). AVoIP
switches are typically Commercial Off-The-Shelf (COTS) products, meaning they are commercially available, pre-built, and require minimal configuration for IPMX deployments.

4. Additional Features

• SMPTE 2110: Focuses on broadcast-specific needs, with robust support for video, audio and metadata. It lacks native HDCP for protected content, HDMI and USB support, limiting its use in Pro AV.

• IPMX: Caters to Pro AV's need for versatile connectivity with HDCP Key Exchange Protocol (HKEP) Copy Protection for protected content, Privacy Encryption Protocol (PEP), HDMI compatibility, and USB for peripherals like cameras, touchscreens and KVM applications. It also supports custom resolutions for LED walls.

Use Cases

SMPTE 2110 Use Cases

• Live Sports Broadcasting: SMPTE 2110's uncompressed streams and PTP synchronization are ideal for multi-camera UHD productions, ensuring flawless alignment of video and audio.

• News Studios: Its flexibility allows cable new networks to route video to editors, audio to mixers, and metadata to graphics systems in real-time, enhancing newsroom efficiency.

• Large-Scale Studios: Large broadcast studios use SMPTE 2110 to manage hundreds of streams, supported by high-capacity spine-leaf networks.

IPMX Use Cases

• Corporate Events: IPMX's HDMI support and simplified setup make it perfect for conferences, where LED walls display custom resolutions and HDCP protects content.

• Digital Signage: Its ability to operate on 1Gbps networks with compression suits

retail or airport displays.

• Education: Universities use IPMX for lecture halls, integrating USB cameras and touch screens for interactive learning, with plug-and-play ease reducing setup time.
• Live Installations: IPMX's custom resolution support and low-bandwidth options enable complex LED setups for concerts or museums, offering stability over SMPTE 2110's PTP reliance.

Benefits and Challenges

SMPTE 2110

• Benefits: Uncompromised quality for UHD and DCI live production.

• Precise PTP synchronization for multi-stream alignment.

• Scalable for large broadcast facilities with NMOS interoperability.

• Challenges: High bandwidth (10Gbps+) requirements and ST 2022-7 (seamless protection and redundancy) increase network costs.

• PTP complexity requires Grandmaster clocks and expertise.

• Limited applicability outside broadcast due to lack of support for HDMI and HDCP for protected content.

IPMX

• Benefits: Flexibility for Pro AV markets with HDCP Key Exchange Protocol (HKEP) Copy Protection for protected content, Privacy Encryption Protocol (PEP), HDMI compatibility and USB support.

• Supports a wide range of video formats and resolutions needed for Pro AV over IP applications

• Operates on lower-bandwidth networks, reducing costs.

• Simplified setup without ST 2022-7 (seamless protection and redundancy) and mandatory PTP, ideal for dynamic environments.

• Challenges: Less mature than SMPTE 2110.

• Interoperability with SMPTE 2110 requires PTP, limiting plug-and-play benefits in

mixed systems.

Choosing the Right Standard

- Choose SMPTE 2110 for: High-budget broadcast environments needing uncompressed UHD, precise synchronization, and cloud integration, such as live sports or news.
- Choose IPMX for: Pro AV applications requiring cost-effective, flexible setups, with HDMI/HDCP support, like corporate events, education, or LED installations.
- Consider Hybrid Approaches: Smaller broadcasters or mixed AV/broadcast setups can use gateways to combine SMPTE 2110 with IPMX.

Conclusion

SMPTE 2110 and IPMX represent the future of IP-based media, but they serve distinct needs. SMPTE 2110 excels in broadcast environments, delivering uncompressed quality and precise synchronization for live production. IPMX extends these principles to Pro AV market, offering
flexibility, lower cost simpler network requirements and HDMI support for events and installations. Broadcasters and integrators must weigh bandwidth, synchronization, and interoperability needs against budget and use cases.