This is a preview of "ANSI/SCTE 67 2010". Click here to purchase the full version from the ANSI store.

Society of Cable Telecommunications Engineers

ENGINEERING COMMITTEE

Digital Video Subcommittee

AMERICAN NATIONAL STANDARD

ANSI/SCTE 67 2010

Recommended Practice for SCTE 35

Digital Program Insertion Cueing Message for Cable

This is a preview of "ANSI/SCTE 67 2010". Click here to purchase the full version from the ANSI store.

NOTICE

The Society of Cable Telecommunications Engineers (SCTE) Standards are intended to serve the public interest by providing specifications, test methods and procedures that promote uniformity of product, interchangeability 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 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 members, whether used domestically or internationally.

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

Attention is called to the possibility that implementation of this standard may require the use of subject matter covered by patent rights. By publication of this standard, no position is taken with respect to the existence or validity of any patent rights in connection therewith. SCTE 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 standard 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 web site at http://www.scte.org.

All Rights Reserved

© Society of Cable Telecommunications Engineers, Inc. 2010

140 Philips Road

Exton, PA 19341

This is a preview of "ANSI/SCTE 67 2010". Click here to purchase the full version from the ANSI store.

Table of Contents

1 INTRODUCTION ..... - 1 -

2 INFORMATIVE REFERENCES ..... - 1 -

3 GLOSSARY OF TERMS AND ACRONYMS ..... - 2 -

4 OVERVIEW ..... - 4 -

4.1 SCOPE ..... - 6 -
4.2 PURPOSE ..... - 6 -

5 APPLICATION GUIDELINES ..... - 6 -

5.1 PRACTICAL BOUNDARIES FOR SPLICE_TIME() IN SPLICE_INSERT() ..... - 6 -
5.2 SPLICE TIME ACCURACY ..... - 7 -
5.3 SPLICE_EVENT_ID USAGE AND UNIQUENESS ..... - 8 -
5.4 USE OF SPLICE_SCHEDULE() COMMAND ..... - 10 -
5.5 COMPONENT SPLICE MODE ..... - 10 -
5.5.1 Erroneous Component Splice Commands ..... - 11 -
5.6 PRE-ROLL FUNCTIONALITY - ACCOMPLISHING A PRE-ROLL FUNCTION ..... - 11 -
5.7 CONDITIONAL ACCESS AND CUE ENCRYPTION ..... - 12 -
5.7.1 What to Encrypt ..... - 12 -
5.7.2 Operation in a Cue Insertion Device ..... - 12 -
5.7.3 Operation in an Ad Insertion Device ..... - 12 -
5.7.4 Theory of Operation ..... - 13 -
5.8 USAGE OF UNIQUE_PROGRAM_ID ..... - 18 -
5.8.1 What is a "Program"? ..... - 18 -
5.8.2 What is a "program_id"? ..... - 18 -
5.8.3 Why should programs be identified and differentiated? ..... - 18 -
5.8.4 Why does the time at which a program is scheduled not identify it? ..... - 19 -
5.8.5 How will a unique_program_id alleviate problems? ..... - 19 -
5.9 AVAIL FIELDS USAGE ..... - 19 -
5.9.1 What is an Avail? ..... - 19 -
5.9.2 How many Avails occur within a program? ..... - 20 -
5.9.3 Why is it important to identify the Avails within a program? ..... - 20 -
5.9.4 How do the Avail fields provide for this? ..... - 20 -
5.9.5 What does the Avails_expected field do? ..... - 20 -
5.9.6 Conditional Avails ..... - 21 -
5.10 CUEING USAGE ..... - 23 -
5.10.1 Starting a Break ..... - 23 -
5.10.2 Ending a Break ..... - 24 -
5.10.3 Spot Sharing Within a Break ..... - 24 -
5.11 CREATION AND USAGE OF PRIVATE SPLICE DESCRIPTORS ..... - 25 -
5.11.1 What are Descriptors ..... - 25 -
5.11.2 Registration ..... - 25 -

This is a preview of "ANSI/SCTE 67 2010". Click here to purchase the full version from the ANSI store.

5.11.3 Creating Compatible Private Descriptors - 26 -
5.11.4 Using the avail_descriptor - 27 -
5.11.5 Using the DTMF Descriptor - 27 -
5.12 HANDLING TIME BASE DISCONTINUITIES - 29 -
5.13 CASCADED SPLICING DEVICES - 30 -
5.13.1 Restamping SCTE 35 Cue Messages - 31 -
5.13.2 Cue Propagation - 31 -
5.13.3 Delay - 32 -
5.13.4 Logical Cascading - 32 -
5.14 USAGE OF SEGMENTATION DESCRIPTORS - 32 -
5.14.1 Segmentation Descriptor Field Usage - 32 -
5.14.2 Delivery of Segmentation Descriptors - 34 -
5.14.3 Processing of Segmentation Descriptors - 34 -
5.14.4 Specific use cases - 35 -
5.15 BANDWIDTH RESERVATION COMMAND - 40 -
5.15.1 Why use a Bandwidth Reservation Command? - 40 -
5.16 HEARTBEAT MESSAGES - 40 -
5.16.1 Why use a Heartbeat Message - 40 -
5.17 TIME SIGNAL COMMAND - 41 -
5.17.1 Uses for the Time Signal Command - 41 -

6 ADDITIONAL INFORMATION - 41 -

6.1 CONSIDERATIONS FOR EVALUATION OF MPEG-2 SPLICING DEVICES - 41 -
6.1.1 Overview - 41 -
6.1.2 Splicer Technology - 42 -
6.1.3 Environment - 43 -
6.1.4 Splicer Performance - 46 -

List of Figures

Figure 1 - System Overview - 5 -
Figure 2 – SCTE 35 Cue Message Insertion Points - 9 -
Figure 3 - DES ECB Example - 15 -
Figure 4 - DES CBC Encryption Example - 15 -
Figure 5 - DES CBC Decryption Example - 16 -
Figure 6 - Triple-DES ECB Encryption Example - 17 -
Figure 7 - Triple-DES ECB Decryption Example - 17 -
Figure 8 - Cascading of Splicer / Server Devices - 31 -

List of Tables

Table 5-1 -- Avail incrementing/skipping Example - 22 -
Table 8-2. (of SCTE 35 [1]): splice_descriptor() - 26 -

This is a preview of "ANSI/SCTE 67 2010". Click here to purchase the full version from the ANSI store.

Table 8-3. (of SCTE 35 [1]): avail_descriptor() ..... *- 26 -*

This is a preview of "ANSI/SCTE 67 2010". Click here to purchase the full version from the ANSI store.

This is a preview of "ANSI/SCTE 67 2010". Click here to purchase the full version from the ANSI store.

Recommended Practice for SCTE 35

Digital Program Insertion Cueing Message for Cable

1 Introduction

The goal of this Interpretation document is to serve as an informational enhancement to SCTE 35, Digital Program Insertion Cueing Message for Cable. SCTE 35 is necessarily brief in many areas in order to maintain conciseness and accuracy. This document serves as a companion to SCTE 35.

2 Informative References

At the time of publication, the editions indicated below were current. All standards are subject to revision, and parties to agreement based on this document are encouraged to apply the most recent editions of the documents listed below when appropriate.

[1] ANSI/SCTE 35 2007 - Digital Program Insertion Cueing Message for Cable.

[2] ANSI/SCTE 30 2009 - Digital Program Insertion Splicing API.

[3] ITU-T Rec. H.222.0 / ISO/IEC 13818-1 2000 - Information technology – Generic coding of moving pictures and associated audio information: systems

[4] ITU-T Rec. H.262.0 / ISO/IEC 13818-2 2000 - Information technology – Generic coding of moving pictures and associated audio information: video

[5] ISO/IEC 13818-4 2004 - Information technology — Generic coding of moving pictures and associated audio information — Part 4: Conformance testing

[6] SMPTE 312M 2001- Splice Points for MPEG-2 Transport Streams

[7] ANSI/SCTE 40 2004- Digital Cable Network Interface Standard

[8] ANSI/SCTE 118-1 2006 – Program-Specific Ad Insertion - Data Field Definitions, Functional Overview and Application Guidelines.

[9] ANSI/SCTE 118-2 2007 – Program-Specific Ad Insertion – Content Provider to Traffic Communication Applications Data Model.

[10] ANSI/SCTE 118-3 2006 – Program-Specific Ad Insertion – Traffic System to Ad Insertion System File Format Specification.

[11] ANSI/SCTE 54 2009 - Digital Video Service Multiplex and Transport System Standard for Cable Television.

This is a preview of "ANSI/SCTE 67 2010". Click here to purchase the full version from the ANSI store.

3 Glossary of Terms and Acronyms

Throughout this document, the terms used have specific meanings. Because some of the terms that are defined in ISO/IEC 13818-1 [3] have very specific technical meanings, the reader is referred to the original source for their definition. For terms used in this document, brief definitions are given below.

TERM	DESCRIPTION
Access Unit	The coded representation of a video picture or an audio frame [3].
Analog Cue Tone	In an analog system, a signal which is usually either a sequence of DTMF tones or a contact closure that denotes to ad insertion equipment that an advertisement avail is about to begin or end.
ATSC	Advanced Television Systems Committee
Avail	Time space provided to cable operators by cable programming services during a program for use by the CATV operator; the time is usually sold to local advertisers or used for channel self promotion.
Break	Avail or an actual insertion in progress.
CBC	Cipher Block Chaining. This is a specific method of encryption. It is one of the methods used in DES.
CBR	Constant Bit Rate
Component Splice Mode	A mode of the Cueing Message whereby the program_splice_flag is set to '0' and indicates that each PID/component that is intended to be spliced will be listed separately by the syntax that follows. Components not listed in the Message are not be spliced.
CRC	Cyclic Redundancy Check. A method to verify the integrity of a transmitted Message.
Cueing Message	See Message.
DES	Data Encryption Standard. A method for encrypting data with symmetric keys.
DVB	Digital Video Broadcasting. An international consortium for the development of digital television systems.
SCTE 35 Cue Message	See Message.
ECB	Electronic Code Book. This is a specific method of encryption. It is one of the methods used in DES.

This is a preview of "ANSI/SCTE 67 2010". Click here to purchase the full version from the ANSI store.

TERM	DESCRIPTION
ECM	Entitlement Control Message. These are private conditional access information messages which specify control words and possibly other, typically stream-specific, scrambling and/or control parameters.
EMM	Entitlement Management Message. These are private conditional access information messages which specify the authorization levels or the services of specific decoders. They may be addressed to single decoders or groups of decoders.
Event	A splice event or a Viewing Event as defined below.
In Point	A point in the stream, suitable for entry, that lies on an Access Unit boundary.
Message	In the context of this document a message is the contents of any splice_info_section.
MPTS	A Multi Program Transport Stream.
Out Point	A point in the stream, suitable for exit, that lies on an Access Unit boundary.
payload_unit_start_indicator	A bit in the transport packet header that signals, among other things, that a section begins in the payload that follows [3].
PID	Packet identifier; a unique 13-bit value used to identify elementary streams of a program in a single or multi-program Transport Stream [3].
PID stream	A stream of packets with the same PID within a transport stream.
PMT	Program Map Table [3].
Presentation Time	The time that a presentation unit is presented in the system target decoder [3].
Program	A collection of video, audio, and data PID streams which share a common program number within an MPTS [3].
Program In Point	A group of PID stream In Points that correspond in Presentation Time.
Program Out Point	A group of PID stream Out Points that correspond in Presentation Time.
Program Splice Mode	A mode of the Cueing Message whereby the program_splice_flag is set to ‘1’ and indicates that the Message refers to a Program Splice Point and that all PIDs/components of the program are to be spliced.

This is a preview of "ANSI/SCTE 67 2010". Click here to purchase the full version from the ANSI store.

TERM	DESCRIPTION
Program Splice Point	A Program In Point or a Program Out Point.
PTS	Presentation Time Stamp [3].
Registration Descriptor	Carried in the PMT of a program to indicate that, when signaling Splice Events, splice_info_sections is carried in a PID stream within this program. The presence of the Registration Descriptor signifies a program's compliance with SCTE 35 [1].
reserved	The term "reserved", when used in the clauses defining the coded bit stream, indicates that the value may be used in the future for extensions to the standard. Unless otherwise specified in SCTE 35 [1], all reserved bits are set to '1'.
Splice Event	An opportunity to splice one or more PID streams.
Splice Immediate Mode	A mode of the Cueing Message whereby the splicing device chooses the nearest opportunity in the stream, relative to the splice_info_table, to splice. When not in this mode, the Message gives a "pts_time", which is a Presentation Time, for the intended splicing moment.
Splice Point	A point in a PID stream that is either an Out Point or an In Point.
SPTS	A Single Program Transport Stream.
T-STD	Transport Stream System Target Decoder
uimsbf	Unsigned integer, most significant bit first
VBR	Variable Bit Rate
Viewing Event	A television program or a span of compressed material within a service; as opposed to a Splice Event, which is a point in time.

4 Overview

The SCTE 35 standard [1] supports the splicing of MPEG-2 transport streams for the purpose of Digital Program Insertion, which includes insertion of advertisement and other content types. An in-stream messaging mechanism is defined in SCTE 35 [1] to signal splicing and insertion opportunities. A splicing device is free to ignore Splicing Events signaled by the SCTE 35 Cue Message because the Message is not a command to splice, but is an indicator of the presence of an ad Avail. The taking of an Avail is optional.

As shown in the following diagram, SCTE 35 Cue Messages are received and acted upon in the cable system headends by splicer and server devices to affect the insertion of local advertisements by splicing the ad bit stream (typically containing the commercial content) into the bit stream of programming content. SCTE 35[1] does not differentiate between a splicing device and a server, as does SCTE 30[2]. When SCTE 35[1] uses the terms "splicer" or "splicing device" the meaning of the sentence may apply to a splicer/server combination as well. In actual

This is a preview of "ANSI/SCTE 67 2010". Click here to purchase the full version from the ANSI store.

practice it is common for ad servers (and not splicers) to parse, interpret and initiate action upon SCTE 35 Cue Messages. Since splicer and server devices can be combined into one, this document often uses the term server/splicer to denote a device or set of devices that together perform both functions. This block diagram describes the overall functionality and interoperability associated with the systems that accomplish this.

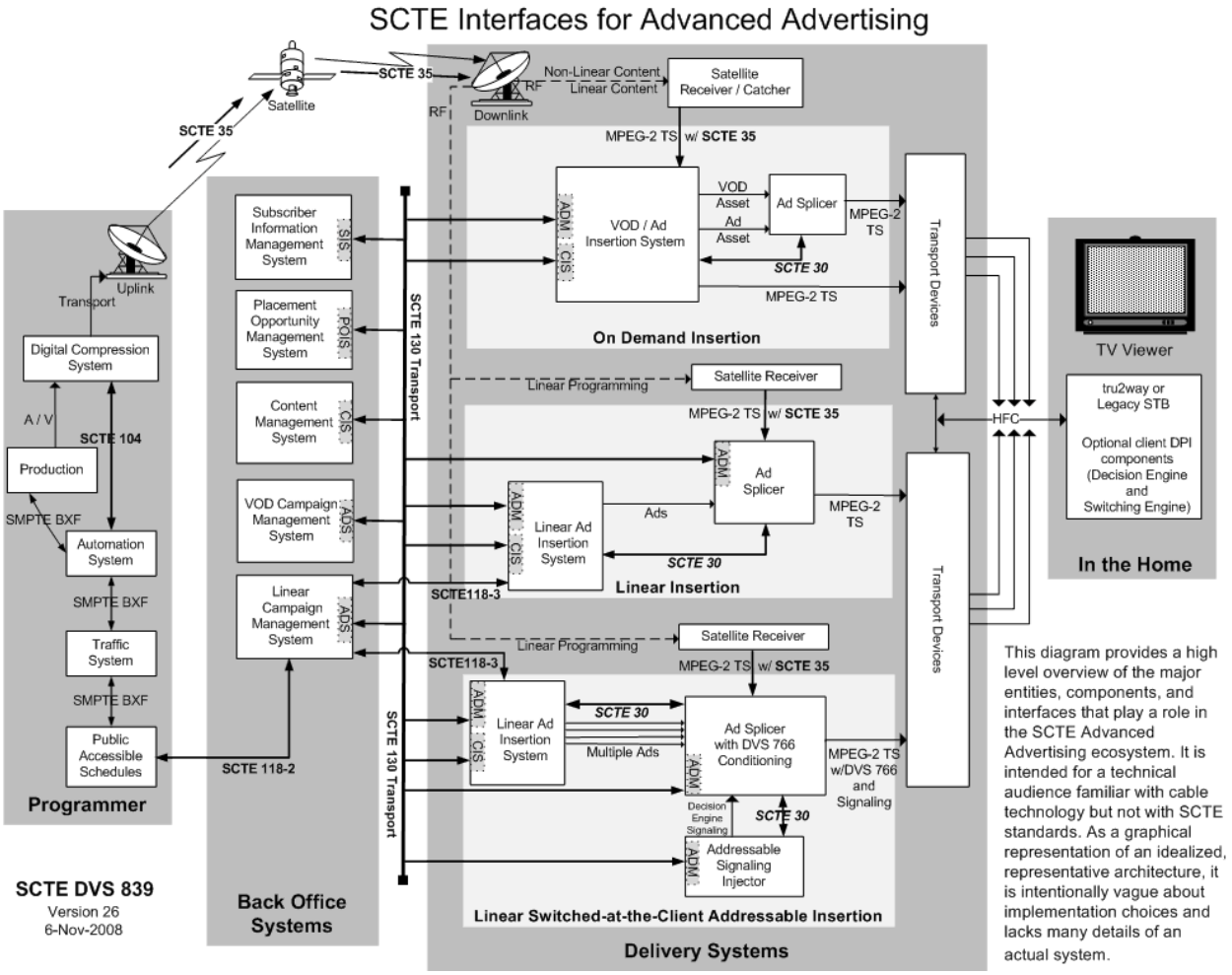

Figure 1 - System Overview

In Figure 1, a compliant MPEG-2 transport stream (either Multi Program Transport Stream or Single Program Transport Stream) is assumed for the network stream. No further constraints beyond the inclusion of the defined Cueing Messages are placed upon the stream. It is expected that transport packet boundary splicing, as intended by ISO/IEC 13818-1[3] and by SMPTE 312M[6], will not be suitable in cable plants due to as the use of statistical multiplexing (VBR) and progressive refresh (no I-frames); both of which may require the removal of the transport layer.

SCTE 35[1] specifies a technique for carrying notification of upcoming splice points in the transport stream. A splice information table is defined for notifying downstream devices of

This is a preview of "ANSI/SCTE 67 2010". Click here to purchase the full version from the ANSI store.

Splice Events, such as a network Break or return from a network Break. The splice information table, which pertains to a given program, is carried in a separate PID referred to by that program's Program Map Table (PMT). In this way, Splice Event notification can pass through most transport stream remultiplexers without need for special processing. However, remultiplexers may need to obey certain constraints when they carry the SCTE 35 Cue Message. These constraints are addressed in SCTE 35[1] and are elaborated on within this document.

SCTE 35[1]does not address constraints on splicing devices and SCTE 35's [1] splice_info_table syntax never suggests picture or splice quality. SCTE 35[1] is not intended to guarantee seamless splicing.

4.1 Scope

This document is an informational companion to SCTE 35[1]. It is not in itself a specification or a standard. The information within is intended as guideline information. Where this document contradicts SCTE 35[1], SCTE 35[1] takes precedence.

4.2 Purpose

The purpose of this document is to aid splicing equipment designers, ad insertion equipment designers and purchasers and users of such equipment. Also expected to be interested are the networks that will originate SCTE 35 Cue Messages from their uplink sites and the manufacturers of the equipment to do this. This document is also expected to aid in the system integration of advertising related equipment, both at the Message origination end and at the Message reception end.

There may be crucial information within this document for manufacturers of equipment that pass the SCTE 35 Cue Message as part of the MPEG stream. An example of such equipment is a rate altering re-multiplexer, which performs complex processing of the stream. When the stream is demultiplexed and processed and then re-multiplexed, it is very important to place the SCTE 35 Cue Message in the proper position relative to the video service and relative to nearby time base discontinuities. Such equipment may also be required to alter the Message before retransmission.

5 Application Guidelines

5.1 Practical Boundaries for splice_time() in splice_insert()

How far ahead of the splice must a splice_insert Message be sent, relative to the picture it refers to, in order to be safely responded to by an ad insertion system?

The "arm time" denotes the time an SCTE 35 Cue Message precedes that actual insertion. The arm time is typically in the range of 5 - 8 seconds. This is in line with the pre-roll time for analog cue-tones. The arm time cannot be so short that the Avail passes by before the ad insertion system has time to respond. A minimum of 4 seconds is required for "start" Cue Messages (out_of_network_indicator = 1) and a minimum of 4 seconds is recommended for "stop" Cue Messages (out_of_network_indicator = 0).