



VIDEO SERVICES FORUM

# **Video Services Forum (VSF) Technical Recommendation TR-10-2**

Internet Protocol Media Experience (IPMX):  
Uncompressed Active Video



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## **Executive Summary**

Internet Protocol Media Experience (IPMX) was created to foster the adoption of open standards-based protocols for interoperability over IP in the media and entertainment and professional audio/video industries. IPMX is based on the SMPTE ST 2110 standard and as such the VSF TR-10 suite of technical recommendations is a set of differences between SMPTE ST 2110 and IPMX.

This technical recommendation documents the transport of uncompressed active video using RTP protocol in IPMX. It documents the differences between TR-10-2 and the SMPTE ST 2110-20 specification.

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## 1 Introduction (Informative)

IPMX, which stands for IP Media Experience, is based on two families of specifications. The SMPTE ST 2110 Professional Media Over Managed IP Networks suite of standards for the transport of video, audio, and ancillary/control signals over IP networks, and the NMOS REST APIs from AMWA, which provide discovery, connection management, and control.

IPMX is an accessible, open standard that meets the needs of professional and consumer video and audio users in a wide variety of contexts while giving manufacturers and developers what they need to build low-latency, interoperable, IP based audiovisual products or applications.

This document covers the IPMX transport of uncompressed active video using the RTP protocol. Other aspects of the IPMX system as well as other IPMX individual media essence types and their individual requirements are documented in other parts of this Technical Recommendation.

### 1.1 Contributors

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## 1.2 About the Video Services Forum

The Video Services Forum, Inc. ([www.videoservicesforum.org](http://www.videoservicesforum.org)) is an international association dedicated to video transport technologies, interoperability, quality metrics and education. The VSF is composed of [service providers, users and manufacturers](#). The organization's activities include:

- providing forums to identify issues involving the development, engineering, installation, testing and maintenance of audio and video services;
- exchanging non-proprietary information to promote the development of video transport service technology and to foster resolution of issues common to the video services industry;
- identification of video services applications and educational services utilizing video transport services;
- promoting interoperability and encouraging technical standards for national and international standards bodies.

The VSF is an association incorporated under the Not For Profit Corporation Law of the State of New York. [Membership](#) is open to businesses, public sector organizations and individuals worldwide. For more information on the Video Services Forum or this document, please call +1 929-279-1995 or e-mail [opsmgr@videoservicesforum.org](mailto:opsmgr@videoservicesforum.org).

## 3 Conformance Notation

Normative text describes elements of the design that are indispensable or contain the conformance language keywords: "shall," "should," or "may."

Informative text is potentially helpful to the user but not indispensable and can be removed, changed, or added editorially without affecting interoperability. Informative text does not contain any conformance keywords.

All text in this document is, by default, normative, except the Introduction and any section explicitly labeled as "Informative" or individual paragraphs that start with "Note:"

The keywords "shall" and "shall not" indicate requirements strictly to be followed to conform to the document and from which no deviation is permitted.

The keywords "should" and "should not" indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

The keywords "may" and "need not" indicate courses of action permissible within the limits of the document.

The keyword “reserved” indicates a provision that is not defined at this time, shall not be used, and may be defined in the future. The keyword “forbidden” indicates “reserved” and in addition indicates that the provision will never be defined in the future.

A conformant implementation according to this document is one that includes all mandatory provisions ("shall") and, if implemented, all recommended provisions ("should") as described. A conformant implementation need not implement optional provisions ("may") and need not implement them as described.

Unless otherwise specified, the order of precedence of the types of normative information in this document shall be as follows: Normative prose shall be the authoritative definition; Tables shall be next; followed by formal languages; then figures; and then any other language forms.

## 4 Normative References

- SMPTE ST 2010-20:2017 Professional Media Over Managed IP Networks: Uncompressed Active Video
- VSF TR-10-1 Internet Protocol Media Experience (IPMX): System Timing and Definitions
- VSF TR-10-8 Internet Protocol Media Experience (IPMX): NMOS Requirements
- VSF TR-10-9 Internet Protocol Media Experience (IPMX): IPMX Requirements for System Environment and Device Behavior

## 5 Definitions

For the purposes of this document, the terms, and definitions of VSF TR-10-1 and those of SMPTE ST-2110-20:2017 apply.

## 6 General Provisions

All IPMX Senders and Receivers shall comply with the following specifications:

SMPTE ST 2110-20:2017 Sections 1-5, 6.1.2, 6.1.4, 6.1.5, 6.2, 6.3, and 7, subject to the constraints in this document

The active sample arrays of the video essence shall be transported using RTP (IETF RFC 3550), subject to the constraints and payload formats defined elsewhere in this document and in the applicable sections of ST 2110-20:2017.

Unless otherwise noted, multi-octet fields within the RTP Header, RTP Payload Header, and RTP Payload shall be transmitted in Network Byte Order (most significant byte first).

When represented in bit-field diagrams, the most significant bits of multi-bit fields shall occupy the lowest-numbered bit index positions (left-most positions in the figures), and shall be transmitted first.

The image technical metadata necessary to receive and interpret the RTP stream shall be communicated via SDP as defined in section 7 of SMPTE ST 2110-20:2017.

IPMX Senders shall make their SDP object available through the method described in TR-10-8.

Senders and Receivers compliant with this standard shall comply with the provisions of VSF TR-10-1, TR-10-8 and TR-10-9.

## 7 Payload Formats

IPMX Receivers compliant with this standard shall support media payload sample format of YCbCr 4:2:2 with a bit depth of 10 bits per component, and RGB 4:4:4 with a bit depth of 8 bits per component.

## 8 Media Clock, RTP Clock, and RTP Timestamps

The Media Clock and RTP Clock shall comply with the provisions of VSF TR-10-1. The Media Clock and RTP Clock rate for streams compliant with this standard shall be 90 kHz.

All RTP packets which are part of the same progressive frame shall contain the same RTP Timestamp value.

All RTP packets which are part of the same interlaced field shall contain the same RTP Timestamp value.