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Candidate Standard:
ACAP Service Signaling and Announcement

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The Advanced Television Systems Committee, Inc., is an international, non-profit organization developing voluntary standards for digital television. The ATSC member organizations represent the broadcast, broadcast equipment, motion picture, consumer electronics, computer, cable, satellite, and semiconductor industries.

Specifically, ATSC is working to coordinate television standards among different communications media focusing on digital television, interactive systems, and broadband multimedia communications. ATSC is also developing digital television implementation strategies and presenting educational seminars on the ATSC standards.

ATSC was formed in 1982 by the member organizations of the Joint Committee on InterSociety Coordination (JCIC): the Electronic Industries Association (EIA), the Institute of Electrical and Electronic Engineers (IEEE), the National Association of Broadcasters (NAB), the National Cable Television Association (NCTA), and the Society of Motion Picture and Television Engineers (SMPTE). Currently, there are approximately 140 members representing the broadcast, broadcast equipment, motion picture, consumer electronics, computer, cable, satellite, and semiconductor industries.

ATSC Digital TV Standards include digital high definition television (HDTV), standard definition television (SDTV), data broadcasting, multichannel surround-sound audio, and satellite direct-to-home broadcasting.

About the Candidate Standard

This specification is being put forth as a Candidate Standard by the TSG/S13 Specialist Group on Data Broadcast. ATSC members and non-members are encouraged to review and implement this specification and return comments to cs_amend_editor@atsc.org. ATSC Members can also send comments directly to the TSG/S13 Specialist Group. The ATSC believes this specification is stable. It is expected to progress to Proposed Standard within a period of time ending 15 May 2005.

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1. SCOPE AND DOCUMENTATION STRUCTURE

This Standard augments the MPEG-2 transport signaling defined in A/101, by defining the required signaling for current services and the mechanism for announcement of future services.

1.1 Documentation Structure

This document is organized as follows:

- Section 1 – This general introduction.
- Section 2 – Listing of references for this standard.
- Section 3 – Definitions and terms used in this standard.
- Section 4 – An informative introduction to ACAP service signaling and announcement
- Section 5 – An informative discussion of the data broadcast descriptor.
- Section 6 – Normative announcement and discovery specifications.
- Section 7 – Normative virtual channel signaling specifications.

2. REFERENCES

2.1 Normative References

The following documents contain provisions which in whole or part, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and amendment, and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the documents listed below.

[1] ATSC Standard A/101 (2005), “Advanced Common Application Platform Advanced Television Systems Committee, Washington, D.C.”[A/101].

[2] ATSC Standard A/65C (2006), “Program and System Information Protocol for Terrestrial Broadcast and Cable (Revision B)”, Advanced Television Systems Committee, Washington, D.C.”[A/65].

[3] ATSC Standard A/90 (2000), “ATSC Data Broadcast Standard", Advanced Television Systems Committee, Washington, D.C [A/90].

[4] EN 301 192 v. 1.3.1 Digital Video Broadcast Specification for Data Broadcasting [EN 301 192]

[5] ETSI EN 300 468 (2004), “Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems” [EN 300 468].

[6] ITU-T Rec. H.222.0 | ISO/IEC 13818-1:2000, Information Technology — Generic coding of moving pictures and associated audio — Part 1: systems. [MPEG-2]

[7] IEEE SI10-2002: "Metric Practice and Graphic Symbols and Designations Used in Technical Documentation," Institute of Electrical and Electronics Engineers, New York, N.Y. [IEEE]

[8] ATSC Standard A/53D (2005), "Digital Television Standard, Revision D", Advanced Television Systems Committee, Washington, D.C. [A/53].

3. DEFINITIONS

With respect to definition of terms, abbreviations, and units, the practice of the Institute of Electrical and Electronics Engineers (IEEE) as outlined in the Institute's published standards shall be used. Where an abbreviation is not covered by IEEE practice, or industry practice differs from IEEE practice, then the abbreviation in question will be described in Section 3.4 of this document. Many of the definitions included therein are derived from definitions adopted by MPEG.

3.1 Compliance Notation

As used in this document, "shall" or "will" denotes a mandatory provision of the standard. "Should" denotes a provision that is recommended but not mandatory. "May" denotes a feature whose presence does not preclude compliance, that may or may not be present at the option of the implementor.

3.2 Treatment of Syntactic Elements

This document contains symbolic references to syntactic elements used in the transport coding subsystems. These references are typographically distinguished by the use of a different font (e.g., restricted), may contain the underscore character (e.g., sequence_end_code) and may consist of character strings that are not English words (e.g., dynrng).

3.3 Terms Employed

For the purposes of this standard, the following definition of terms apply:

ACAP – ATSC Common Application Platform.

3.4 Symbols, Abbreviations, and Mathematical Operators

The symbols, abbreviations, and mathematical operators used in this standard shall have the meanings established for use by ATSC in A/53 [A/53] which are similar to those used in the "C" programming language. Note that integer division with truncation and rounding are signified by specifically defined symbols in A/53. The bitwise operators are defined assuming two's-complement representation of integers. Numbering and counting loops generally begin from 0.

3.4.1 Mnemonics

The following mnemonics are defined to describe the different data types used in the coded bit stream.

bslbf	Bit string, left bit first, where "left" is the order in which bit strings are written in the Standard. Bit strings are written as a string of 1s and 0s within single quote marks, e.g. '1000 0001'. Blanks within a bit string are for ease of reading and have no significance.
uimsbf	Unsigned integer, most significant bit first.

The byte order of multi-byte words is most significant byte first.

3.4.2 Method of Describing Bit Stream Syntax

Each data item in the coded bit stream described below is in bold type. It is described by its name, its length in bits, and a mnemonic for its type and order of transmission.

The action caused by a decoded data element in a bit stream depends on the value of that data element and on data elements previously decoded. The decoding of the data elements and definition of the state variables used in their decoding are described in the clauses containing the semantic description of the syntax. The following constructs are used to express the conditions when data elements are present, and are in normal type.

Note this syntax uses the "C" code convention that a variable or expression evaluating to a non-zero value is equivalent to a condition that is true.

while (condition) {
data_element
. . .
}
	If the condition is true, then the group of data elements occurs next in the data stream. This repeats until the condition is not true.

do {
data_element
. . . }
while (condition)
	The data element always occurs at least once. The data element is repeated until the condition is not true.

if (condition) {
data_element
. . .
}
	If the condition is true, then the first group of data elements occurs next in the data stream.

else {
data_element
. . .
}
	If the condition is not true, then the second group of data elements occurs next in the data stream.

for (i = 0;i<n;i++) {
data_element
. . .
}
	The group of data elements occurs *n* times. Conditional constructs within the group of data elements may depend on the value of the loop control variable *i*, which is set to zero for the first occurrence, incremented to 1 for the second occurrence, and so forth.

As noted, the group of data elements may contain nested conditional constructs. For compactness, the { } are omitted when only one data element follows.

data_element [ ]	data_element [ ] is an array of data. The number of data elements is indicated by the context.
data_element [n]	data_element [n] is the n+1th element of an array of data.
data_element [m] [n]	data_element [m] [n] is the m+1,n+1 th element of a two-dimensional array of data.
data_element [l] [m] [n]	data_element [l] [m] [n] is the l+1,m+1,n+1 th element of a three-dimensional array of data.
data_element [m..n]	data_element [m..n] is the inclusive range of bits between bit m and bit n in the data_element.

4. INTRODUCTION (INFORMATIVE)

This Standard describes the method for ACAP (Advanced Common Application Platform) signaling and announcement according to the following design requirements.

Note: The use of conformance terms in this section apply to requirements and not the design in this document.

- The ACAP Announcement should be compatible with the announcement and signaling mechanisms defined by A/65.
- The ACAP Announcement should support the standalone announcement of a data service including only data component in a virtual channel.
- The ACAP Announcement should support the separate announcement of a data service including audio/video/data components or audio/data components.
- The ACAP Announcement should support the non-separate announcement of a data service including audio/video/data components or audio/data components.
- The ACAP Announcement should use an existing announcement mechanism of data service supported in ATSC [A/90], not define a new one.

There exist three announcement types according to ACAP data service scenarios:

- **Standalone data service announcement**:

  Standalone data service announcement is to announce an independent data service in a Virtual Channel which does not include any audio-visual event.

- **Separate data service announcement**:

  Separate data service announcement is to announce a separate data service which is related to a video/audio program but has different start time and duration or a separate title from a video/audio program.

- **Non-separate data service announcement**:

  Non-separate data service announcement is to announce a non-separate data service which is related to a video/audio program and has the same start time and duration and title as a video/audio program.

5. DATA BROADCAST DESCRIPTOR (INFORMATIVE)

In order to announce the ACAP data service a new announcement descriptor is needed for ACAP data service. Such a descriptor was defined as the data broadcast descriptor in Section 6.2.11 of DVB SI [ETSI EN 300 468] and its usage in the ATSC system is defined herein.

The data broadcast descriptor is used in general to identify within the DVB SI (DVB SDT and/or EIT) data broadcast services in the DVB framework according to [ETSI EN 300 468]. This descriptor identifies the type of the data component and may be used to provide a text description of the data component. The syntax of this DVB descriptor is reproduced in Table 5.1. It has been further constrained and expanded by [A/101] when used to signal the presence of ACAP data broadcast services.

Table 5.1 DVB Data Broadcast Descriptor (Informative)

Syntax	No. of Bits	Format
data_broadcast_descriptor() {		
descriptor_tag	8	0x64
descriptor_length	8	uimsbf
data_broadcast_id	16	uimsbf
component_tag	8	uimsbf
selector_length	8	uimsbf
for(i=0; i<selector_length; i++){		
selector_byte	8	uimsbf
}		
ISO_639_language_code	24	bslbf
text_length	8	uimsbf
for(i=0; i< text_length; i++){		
text_char	8	uimsbf
}		
}		

data_broadcast_id – This 16-bit field identifies the data broadcast specification that is used to broadcast the data in the broadcast network. It is set to 0x010D to indicate an ACAP object carousel, as provided in [A/101].

component_tag – This 8-bit field has the same value as a component_tag field of a stream_identifier_descriptor (if present in the PSI program map table) for the stream that is used to broadcast the object carousel.

selector_length – This 8-bit field is set to length in bytes of the following selector field.

selector_byte – The sequence of selector_byte fields specifies the selector field. The selector field can contain service specific information that is necessary to identify an entry-point of the broadcast data.

ISO_639_language_code – This 24-bit field contains the ISO 639-2 three character language code that is used to select the object necessary to start up the higher layer protocols.

text_length – This 8-bit field specifies the length in bytes of the following text describing the data component.

text_char – This is a 8-bit field. A string of "char" fields specifies the text description of the data component.

When data_broadcast_id is equal to 0x0007 (object carousel) and the contents of the object carousel are for an ACAP application, the selector_byte field shall contain bytes ordered as defined by the structure defined in Section 9.3.1 of [EN 301 192], and as shown in Table 5.2 with the semantics as constrained below.

Table 5.2 Syntax for Object Carousel Info Structure (Informative)

Syntax	No. of Bits	Mnemonic
object_carousel_info() {		
carousel_type_id	2	bslbf
reserved	6	bslbf
transaction_id	32	uimsbf
time_out_value_DSI	32	uimsbf
time_out_value_DII	32	uimsbf
reserved	2	bslbf
leak_rate	22	uimsbf
for(i=0; i< N1; i++){		
ISO_639_language_code	24	bslbf
object_name_length	8	uimsbf
for(j=0; j< N2; j++){		
object_name_char	8	uimsbf
}		
}		
}		

carousel_type_id – This 2-bit field indicates which kind of data carousel is used. '01' indicates a one layer carousel, and '10' indicates a two layer carousel. This field is set to '10' indicating a two-layer carousel in case of object carousel.

reserved – This is a 6-bit field that is set to '111111'.

transaction_id – This 32-bit field shall have the same value as the transactionId value of the DownloadServerInitiate message that carries the object reference of the service gateway. The value of 0xFFFFFFFF shall be used to indicate to receivers that any received DownloadServerInitiate message on the associated stream is valid.

time_out_value_DSI – This 32-bit field indicates the recommended time out period in milliseconds that receivers should use to time out the acquisition of the DownloadServerInitiate message. The value of 0xFFFFFFFF is used to indicate to receivers that there is no recommended time-out value.

time_out_value_DII – This 32-bit field indicates the recommended time out period in milliseconds that receivers should use to time out the acquisition of the DownloadInfoIndication message. The value of 0xFFFFFFFF is used to indicate to receivers that there is no recommended time-out value.

reserved – This is a 2-bit field that is set to '11'.

leak_rate – This is a 22-bit field that indicates the leak rate Rxn of the data carousel decoder model that is applied by the service. The leak rate is encoded as a 22-bit positive integer. The value of the leak_rate is expressed in units of 50 byte/s.

ISO_639_language_code – This 24-bit field contains the ISO 639-2 three character language code that is used to select the object necessary to start up the higher layer protocols.

object_name_length – This 8-bit field specifies the number of bytes that follow the object_name_length field for describing characters of the object name.

object_name_char – This is a 8-bit field. A string of object_name_char fields specify the name of the object to be used to start up the higher layer protocols.

6. ANNOUNCEMENT AND DISCOVERY

When a future data broadcast service is to be announced, the Data Broadcast Descriptor (DBD), as defined in [A/101] shall be included in either the [A/65] EIT or [A/90] DET according to the type of data broadcast service as summarized in Table 6.1.

Table 6.1 ACAP Announcement Mechanism

Announcement Type	DET/EIT/DBD	VCT
Standalone data service	Announcement of DET alone. Mandatory inclusion of DBD in DET descriptor loop.	service_type = 0x04
Separate data service	Announcement of both DET and EIT Mandatory inclusion of DBD in DET descriptor loop	service_type = 0x02, or 0x03
Non-separate data service	Announcement of EIT alone. Mandatory inclusion of DBD in EIT descriptor loop	service_type = 0x02, or 0x03

6.1 Table Linkages Summary

When the DBD is inserted into the EIT or DET, it provides the linkage between a variety of tables, the DET/EIT, the PMT and the ACAP data elementary streams as illustrated in Figure 6.1.

The data broadcast service shall indicate the use of a ACAP object carousel by including one data_broadcast_descriptor in EIT/DET which shall point to one ACAP object carousel and shall be associated to a particular stream via a component_tag field of a stream_identifier_descriptor that may be present in the PSI [MPEG-2] program map section for the stream that is used as a data stream.

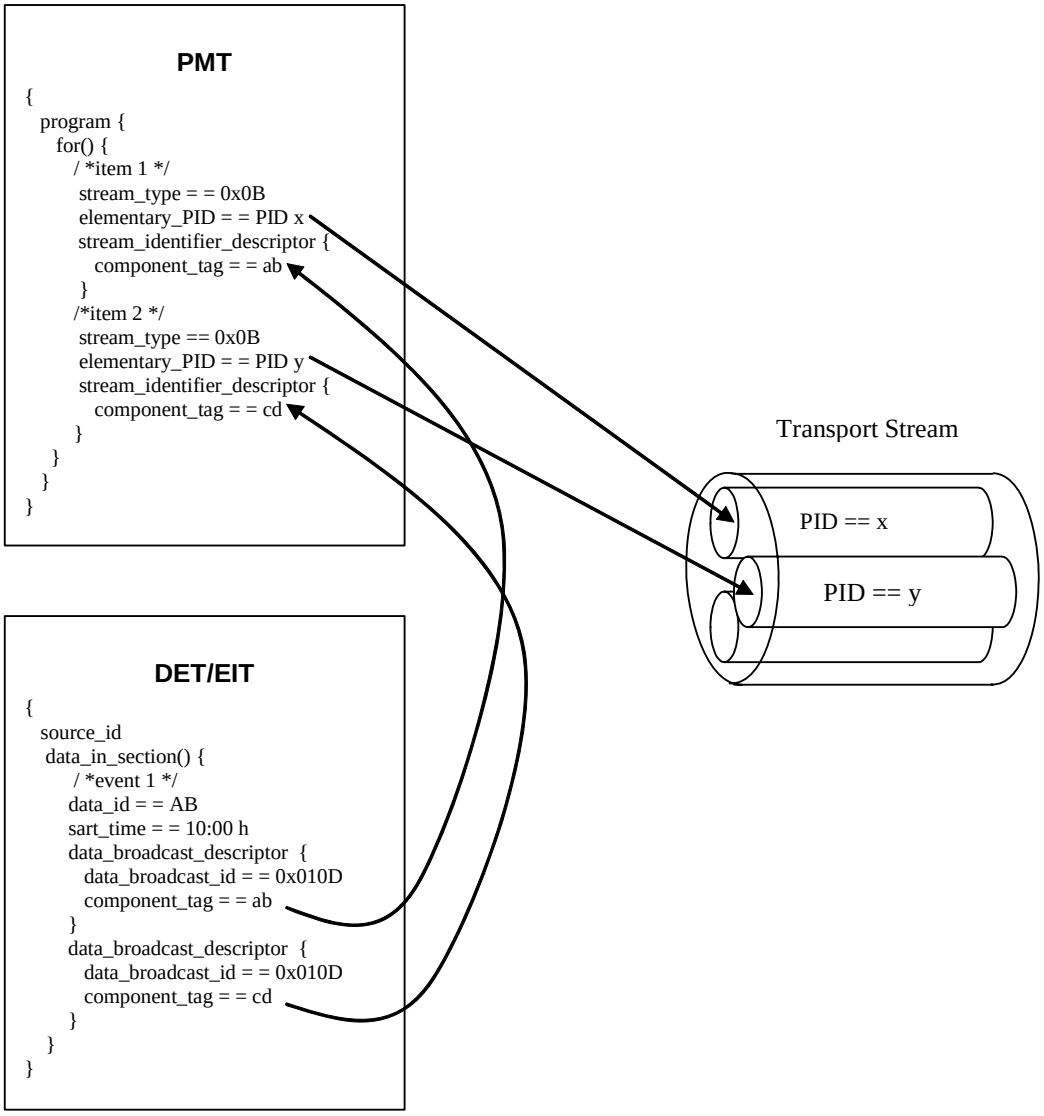

Figure 6.1 The Relationship of DET/EIT, PMT and ACAP data elementary stream through data broadcast descriptor. (Informative)

Note that use of the [A/90] Data Service Table (DST) is not specified and the DST shall not be used to signal an ACAP service [A/101].

7. VIRTUAL CHANNEL SIGNALING

The data field values in the VCT for shall be set per [A/65] as further constrained by Table 6.1 above and this section. In all cases, when an ACAP data broadcast service is present in the transport and signaled in the PMT as required by [A/101] (or will be present before the next

instance of the VCT section or PMT section is transmitted), then the entries for ACAP services shall be present.

The virtual channel with which the ACAP service is associated shall contain a service_location_descriptor [A/65] with the stream_type set to 0x0B for the ACAP object carousel and with the stream_type set to 0x05 for the Application Information Table (AIT) [A/1011].

The TS_program_map_section() shall contain the Deferred Association Tags Descriptor in the outer descriptor sequence. The contents of the Deferred Association Tags descriptor are defined in Section 10.6.2.1 of A/101. The requirements for descriptors placed in the inner descriptor sequence of the TS_program_map_section() are defined in Section 10.6.2.1 of A/101.

7.1 Constraints on minor channel number values

For stand-alone data services, the value in the minor_channel_number field shall be greater than 99 and the service_type shall be 0x04 for that minor_channel_number.

For separate data services, an additional minor_channel_number entry for the data service may be present. If separate data services are announced the minor_channel_number field shall contain a value greater than 99 and the service_type shall be 0x04 for that minor_channel_number.

For non-separate data services (those associated with audio or video with the same schedule) there are no constraints on the value in the minor_channel_number field.

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