Society of Cable Telecommunications Engineers

ENGINEERING COMMITTEE
Digital Video Subcommittee

AMERICAN NATIONAL STANDARD

ANSI/SCTE 80 2002

(Formerly DVS 161)

In-Band Data Broadcast Standard including Out-of-Band Announcements

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 nonmember 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 or Recommended Practices, and accepts full responsibility for any damage and/or claims arising from the adoption of such Standards or Recommended Practices.

Attention is called to the possibility that implementation of this standard may require 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 inquires 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.

140 Philips Road

Exton, PA 19341

TABLE OF CONTENTS

1.0 SCOPE

This standard is prepared by the Society of Cable Telecommunications Engineering (SCTE) Digital Video Subcommittee (DVS) to make in-band data broadcasting available as an SCTE standard. This document defines the characteristics and normative specifications for the signaling of data broadcast.

This standard applies extensions, modifications, and constraints to the syntax and semantics for a standard set of tables providing the data necessary for receivers to discover and access data services offered on cable. The data transmission infrastructure is compatible with digital multiplex bit streams constructed in accordance with ISO/IEC 13818-1 (MPEG-2 Systems). The document also specifies the mechanisms necessary to allow applications to be associated with data referenced by a PID.

2.0 REFERENCES

2.1 Normative References

1. ANSI/SCTE 65 2002 (formerly SCTE DVS 234), Service Information Delivered Out-Of-Band For Digital Cable Television.
2. ANSI/SCTE 53 2002 (formerly SCTE DVS 051), Methods For Asynchronous Data Services Transport.
3. ANSI/SCTE 19 2001 (formerly SCTE DVS 132), Methods for Isochronous Data Services Transport
4. ANSI/SCTE 42 2002 (formerly SCTE DVS 311), IP Multicast for Digital MPEG Networks.
5. ANSI/SCTE 28 2001 (formerly SCTE DVS 295), Host POD Interface Standard.
6. ATSC A/90, ATSC Data Broadcast Standard, July 26, 2000.
7. ATSC A/90 Amendment #1 to the ATSC Data Broadcast Standard, May 14, 2002.
8. ATSC A/90 Corrigendum #1 and Corrigendum #2 to the ATSC Data Broadcast Standard, April 1, 2002.
9. ATSC A/65A, “Program System Information Protocol for Terrestrial Broadcast and Cable, Dec 23, 1997, Rev A - #1 May, 2000.
10. ISO/IEC/TR3 8802-1:1997, Information Technology — Telecommunications and Information Exchange between Systems -- Local and Metropolitan Area Networks — Specific Requirements — Part 1: Overview of Local Area Network Standards.
11. ISO/IEC 8802-2: 1998, Information Technology — Telecommunications and Information Exchange between Systems -- Local and Metropolitan Area Networks — Specific Requirements — Part 2: Logical Link Control.
12. ISO/IEC 13818-1 | ITU-T Rec. H.222.0:1996, Information Technology — Generic Coding of Moving Pictures and Associated Audio — Part 1: Systems.

13. Technical Corrigendum 1:1999 to ISO/IEC 13818-1:1996.
14. Amendment 1:1997 to ISO/IEC 13818-1:1996, Registration Procedure for "Copyright Identifier".
15. Amendment 2:1997 to ISO/IEC 13818-1:1996, Registration Procedure for "Format Identifier".
16. ISO/IEC 13818-2 | ITU-T Rec. H.262, 1995, Information Technology — Generic Coding of Moving Pictures and Associated Audio — Part 2: Video.
17. ISO/IEC 13818-6, 1998, MPEG-2 Digital Storage Media Command & Control, Chapter 2, 4, 5, 6, 7, 9 and 11.
18. Amendment 2:2000 to ISO/IEC 13818-6, Additions to Support Synchronized Download Services, Opportunistic Data Services and Resource Announcement in Broadcast and Interactive Services.
19. SMPTE 325M (1999), Opportunistic Data Broadcast Flow Control
20. IETF RFC 2396, Uniform Resource Identifiers (URI). Generic Syntax, 1998.
21. IETF RFC 2045, Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies, Section 5.

2.2 Informative References

1. ATSC A/91, ATSC Data Broadcast Standard Implementation Guidelines.
2. ANSI/SCTE 54 2002 (formerly SCTE DVS 241), Digital Video Service Multiplex and Transport System Standard for Cable Television.
3. ETSI EN 301 192 V1.2.1, Digital Video Broadcasting (DVB); DVB Specification for Data Broadcasting (1999-6).

3.0 OVERVIEW

The ATSC Data Broadcast standard, ATSC A/90, specifies an extensible method for signaling data services which carry data in one or more PIDs. Due to the wide range of protocol encapsulations possible, there is a need to signal which encapsulation is used in each data stream. While it is possible to use the PMT for such signaling, this approach is not scalable and will work for simple cases only. To provide a scalable framework, the service description framework is defined.

Figure 1 depicts the Service Description Framework (SDF) for the data broadcasting standard. The data in the PMT points to a Data Service Table (DST) and a Network Resource Table (NRT). The DST points to the individual data streams. For each TS_program_map_section, there is a single DST and a single NRT.

This standard introduces the Aggregate Data Event Table (ADET).

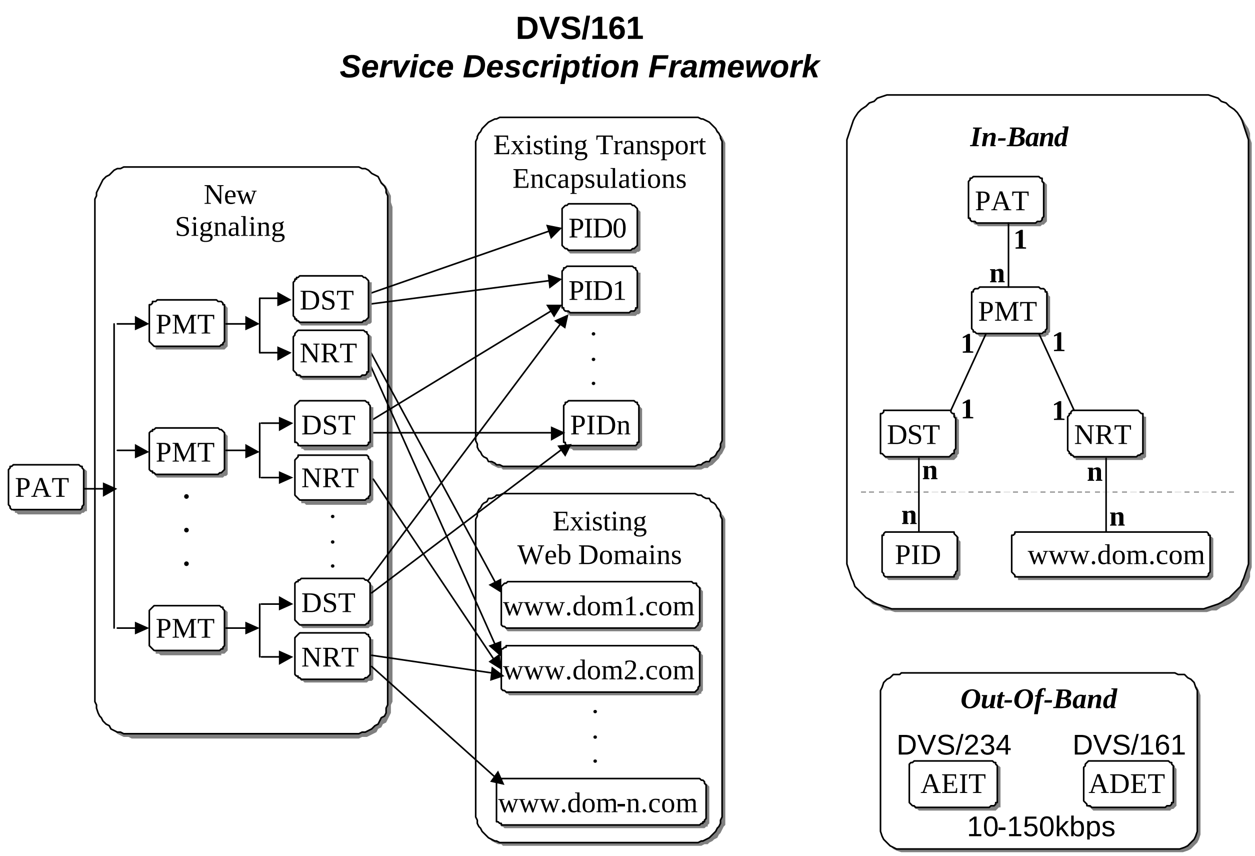

Figure 1: The table structure for signaling a data broadcast.

4.0 EXTENSIONS TO A/90

This standard and A/90 define several ways to encapsulate data and carry that data in a transport stream, as well as several ways to signal the presence of that data. Each method of encapsulation and each method of signaling may stand on its own, without requiring implementation of optional features not utilized.

5.0 AGGREGATE DATA EVENT TABLE (ADET)

A new table, named the Aggregate Data Event Table (ADET) is defined hereinafter. It delivers data event title and schedule information that may be used to support an Electronic Program Guide (EPG) application. The transmission format allows instances of table sections for different time periods to be associated with common PID values. For use on the Extended Channel (out-of-band), reduction of the total number of PID values in use for SI data is important, because the POD module can typically support only a small number of concurrent data flows (each associated with one PID value). To facilitate this conservation of PID values, an ADET may share the same PID as an AEIT covering the same time period.

The purpose of the ADET is twofold:

- To support the announcement of a data service in a Virtual Channel which does not include any audio-visual event.
- To allow separate announcement of the data service portion of an audio/video/data event or audio/data event in a Virtual Channel.

The ADET should list all events for those channels that appear in the VCT for a given time window. The start time for any ADET is constrained to be one of the following eight UTC times: 00:00 (midnight), 03:00, 06:00, 09:00, 12:00 (noon), 15:00, 18:00, and 21:00. Up to 128 ADETs may be transmitted and each is referred to as ADET-k, with k = 0, 1, … 127. The notation ADET-k refers to the ADET corresponding to timeslot k. Any change in an ADET-k shall trigger a change in version of the MGT.

Each instance of ADET-k contains a list of events for each virtual channel during a three-hour time period. Linkage to each channel in the VCT is made via the source_id. ADET-0 describes the events for the first 3 hours and ADET-1 for the second 3 hours. ADET-0 and ADET-1 share a common associated PID value as SCTE Standard Service Information Delivered Out-of-Band for Digital Cable Television 28 March, 2000 defined in the MGT.

In MPEG, tables can have a multitude of instances. When different instances of a table share the same table_id value and PID, they are distinguished by differences in the 16-bit table_id_extension field. As for the AEIT specified in ANSI/SCTE 65 2002 (formerly DVS 234), the ADET, the table_id_extension field of the ADET appears as the MGT_tag. ETMs for events described in ADET-0 shall be provided in AETT-0 on the PID associated with ADET-0 until they are no longer referenced by ADET-0.

The service types specified in ANSI/SCTE 65 2002 (formerly DVS 234) Table 5.30 (section 5.6) shall be supported. For a virtual channel of service_type 0x04, every data service event shall be announced in a ADET. For a virtual channel of service_type 0x02 or 0x03, the data service portion of an audio/video/data event may be announced independently in a ADET. There are no constraints on the specification of the ADET for any other service_type.

The purpose of such separate announcement is:

- To convey a data service schedule that is not aligned with the associated audio/video event. In this situation, the data service schedule (start_time, duration) may span only a fraction of the audio/video portion of an event or it may span the audio/video portion of several events. The value of the source_id field in the ADET(s) announcing the data portion of the event(s) shall match the value of the source_id field in the related AEIT(s) where the audio/video portion of the event(s) is announced. This constraint captures the fact that the audio/video and data portions of the event(s) belong to the same virtual channel.
- To convey a distinct name or description for the data service portion of the audio/video/data event. In this situation, the data service portion of the event shares the same schedule (start_time, duration) as the audio/video portion of the event. The value of the source_id field in the ADET(s) shall match the value of the source_id field in the related AEIT(s) where the audio/video portion of the event is announced. This constraint captures the fact that audio/video and data portions of the event belong to the same virtual channel.
- To convey an Aggregate Extended Text Table (AETT) specific to the Data Service. In this situation, the data_id field in the ADET allows identification of an AETT associated with the instance of the ADET announcing the schedule of the data service.

5.1 Table Structure

Table 6.1 below defines the syntax of the Aggregate Data Event Table (ADET).

Table 6.1 Bit Stream Syntax for the ADET

Syntax	No. of bits	Format
aggregate_data_event_table_section () {		
table_id	8	0xD9
section_syntax_indicator	1	‘1’
private_indicator	1	‘1’
reserved	2	‘11’
section_length	12	uimsbf
ADET_subtype	8	uimsbf
MGT_tag	8	‘11’
version_number	5	uimsbf
current_next_indicator	1	‘1’
section_number	8	uimsbf
last_section_number	8	uimsbf
if (**ADET_subtype**==0) {		
num_sources_in_section	8	uimsbf
for (i = 0; i< num_sources_in_section; i++) {		
source_ID	16	uimsbf
num_events	8	uimsbf
for (j = 0; j< num_events;j++) {		
reserved	2	‘11’
data_id	14	uimsbf
start_time	32	uimsbf
reserved	2	‘11’
ETM_present	2	uimsbf
duration	20	uimsbf
title_length	8	uimsbf
title_text()	var	
reserved	4	‘1111’
descriptors_length	12	
for (k=0;k< **descriptors_length**;k++) {		
descriptor()		
}		
}		
}		
}		
else		
reserved	n*8	N
CRC_32	32	rpchof
}		

table_id — This 8-bit field of the ADET shall be 0xD9, identifying this Section as belonging to the Aggregate Data Event Table.

section_syntax_indicator — This 1-bit field shall be set to ‘1’ denoting that the section follows the generic section syntax beyond the section length field.

private_indicator — This 1-bit field shall be set to ‘1’.

section_length — This 12-bit field shall specify the number of remaining bytes in this Section immediately following the section_length field up to the end of the Section, including the CRC_32 field. The value of this field shall not exceed 4093.

ADET_subtype — This 8-bit field identifies the subtype of the ADET. In the current protocol, only table subtype value 0x00 is defined. Host devices shall discard instances of the aggregate_event_information_table_section() in which an unknown ADET_subtype is specified (currently, any value other than zero).

MGT_tag — An 8-bit field that ties this ADET instance to the corresponding table_type in the MGT and to an AETT instance with the same value. The MGT_tag value for an ADET instance for a given timeslot shall be one higher (modulo 256) than the instance for the preceding time period.

version_number — This 5-bit field is the version number of the ADET instance. An instance is identified by the MGT_tag. The version number shall be incremented by 1 modulo 32 when any field in the ADET changes. The value of this field shall be identical to that of the corresponding ADET-k version_number in the MGT.

current_next_indicator — This 1-bit indicator shall always set to '1' for ADET sections; the AEIT sent is always currently applicable.

section_number — This 8-bit field shall specify the number of this Section.

last_section_number — This 8-bit field shall specify the number of the last Section.

num_sources_in_section — This 8-bit field gives the number of iterations of the "for" loop describing program schedule data.

source_ID — This 16-bit field specifies the source_ID of the virtual channel carrying the events described in this section.

num_events — Indicates the number of events to follow associated with the program source identified by source_ID. Value 0 indicates no events are defined for this source for the time period covered by the ADET instance.

event_ID — This 14-bit field specifies the identification number of the event described. This number serves as a part of the event ETM_ID (identifier for event Extended Text Message). An assigned event_ID shall be unique at least within the scope of the instance of the ADET in which it appears. Accordingly, as an example, the event associated with event_ID 0x0123 in ADET-m shall be considered to be an event distinct from event_ID 0x0123 in AEIT-n, when m is not equal to n.

start_time — A 32-bit unsigned integer quantity representing the start time of this event as the number of seconds since 0000 Hours UTC, January 6th, 1980. If the GPS_UTC_offset delivered in the System Time Table is zero, start_time includes the correction for leap seconds. Otherwise, start_time can be converted to UTC by subtracting the GPS_UTC_offset.

ETM_present — This 2-bit field indicates the existence of an Extended Text Message (ETM) based on ANSI/SCTE 65 2002 (formerly DVS 234) Table 5.34.

duration — Duration of this event in seconds.

title_length — This field specifies the length (in bytes) of the title_text(). Value 0 means that no title exists for this event.

title_text() — The event title in the format of a Multiple String Structure. title_text() shall be formatted according to the Multiple String Structure (see [9] Section 7.2).

descriptors_length — Total length (in bytes) of the event descriptor list that follows.

CRC_32 —This is a 32-bit field that contains the CRC value that ensures a zero output from the registers in the decoder defined in Annex A of ISO-13818-1 "MPEG-2 Systems" after processing the entire Aggregate Event Information Table section.

5.2 Constraints

Except for ADET-0, each ADET instance shall include event data only for those events actually starting within the covered time period. ADET-0 shall also include all data events starting in a prior timeslot but continuing into the current timeslot. In addition, if the VCT entry for a particular source ID includes a time_shifted_service_descriptor(), ADET-0 shall describe event data for active events on any channels referenced through the time_shifted_service_descriptor().

When service_type 0x04 is included or will be included in the transport within the next 12 hours, the Transport Stream shall have at least four ADETs and no more than 128 ADETs, each of which provides the data information for a certain time span. Optionally, ADETs may exist which contain data events for data services of service_type 0x02 or 0x03. In this case, the data events in the ADETs shall not duplicate information about the events announced in the AEITs for the same scope; they shall announce only the data service portions. Any data event announced for a time interval that extends over one or more ADETs shall be described in each of these ADETs, with the same data_id. For instance, an event that starts at 17:30 UTC and lasts until 19:30 UTC will appear in two ADETs with the same data_id, the ADET covering 15:00-18:00 UTC as well as the ADET covering 18:00-21:00 UTC. The data_id field uniquely identifies each of the data services during the 3-hour interval associated with the containing ADET. The data_id field in ADETs and event_id field in AEITs shall not share the same value space.

No ADETs are required to be in the transport stream when service_type 0x04 is not present in the transport stream. Data events in a ADET instance shall be in the order of their starting times, i.e., the start_time of the first data event in a Section shall be ahead of that of the second data event in the same Section, and the start_time of the last data event in Section one shall be ahead of that of the first data event in Section two, etc. Moreover, in any virtual channel, the start_time value of a data event shall not be less than the end time of the preceding event where the end time of an event is defined to be equal to that event's start_time plus that event's length_in_seconds value.

Each ADET-k may have multiple instances, each of which contains information for one virtual channel, and each of which is identified by the combination of table_id and source_id. Each ADET-k instance may be segmented into as many as 256 Sections. One Section may contain information for several data services, but the information for one data service shall not be segmented and put into two or more Sections. Thus the first field after protocol_version for each Section shall be num_data_in_section.

The content_advisory_descriptor shall not appear in the data event descriptor loop of any ADET-k associated with a virtual channel of service_type 0x02 or 0x03.

Transport Stream packets carrying the ADET sections shall have PID values as specified in the Master Guide Table (MGT) and shall be unique among the collection of table_type_PID values listed in the MGT.

The table_type values for ADET-0 to ADET-127 in the Master Guide Table shall be in the range 0x1500 to 0x157F.

ADET-0 shall list all the available events for the current 3-hour time segment. ADET-1 shall list all the available events for the next 3-hour time segment, and likewise, non-overlapping sequential time windows are allocated for all the other ADET-k's.

Every digital Transport Stream where ADETs are required shall broadcast the first four Data Event Tables (ADET-0, ADET-1, ADET-2 and ADET-3). All the other ADETs and the whole collection of associated AETTs are optional.

The recommended maximum cycle time for ADET-0 is 500 ms and the recommended maximum cycle time for ADET-1 is 2 seconds.

The minimum and maximum leak rates for delivery of the ADET are 10kpbs and 150kbps respectively. Note that these rates are identical to the AEIT rates specified in ANSI/SCTE 65 2002 (formerly DVS 234).

The ADET may be carried in the system information described by ANSI/SCTE 65 2002 (formerly DVS 234) profiles 4 or 5