

SCTE • ISBE[®]

S T A N D A R D S

Digital Video Subcommittee

AMERICAN NATIONAL STANDARD

ANSI/SCTE 42 2019

IP MULTICAST FOR DIGITAL MPEG NETWORKS

NOTICE

The Society of Cable Telecommunications Engineers (SCTE) / International Society of Broadband Experts (ISBE) Standards and Operational Practices (hereafter called “documents”) are intended to serve the public interest by providing specifications, test methods and procedures that promote uniformity of product, interchangeability, best practices and ultimately the long-term reliability of broadband communications facilities. These documents shall not in any way preclude any member or non-member of SCTE•ISBE from manufacturing or selling products not conforming to such documents, nor shall the existence of such standards preclude their voluntary use by those other than SCTE•ISBE members.

SCTE•ISBE assumes no obligations or liability whatsoever to any party who may adopt the documents. Such adopting party assumes all risks associated with adoption of these documents, and accepts full responsibility for any damage and/or claims arising from the adoption of such documents.

Attention is called to the possibility that implementation of this document may require the use of subject matter covered by patent rights. By publication of this document, no position is taken with respect to the existence or validity of any patent rights in connection therewith. SCTE•ISBE shall not be responsible for identifying patents for which a license may be required or for conducting inquiries into the legal validity or scope of those patents that are brought to its attention.

Patent holders who believe that they hold patents which are essential to the implementation of this document have been requested to provide information about those patents and any related licensing terms and conditions. Any such declarations made before or after publication of this document are available on the SCTE•ISBE web site at <http://www.scte.org>.

All Rights Reserved

© Society of Cable Telecommunications Engineers, Inc.2019
140 Philips Road
Exton, PA 19341

TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	SCOPE	1
2	REFERENCES	1
2.1	NORMATIVE REFERENCES	1
2.2	INFORMATIVE REFERENCES	2
2.3	ACRONYMS AND ABBREVIATIONS.....	2
2.4	GLOBAL TERMS	3
3	MULTICAST IP DATA ENCAPSULATION.....	5
3.1	DVB MPE DATAGRAM.....	5
3.1.1	<i>DVB Datagram Section Field constraints (Normative)</i>	<i>6</i>
3.2	ATSC MPE DATAGRAM	7
3.3	ATSC AND DVB COMPARISON (INFORMATIVE)	8
3.4	FORMULATION OF THE MAC_ADDRESS / DEVICEId (NORMATIVE).....	8
4	TRANSPORTING IP DATA OVER MPEG.....	10
4.1	DSM-CC STREAM TYPE	11
4.2	MAC_ADDRESS_LIST_DESCRIPTOR()	11
4.2.1	<i>MAC_Address_List_Descriptor() Field Definitions</i>	<i>13</i>
4.3	BUFFER MODEL	14
4.4	DEFINITION OF IP NETWORK.....	15
	ANNEX A: COORDINATION OF IP ADDRESS RANGES (INFORMATIVE).....	16
	ANNEX B: INCLUDING ATVEF DATA WITHIN AN MPEG PROGRAM	
	(INFORMATIVE).....	17
	ANNEX C: IP MULTICAST BUFFER MODEL (INFORMATIVE).....	20

List of Figures

FIGURE 1. CARRYING MULTICAST IP DATAGRAMS OVER MPEG	10
FIGURE 2. IP MULTICAST SERVERS	16
FIGURE 3. ANNOUNCEMENT, TRIGGER AND RESOURCE DATA CARRIED ON A SINGLE PID STREAM	17
FIGURE 4. ANNOUNCEMENT CARRIED SEPARATELY FROM TRIGGERS AND RESOURCES	18
FIGURE 5. SHARING TRIGGERS AND RESOURCES.....	19
FIGURE 6. APPLICATION BUFFER MODEL FOR THE ACQUISITION OF IP MULTICAST DATA	20

List of Tables

TABLE 1. ENCAPSULATION USING DVB MPE DATAGRAM SECTION	5
TABLE 2. ENCAPSULATION USING ATSC MPE DATAGRAM SECTION	7
TABLE 3. MPE COMPARISON.....	8
TABLE 4. MAC_ADDRESS_LIST_DESCRIPTOR()	12

TABLE 5. CODING OF THE PDU_SIZE FIELD	13
---	----

1 INTRODUCTION

1.1 SCOPE

This document is identical to SCTE 42 2008 except for informative components which may have been updated such as the title page, NOTICE text, headers and footers. No normative changes have been made to this document.

The document describes two methods to transmit multicast IP datagrams over MPEG 2 digital transport streams. It describes the use of Digital Video Broadcasting (DVB) Multi-Protocol Encapsulation (MPE) Datagram Sections and the Advanced Television Systems Committee's (ATSC) Addressable Sections, to encapsulate IP datagrams for subsequent segmentation into fixed length MPEG transport packets. It also describes how the encapsulated data will be included within an MPEG Program in a manner that allows a digital MPEG Decoder to efficiently locate the data PID streams carrying multicast IP content.

This document does not cover how the multicast IP data is used in conjunction with the audio / visual content of an MPEG program.

2 REFERENCES

2.1 NORMATIVE REFERENCES

- [1] Information Technology - Generic coding of moving pictures and associated audio information, Part 6: Extensions for DSM-CC, ISO/IEC 13818-6: 1998/Amd. 1:2000(E)
 - [2] ISO/IEC 8802-1 and 2: "Information technology; Telecommunications and information exchange between systems; Local and metropolitan area networks; Specific requirements; Part 1: Overview of Local Area Network Standards, Part 2: Logical Link Control"
 - [3] Host Extensions for IP Multicasting, IETF RFC 1112, S. Deering, August 1989
- SCTE STANDARD

© SCTE•ISBE

1

- [4] Assigned Numbers, IETF RFC 1700, J. Reynolds and J. Postel, October 1994
- [5] ISO/IEC 13818-1 | ITU-T Rec. H.222.0:2007, Information Technology — Generic coding of moving pictures and associated audio — Part 1: systems.
- [6] Digital Video Broadcasting (DVB); DVB Specification for data broadcasting, ETSI EN 301 192 v1.4.1 (2004-11)
- [7] ATSC Data Broadcast Specification, ATSC A/90, December 2000 with Amendment 1 (14 May 2002) and Corrigendum 1 and 2 (1 April 2002)

2.2 INFORMATIVE REFERENCES

- [8] SMPTE Standard 357M Declarative Data Essence, IP Multicast Encapsulation.
- [9] Advanced Television Enhancement Forum Specification (ATVEF), Draft Version 1.1r26, updated 02/02/99

2.3 ACRONYMS AND ABBREVIATIONS

The following acronyms and abbreviations are used within this specification:

ATSC	Advanced Television Systems Committee
ATVEF	Advanced Television Enhancement Forum
bslbf	bit serial, leftmost bit first
CRC	Cyclic Redundancy Check
DSM-CC	Digital Storage Media Command and Control
DVB	Digital Video Broadcasting
FRAGnkj	IP fragmentation buffer for fragment identifier j, multicast address k, in elementary stream n.
IETF	Internet Engineering Task Force
IP	Internet Protocol
IPM	IP Multicast
IPGRMBnk	IP datagram buffer for k-th IP multicast address in the n-th elementary stream
MAC	Media Access Control
MPE	Multi-Protocol Encapsulation
MPEG	Moving Picture Experts Group
MTU	Maximum Transmission Unit
PAT	Program Association Table
PDU	Protocol Data Unit

PID	Packet Identifier
PMT	Program Map Table
RFC	Request for comments
SB_n	Smoothing Buffer for the n-th elementary stream
TB_n	Transport Buffer for the n-th elementary stream
TS	Transport Stream
uimsbf	Unsigned Integer, Most Significant Bit First
UDP	User Datagram Protocol
UDPNkji	UDP buffer for port i, fragment identifier j, IP multicast address k, in elementary stream

2.4 GLOBAL TERMS

The following terms are used throughout this document:

bit rate: The rate at which the compressed bit stream is delivered from the channel to the input of a decoder.

bps: Bits per second.

byte-aligned: A bit in a coded bit stream is byte-aligned if its position is a multiple of 8-bits from the first bit in the stream.

CRC: The cyclic redundancy check used to verify the correctness of the data.

datagram: A datagram is the fundamental protocol data unit in a packet-oriented data delivery protocol. Typically, a datagram is divided into header and data areas, where the header contains full addressing information (source and destination IP addresses) with each data unit. Datagrams are most often associated with connectionless network and transport layer services.

elementary stream (ES): A generic term for one of the coded video, coded audio or other coded bit streams. One elementary stream is carried in a sequence of PES packets with one and only one stream_id.

IP Multicast data stream: A collection of IP packets with the same IP Multicast address and port number.

kbps: 1,000 bits per second.

Maximum Transmission Unit: The largest amount of data that can be transferred in a single unit across a specific physical connection. When using the Internet Protocol, this translates to the largest IP datagram size allowed.

Mbps: 1,000,000 bits per second.

MPEG-2: Refers to the collection of ISO/IEC standards 13818-1 through 13818-6.

Multiprotocol encapsulation: The encapsulation or splitting of datagrams in DSM-CC private sections.

packet: A packet is a set of contiguous bytes consisting of a header followed by its payload.

packet identifier (PID): A unique integer value used to associate elementary streams of a program in a single or multi-program transport stream.

payload: Payload refers to the bytes following the header byte in a packet.

program: A collection of Program Elements. Program Elements may be elementary streams. Program Elements need not have any defined time base; those that do have a common time base and are intended for synchronized presentation.

program element: A generic term for one of the elementary streams or other data streams that may be included in an ISO/IEC 13818-1 (MPEG-2) Program. The MPEG-2 Transport Stream packets conveying a Program Element are referenced by a unique PID value in the MPEG-2 Program.

Transport Stream: Refers to the MPEG-2 Transport Stream syntax for the packetization and multiplexing of video, audio, and data signals for digital broadcast systems.