SMPTE STANDARD

Professional Media Over Managed IP Networks: System Timing and Definitions

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445 Hamilton Avenue., White Plains, NY 10601
(914) 761-1100

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Foreword

SMPTE (the Society of Motion Picture and Television Engineers) is an internationally-recognized standards developing organization. Headquartered and incorporated in the United States of America, SMPTE has members in over 80 countries on six continents. SMPTE's Engineering Documents, including Standards, Recommended Practices, and Engineering Guidelines, are prepared by SMPTE's Technology Committees. Participation in these Committees is open to all with a bona fide interest in their work. SMPTE cooperates closely with other standards-developing organizations, including ISO, IEC and ITU.

SMPTE Engineering Documents are drafted in accordance with the rules given in its Standards Operations Manual. This SMPTE Engineering Document was prepared by Technology Committee 32NF.

Intellectual Property

At the time of publication no notice had been received by SMPTE claiming patent rights essential to the implementation of this Engineering Document. However, attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. SMPTE shall not be held responsible for identifying any or all such patent rights.

Introduction

This section is entirely informative and does not form an integral part of this engineering document.

The capability and capacity of IP networking equipment has improved steadily, enabling the use of IP switching and routing technology to transport and switch video, audio, and metadata essence within television facilities. Existing standards such as SMPTE ST 2022-6 have gained some amount of use in this application, but there was a desire in the industry to switch different essence elements separately.

This family of SMPTE standards builds on the work of VSF TR-03 and TR-04, and of AES67, documenting a system for inter-networking various essence streams and capturing the timing relationships between those streams. The system is intended to be extensible to a variety of essence types.

This standard covers the system as a whole, the timing model, and common requirements across all essence types. Subsequent parts of this standard document the individual media essence types and their individual requirements as used within this system.

1 Scope

This family of engineering documents defines an extensible system of RTP-based essence streams referenced to a common reference clock, in a manner which specifies their timing relationships.

This standard specifies the system timing model and the requirements common to of all of the essence streams.

2 Conformance Notation

Normative text is text that describes elements of the design that are indispensable or contains the conformance language keywords: "shall", "should", or "may". Informative text is text that 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, 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 in order 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; then formal languages; then figures; and then any other language forms.

3 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this engineering document. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this engineering document are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

AES67:2015, AES standard for audio applications of networks - High-performance streaming audio-over-IP interoperability

IEEE 1588-2008 IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems

Internet Engineering Task Force (IETF) RFC 768 User Datagram Protocol [online, viewed 2017-08-10] Available at https://www.ietf.org/rfc/rfc768.txt

Internet Engineering Task Force (IETF) RFC 791 Internet Protocol [online, viewed 2017-08-10] Available at https://www.ietf.org/rfc/rfc791.txt

Internet Engineering Task Force (IETF) RFC 2460 Internet Protocol, Version 6 (IPv6) Specification [online, viewed 2017-08-10] Available at https://www.ietf.org/rfc/rfc2460.txt

Internet Engineering Task Force (IETF) RFC 3550 RTP: A Transport Protocol for Real-Time Applications [online, viewed 2017-08-10] Available at https://www.ietf.org/rfc/rfc3550.txt

Internet Engineering Task Force (IETF) RFC 3551 RTP Profile for Audio and Video Conferences with Minimal Control [online, viewed 2017-08-10] Available at https://www.ietf.org/rfc/rfc3551.txt

Internet Engineering Task Force (IETF) RFC 3376 Internet Group Management Protocol, Version 3 [online, viewed 2017-08-10] Available at https://www.ietf.org/rfc/rfc3376.txt

Internet Engineering Task Force (IETF) RFC 4566 SDP: Session Description Protocol [online, viewed 2017-08-10] Available at https://www.ietf.org/rfc/rfc4566.txt

Internet Engineering Task Force (IETF) RFC 4604 Using Internet Group Management Protocol Version 3 (IGMPv3) and Multicast Listener Discovery Protocol Version 2 (MLDv2) for Source-Specific Multicast [online, viewed 2017-08-10] Available at https://www.ietf.org/rfc/rfc4604.txt

Internet Engineering Task Force (IETF) RFC 7104 Duplication Grouping Semantics in the Session Description Protocol [online, viewed 2017-08-10] Available at https://www.ietf.org/rfc/rfc7104.txt

Internet Engineering Task Force (IETF) RFC 7273 RTP clock Source Signaling [online, viewed 2017-08-10] Available at https://www.ietf.org/rfc/rfc7273.txt

SMPTE ST 272:2004 Formatting AES Audio and Auxiliary Data into Digital Video Ancillary Data Space

SMPTE ST 299-1:2009 24-Bit Digital Audio Format for SMPTE 292 Bit-Serial Interface

SMPTE ST 299-2:2010 Extension of the 24-Bit Digital Audio Format to 32 Channels for 3 Gb/s Bit-Serial Interfaces

SMPTE ST 2022-7:2013 Seamless Protection Switching of SMPTE ST 2022 IP Datagrams