SMPTE OVERVIEW DOCUMENT

Professional Media over Managed IP Networks
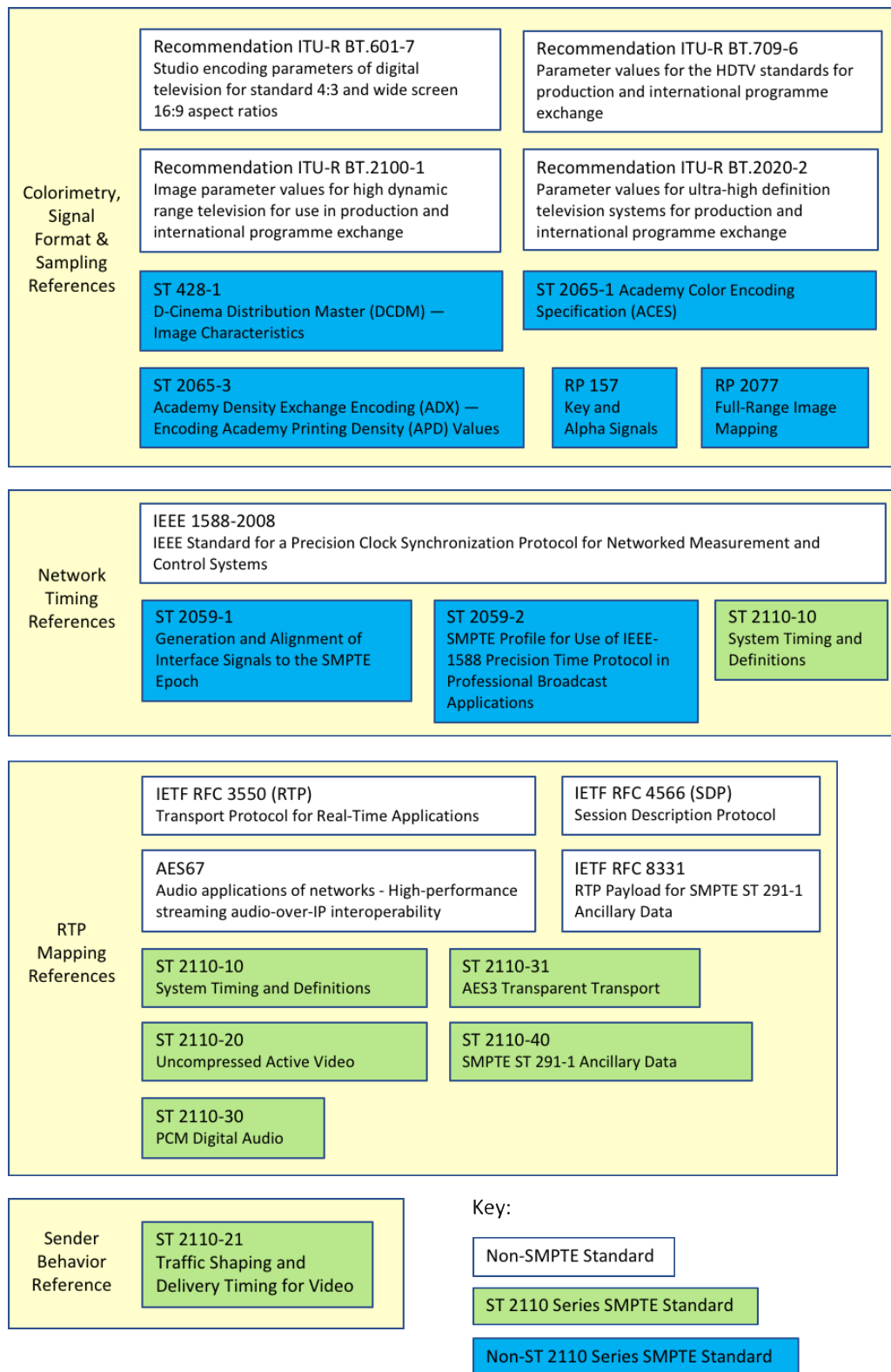
Roadmap for the 2110 Document Suite

Document Roadmap

The SMPTE 2110 suite of 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 informative "roadmap" describes the documents in the SMPTE 2110 suite.

The diagram of Figure 1 illustrates a simplified 'essence mapping data flow' roadmap for the RTP-based essence streams as defined by the document suite.

Figure 1 Essence Mapping Data Flow for ST 2110 Suite

Colorimetry, Signal Format & Sampling References

Recommendation ITU-R BT.601-7
Studio encoding parameters of digital television for standard 4:3 and wide screen 16:9 aspect ratios

Recommendation ITU-R BT.709-6
Parameter values for the HDTV standards for production and international programme exchange

Recommendation ITU-R BT.2100-1
Image parameter values for high dynamic range television for use in production and international programme exchange

Recommendation ITU-R BT.2020-2
Parameter values for ultra-high definition television systems for production and international programme exchange

ST 428-1
D-Cinema Distribution Master (DCDM) — Image Characteristics

ST 2065-1 Academy Color Encoding Specification (ACES)

ST 2065-3
Academy Density Exchange Encoding (ADX) — Encoding Academy Printing Density (APD) Values

RP 157
Key and Alpha Signals

RP 2077
Full-Range Image Mapping

Network Timing References

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

ST 2059-1
Generation and Alignment of Interface Signals to the SMPTE Epoch

ST 2059-2
SMPTE Profile for Use of IEEE-1588 Precision Time Protocol in Professional Broadcast Applications

ST 2110-10
System Timing and Definitions

RTP Mapping References

IETF RFC 3550 (RTP)
Transport Protocol for Real-Time Applications

IETF RFC 4566 (SDP)
Session Description Protocol

AES67
Audio applications of networks - High-performance streaming audio-over-IP interoperability

IETF RFC 8331
RTP Payload for SMPTE ST 291-1 Ancillary Data

ST 2110-10
System Timing and Definitions

ST 2110-31
AES3 Transparent Transport

ST 2110-20
Uncompressed Active Video

ST 2110-40
SMPTE ST 291-1 Ancillary Data

ST 2110-30
PCM Digital Audio

Sender Behavior Reference

ST 2110-21
Traffic Shaping and Delivery Timing for Video

Key:

Non-SMPTE Standard

ST 2110 Series SMPTE Standard

Non-ST 2110 Series SMPTE Standard

1   SMPTE ST 2110-10 - System Timing and Definitions

This standard specifies the system timing model and the requirements common to of all of the ST 2110 series essence streams. This includes PTP requirements, RTP clock and timestamp provisions, common SDP requirements, and UDP datagram size limits.

2   SMPTE ST 2110-20 – Uncompressed Active Video

This standard specifies the real-time, RTP-based transport of uncompressed active video essence over IP networks. An SDP-based signaling method is defined for image technical metadata necessary to receive and interpret the stream.

ST 2110-20 allows signaling the carriage of video formats, including:

Width and Height of image:	Up to 32767 x 32767
Chroma sampling:	4:4:4, 4:2:2, and 4:2:0
Sample Component Systems:	$Y'C'_BC'_R$, $Y'_CC'_{BC}C'_{RC}$, I_CT_CP, RGB, R'B'G', $X'Y'Z'$, RP 157 key signals
Bit Depth:	8-bit, 10-bit, 12-bit, 16-bit integer, 16-bit floating point
Colorimetry:	ITU-R BT.601-7, ITU-R BT.709-6, ITU-R BT.2020-2, ITU-R BT.2100-0, ST 2065-1 ("ACES"), ST 2065-3 ("ADX"), ISO 11664-1
Transfer Characteristic Systems:	ITU-R BT.709, ITU-R BT.2100-0 (including "PQ", "HLG"), linear, ST 2065-1 ("ACES"), ST 2065-3 ("ADX")

3   SMPTE ST 2110-21 – Traffic Shaping and Delivery Timing for Video

This standard specifies a timing model for SMPTE ST 2110-20 streams as measured leaving the sender, and defines the sender SDP parameters used to signal the timing properties of such streams.

ST 2110-21 defines Packet Read Schedules (PRS) as either linear or gapped. These schedules define the latest time a packet can be emitted. The gapped PRS has values that loosely approximate the delivery of samples in the SDI signal. The linear PRS has values which are evenly spaced throughout the frame period.

ST 2110-21 also defines two Transmission Traffic Shape Models, including a Network Compatibility Model and a Virtual Receiver Buffer Model. Both models are based on "leaky bucket" style buffers. There are three types of senders, Narrow Senders, Narrow Linear Senders, and Wide Senders. Each type of sender has specific requirements for the Transmission Traffic Shape Models.

The standard further defines different types of receivers, including Narrow or Wide Synchronous Receivers, and Asynchronous Receivers.

4   SMPTE ST 2110-30 – PCM Digital Audio

This Standard specifies the real-time, RTP-based transport of PCM digital audio streams over IP networks by reference to AES67. An SDP-based signaling method is defined for metadata necessary to receive and interpret the stream.

Non-PCM digital audio signals including compressed audio signals are outside the scope of this standard.

ST 2110-30 defines a Channel Order Convention for the identification of channel types within multi-channel audio groups. The standard also defines a set of conformance levels based on number of channels, sampling frequencies, and packet times.

5   SMPTE ST 2110-31 – AES3 Transparent Transport

This Standard specifies the real-time, RTP-based transport of AES3 signals over IP networks. The modern television ecosystem has leveraged the prevalence of AES3 signal transport to encapsulate many different data items. SMPTE ST 337 defines a general method for the encapsulation of various payloads into the AES3 transport, and SMPTE ST 338 manages the growing namespace of such payloads.

6   SMPTE ST 2110-40 – Transport of SMPTE Ancillary Data

This Standard specifies the real-time, RTP-based transport of SMPTE ST 291 Ancillary (ANC) Data packets over IP networks. It normatively references IETF RFC 8331 which is an RTP payload definition for SMPTE ST 291-1 Ancillary Data.