

**Candidate Standard:
Programming Metadata Communication Protocol
Standard**

Advanced Television Systems Committee

1750 K Street, N.W.

Suite 1200

Washington, D.C. 20006

www.atsc.org

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 T3/S1 Specialist Group on PSIP Metadata Communications. ATSC members and non-members are encouraged to review and implement this specification and return comments to cs75-editor@atsc.org. ATSC Members can also send comments directly to the chair of the T3/S1 Specialist Group, gjones@nab.org. The ATSC believes this specification is stable. It is expected to progress to Proposed Standard on or before 30 September 2004.

Editor's Notes

This document is a work in process. As such, notes are included in some portions of the document indicating issues that need further consideration. These items will be addressed as part of the ongoing work on CS/75 that will occur during the Candidate Standard phase.

This first version of the PMCP standard does not make provision for communication of metadata needed to support optional data services in the broadcast transport stream or metadata needed for PSIP in proposed E-VSB transmissions. These items will be addressed in future revisions to the standard.

Use Cases providing guidance for the use of the PMCP schema are included in Annex B. A more comprehensive Guide to the Use of the PMCP Standard is planned for future publication.

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Candidate Standard: Programming Metadata Communication Protocol

1. SCOPE

1.1 Purpose

This standard defines a method for communicating metadata related to PSIP (program and system information protocol), including duplicate data that needs to be entered in other locations in the transport stream. Communication is based on a protocol utilizing XML message documents generated in accordance with a Programming Metadata Communication Protocol (PMCP) XML Schema defined herein. PMCP is capable of extension to incorporate additional metadata and transactions not directly related to PSIP.

1.2 Application

PMCP communications are intended to apply to systems and equipment that affect production of PSIP tables and the digital television transport stream in studio and network centers and associated remote program planning and listing services.

1.3 Organization

The document is organized as follows:

- Section 1 – Provides this general introduction.
- Section 2 – Lists reference documents.
- Section 3 – Provides definitions of terms, acronyms and abbreviations used in this document.
- Section 4 – Defines the transport mechanisms to be used for PMCP communications.
- Section 5 – Describes the PMCP XML schema and how it is used.
- Annex A – A text and graphical view of the PMCP schema.
- Annex B – Provides some informative Use Case XML documents illustrating the use of PMCP.
- Annex C – Provides an informative description of the PSIP metadata system environment in which PMCP is expected to operate.
- Annex D – Lists the electronic files that support this standard (available from the ATSC web site).

2. REFERENCES

The following documents are applicable to this Standard:

- [1] Extensible Markup Language (XML) 1.0 (Second Edition), W3C Recommendation 6 October 2000, <http://www.w3.org/TR/2000/REC-xml-20001006> (*normative*)

- [2] XML Schema, W3C Recommendation, 2 May 2001, <http://www.w3.org/TR/2001/REC-xmlschema-0-20010502/> (*normative*)
- [3] A/53B, “Advanced Television Standard, Revision B with Amendments 1 and 2”, Advanced Television Systems Committee, Washington, D.C., May 19, 2003 (*normative*)
- [4] A/65B “Program and System Information Protocol for Terrestrial Broadcast and Cable (Revision B)”, Advanced Television Systems Committee, Washington, D.C., March 1, 2003 (*normative*)
- [5] “Code Point Registry”, Advanced Television Systems Committee, Washington, D.C. (*normative*)

3. DEFINITIONS

3.1 Compliance Notation

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

3.2 Abbreviations and Terms

The following terms, acronyms and abbreviations are used in this specification:

automation event	An entry in a playlist that triggers an action by an automation system to initiate playback, start a machine, switch a signal, control an effect, change a configuration, or other action that changes the content or configuration of a program output channel.
attribute	A qualifier on an XML tag that provides additional information.
CDATA	A predefined XML tag for Character DATA that says, “don't interpret these characters”, as opposed to Parsed Character Data (PCDATA), in which the normal rules of XML syntax apply.
content	Essence plus its metadata .
contentID	A label for content . This may take the form of a global label such as ISAN , or a “house number”.
EPG	Electronic program guide.
essence	Actual program material (audio, video and/or data).
GPS	Global Positioning System.
GPS Time	Time signal distributed via GPS comprising number of seconds elapsed since 0000 Universal Time on January 6 1980. Offset from UTC by an integer number of seconds (currently 13) due to leap seconds added to UTC but not to GPS time.
interstitial	A special kind of work of typically less than 5 minutes inserted between

	program segments. May comprise advertisements, promotions, or other short program material .
ISAN	International Standard Audiovisual Number.
metadata	Information about essence .
multiplexer	A device that combines MPEG-2 packets from one or more elementary streams into one or more MPEG-2 transport stream outputs containing a multiplex of packets, or that combines multiple transport streams into a system level multiplex.
namespace	A standard that enables the definition of a unique label for the set of element names defined by a specific schema . A document using that schema can be included in any other document without having a conflict between XML element names. The elements defined in the schema are then uniquely identified so that, for example, the parser can tell when an element called <name> should be interpreted according to that schema, rather than using the definition for an element called "name" in a different schema.
packet identifier	A unique integer value used to associate elementary streams of a program in a single or multi-program transport stream.
PID	See packet identifier .
playlist	Also known as the “traffic schedule”. A sequential list of automation events to be played back for a station output channel.
program element	A generic term for one of the elementary streams or other data streams that may be included in a program. For example: audio, video, data, etc.
program segment	Portion of a TV program as defined in the traffic format assigned to the program.
PSIP event	A defined period of time on a virtual channel with associated metadata related to a show .
remultiplexer	A packet multiplexer capable of combining MPEG-2 transport stream packets from one or more inputs containing a multiplex of packets into one or more MPEG-2 transport stream outputs.
root	The outermost element in an XML document that contains all other elements.
schedule	The binding of shows to virtual channels at particular times. A schedule is the generic name for “Television Schedule” that consists of multiple audio-video presentations carried on a channel over a period of time.
schema	A database-inspired method for specifying constraints on XML documents using an XML-based language. Since schemas are founded on XML, they are hierarchical, so it is easy to create an unambiguous specification and possible to determine the scope over which definitions and comments are meant to apply.

show	The composition of the primary work and interstitials in a single timeline suitable for broadcast.
show segment	A contiguous subset of a show identified with a single start time and end time pair referenced to the show's timeline.
tag	A piece of text that describes a unit of data, or element, in XML . The tag is distinguishable as <i>markup</i> , as opposed to data, because it is surrounded by angle brackets (< and >). For example, the element <Channel>My 100</Channel> has the start tag <Channel>, the end tag </Channel>, which enclose the data "100". To treat such markup syntax as data, an entity reference or a CDATA section is used.
traffic format	A defined structure that specifies for each traffic system the organization of a primary work and interstitials . A series of traffic formats linked together form a 24 hour broadcast log. Traffic formats are typically linked to a specific program.
traffic system	A management system comprising a database for tracking the sale of advertising, and the scheduling of program elements , advertising, promotional announcements, and other interstitial material.
UTC	Coordinated Universal Time, the basis for the worldwide system of time. Determined using atomic clocks and maintained by the US Naval Observatory and other laboratories around the world. Adjusted occasionally with leap seconds to maintain synchronization with the solar day based on the rotation of the earth.
valid XML	A valid XML document, in addition to being well formed , conforms to all the constraints imposed by a Schema . It does not contain any tags that are not permitted by the schema, and the order of the tags conforms to the schema's specifications.
value	Used in XML to indicate the number or characters entered for a particular parameter or variable.
virtual channel	The designation, usually a number, that is recognized by the user as the single entity that will provide access to a set of one or more digital elementary streams or an analog TV program. It is called "virtual" because its identification (name and number) may be defined independently from its physical location.
V-ISAN	ISAN combined with a version identifier to provide a globally unique identifier of the version of an audiovisual work.
W3C	The World Wide Web Consortium (http://www.w3c.org/). The international body that governs Internet standards.
well-formed	An XML document that is syntactically correct. To determine whether or not a well-formed document is valid, a validating parser and a schema re required.
work	A completed artistic creation, produced or accomplished through the effort,

activity or agency of a person or group, comprised of any combination of picture (or video) essence, sound (or audio) essence and/or data (or auxiliary) **essence**.

work segment A contiguous subset of a **work**; identified with a single start time and end time pair referenced to the work's timeline; and a defined subset of the elements of the work.

XML Extensible Markup Language.

XML document In general, an **XML** structure in which one or more elements can contain text intermixed with sub-elements.

XML element A unit of **XML** data, delimited by tags which can enclose other elements. For example, in the **XML** structure, “<VirtualChannels><Channel>..</Channel>><Channel>..</Channel></VirtualChannels>”, the <VirtualChannels> element contains two <Channel> elements

XML schema The W3C schema specification for XML documents.

4. TRANSPORT

4.1 Transport Methods

The PMCP protocol may be implemented in different systems using two different transport mechanisms, File Based and Connection Based transport, depending on their needs. Both methods may coexist in the same system.

4.2 File Based Transport

File Based transfer will usually be used where large amounts of data needs to be communicated from one system to another without the need for acknowledgement, and where timing is not critical. The user will simply download a file containing the XML document from the originating device and import it into the receiving device. Alternatively the files may be pushed or pulled to the receiving device in an automatic process.

4.2.1 Common Folders

Receiving devices that implement the file based transport mechanism shall utilize at least one folder where new content is placed. This folder may be on the device itself or elsewhere across any accessible network. The receiving device may automatically detect when new content is available in this folder or may periodically poll the folder for new content.

Separate folders should be used for different receiving devices since the defined file name scheme identifies the message origin but not the intended recipient.

If required there should be other folders for files that will not automatically be processed when moved to a receiving device.

4.2.2 File Name

The originating device shall utilize a common naming scheme for the files so that the receiving device can be set up to identify the files. The file name shall be in the format of:

“PMCPyyyymmdd<Device>nnnnnnnnnn.xml”

where:

“yyyymmdd” is the year, month, and day that the file was sent (using UTC clock)

<Device> is a string of up to 14 letters and digits that identifies the creator of the file uniquely in the system

“nnnnnnnnnn” is a 10-character decimal number including leading zeros

4.3 Connection Based Transport

Connection Based transport of PMCP requires that there be a direct network connection between the sending and receiving devices.

4.3.1 TCP/IP Socket

TCP/IP sockets shall be used for communication. The default port number shall be 7005. Systems and devices shall have the ability of changing this port number to accommodate cases where 7005 is in conflict with something else in the facility.

4.3.2 Socket Connections

Each device using the PMCP protocol that will receive and respond to messages shall act as a server. Each device using the protocol to initiate the sending of messages shall act as a client. Devices that plan to both send and receive messages shall act as both a server and a client.

A socket connection shall be initiated by a PMCP client to connect to a PMCP server. A server that can also be a client shall be responsible for managing the socket connection separately from the other client socket connections. A client shall be allowed to open socket connections to as many PMCP servers as are available.

4.3.3 Inactive Sockets

Sockets that go inactive are those that are non-responsive to circuit ping from a connection listed with a device. Both clients and servers should have the ability to clean up broken connections. Arrangements for managing inactive connections are left up to implementation by each manufacturer.

Editorial Note: Users and reviewers of this Candidate Standard are encouraged to comment whether specific arrangements for managing inactive sockets need to be defined in the standard to ensure interoperability of equipment.

4.3.4 Unicast

The PMCP protocol shall support only unicast over TCP/IP sockets. If multicast functionality is required, it may be implemented by the client opening sockets to all devices.

4.3.5 List of Devices to Connect To

Each PMCP device that is configured as a client shall store a list of available PMCP devices (configured as servers) that it will need to communicate with. This list shall contain the IP address or DNS name of the device, the port number, the Device Name, and its Device Type (see

Section 5.5). Arrangements for setting up and maintaining this list are left up to implementation by each manufacturer.

4.3.6 List of Devices to Accept Connections From

It is recommended that each device that is configured as a server should keep a list of the IP addresses or DNS names for devices that it will accept connections from. This list may or may not be the same as the list of devices it can connect to. If the list is present, then devices that attempt to connect and are not in the list shall not be allowed a socket connection. Arrangements for setting up and maintaining this list are left up to implementation by each manufacturer.

4.3.7 Initiation of Servers

When a device that is configured as a server is turned on, it shall begin accepting TCP/IP socket connections. When a client attempts to connect to the server, the server should reference its list of Devices to Accept Connections From (if present) before deciding to accept the connection.

4.3.8 Sending of Messages

Once a connection is made from a client to a server, only the client may initiate communication. This communication can either be a “push” of information where the client sends data to the server, or a “pull” where the client requests certain information from the server. If there is a need for the server to initiate messages to the client, then a separate socket shall be opened where the client/server roles are reversed.

Editorial Note: Users and reviewers of this Candidate Standard are encouraged to comment on the advantages and disadvantages of allowing asynchronous interrupt driven messages to occur from the server to the client.

4.3.9 Encryption

Encryption, in the form of Secured Sockets Layer or Transport Layer Security may, optionally, be supported by manufacturers.

Editorial Note: Users and reviewers of this Candidate Standard are encouraged to comment whether more specific arrangements for managing secure communications need to be defined in the standard to ensure interoperability of equipment.

4.3.10 Message format

All messages in PMCP shall be sent as XML documents.

Editorial Note: Users and reviewers of this Candidate Standard are encouraged to comment whether more detailed specification of the communications transport layer arrangements need to be defined in the standard to ensure interoperability of equipment.

5. XML SCHEMA DESCRIPTION

5.1 Introduction

The Extensible Markup Language (XML) [1] is a standard that allows structuring of information in a text document so that it is both human and machine-readable. It has a hierarchical structure, it can be easily extended and each piece of information can be labeled. A document compliant to the XML standard is said to be “well-formed”.

The XML Schema standard (XML Schema) [2] defines a way of describing a specific format for an XML document. A schema specifies which elements are allowed in a document, which elements can be the children of another element, which attributes an element can have and the data types that an element or an attribute can have. An XML document that complies with a given schema is said to be “valid”.

The PMCP schema defined in Annex A describes the structure of a Programming Metadata Communication Protocol (PMCP) message. It is mostly the transformation of the parameters and data needed to generate the tables defined in the ATSC transport (A/53 [3]) and PSIP (A/65B [4]) standards. Due to the nature of XML, it can be further extended to include other metadata that is not directly related to PSIP.

5.2 Namespace

The elements and attributes defined in a schema are referred to as a “markup vocabulary” and are specific to a given schema. It is envisaged that for the majority of users of this XML-based standard PMCP will be the default vocabulary of the XML document, or will unambiguously coexists with other vocabularies where explicit namespace use is unnecessary.

It is possible that there may be applications using PMCP where XML documents may contain markup vocabulary defined by multiple XML schemas. For those rare cases where the use of namespace cannot be avoided, the four lower-case letters “pmcp” shall be used as a namespace prefix to refer to the elements and attributes defined in this standard.

5.2.1 Examples:

1) Private PMCP Information - PMCP is default and WM is explicit.

```
<PmcpMessage xmlns=http://www.atsc.org/pmcp/2003/1.0
xmlns:wm="http://www.atsc.org/wm/2003/0.9"...>
...
...
  <PrivatePmcpInformation>
    <wm:Key date="yyyy-mm-dd">
      ...
      <wm:Channel .....>
        ...
      </wm:Channel>
    </wm:Key>
  </PrivatePmcpInformation>
</PmcpMessage>
```

2) SOAP Example where PMCP message is contained inside another XML SOAP document (namespace is not required).

```
<SOAP-ENV:Envelope
xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding">
  <SOAP-ENV:Body>
    <PmcpMessage xmlns="http://www.atsc.org/pmcp/2003/1.0" id="17365" origin="psip_generator" dateTime=
      "2003-12-16T09:30:48-05:00" type="reply">
      <PmcpReply id="12345" origin="automation_main" dateTime="2003-12-16T09:30:47-05:00" status="OK"/>
    </PmcpMessage>
  </SOAP-ENV:Body>
```

</SOAP-ENV:Envelope>

5.3 Naming Conventions

In order to guarantee consistency in the way elements, attributes and values are named the following conventions have been followed in the PMCP schema:

Elements:

- a. All elements have their first letter of every word capitalized. Example `TransportStream`.
- b. Element names do not contain any space, underscore or hyphen sign.
- c. Acronyms in token names are treated like English words so only the first letter is capitalized. Example: `PsipEvent`.

Attributes:

- a. All attributes start with a lower case letter.
- b. Any first letter of any word after the first one is capitalized.
- c. Attributes names do not contain any space or underscore.
- d. Acronyms in attribute names follow the same rules applied to English words, e.g. `pmtPid`.

String Values of Attributes:

- a. String values of attributes may use lower or upper case letters.
- b. Values do not contain spaces.
- c. Multiple word values are separated by an underscore.

5.4 PMCP Messages

Each PMCP message has a root element called “`PmcpMessage`”. It has a certain number of required attributes that identify the type of the message, its origin, and generation time. Unless otherwise described here, the semantics of all attributes shall be interpreted as described in [3] and [4].

Each PMCP message shall conform to the PMCP XML schema defined in Annex A. Senders may transmit messages conforming to other schemas, but messages shall not extend the schema of Annex A without formally declaring it as a new schema according to [1]. Receivers may reject malformed messages or messages conforming to a schema other than that defined in Annex A as further described below.

A PMCP message is either of type “information” (default), “request”, or “reply”. An information message may be sent to communicate some set of metadata information. A request message may be sent to communicate or request some information. Zero, one or two reply messages may be sent to acknowledge a specific information message. One or two reply messages shall be sent to acknowledge a specific request message. No reply message shall be sent otherwise. A reply message shall contain the “`PmcpReply`” element. No “`PmcpReply`” element shall be present in an information or request message.

A system heartbeat request message is sent using the root PmcpMessage alone. All other information, request and reply messages comprise the root element and one or more child elements and their attributes as defined in the schema.

5.5 Device Identification

5.5.1 Device Name

Each device utilizing PMCP shall have a unique, alphanumeric Device Name. This name shall be unique within the facility (but not necessarily globally). The definition of the device name is left up to implementation by each manufacturer, and it is expected that this will be part of a device's initial setup.

5.5.2 Device Type

The device type shall be included in all messages sent from the device, and may aid receiving devices in determining message priority and applicability. Device types shall be assigned and recorded in the ATSC Code Point Registry [5]. The device types are expected to be relatively broad in scope, and it is possible that multiple devices within a facility will be of the same device type. **Table 5.1** identifies the currently defined device types.

Table 5.1 PMCP Device Types

Automation
Conditional_Access
MPEG_Control
Program_Management
Table_Generator
Traffic
Listing_Service
Metadata_Extractor
Table_Extractor

5.6 Message Identification

Every message sent via PMCP shall have a Message ID number and Date/Time stamp so that the individual messages can be acknowledged. In addition it shall include the Device Name and Device Type of the originating device so that the receiving device can identify the sender and take appropriate actions. This information shall be transmitted as part of the XML.

5.6.1 Message ID

The Message ID shall be a sequential number assigned by the originating device. Message ID numbering arrangements are left up to implementation by each manufacturer but shall be in accordance with the PMCP schema.

5.6.2 Time and Date Stamp

The timestamp shall indicate the time and date that the message was sent. The time and date shall be presented in standard XML schema `dateTime` format, including the offset from UTC (see Section 5.10).

5.7 Acknowledgement

The sending device shall have the option of asking for an acknowledgment for each message sent. The `PmcpReply` element is used for this and has a required `status` attribute that shall have one of the values `valid`, `invalid`, `OK` or `error`.

It is envisioned that the request for acknowledgements will be used primarily in the connection based protocol, although it could be implemented with files if so desired.

5.7.1 Valid

A reply message with status `valid` shall be generated by the receiving device upon receipt of a properly formatted message containing a request for acknowledgement. This acknowledgement shall serve to let the sending device know that the message has been received and that it appears to be valid with regard to this schema. It will not, however, indicate that action has been taken on the message. When the reply message responds with `valid`, then a second reply shall be sent later to indicate the final processing status.

The timeout period during which the `valid` message should be received shall be configurable per connection, with a default value of 100 ms. If no response has been received by the sending device in this time period, it may consider the message lost and initiate a resend.

5.7.2 Invalid

A reply message with status `invalid` shall be generated when the message has been received but does not comply with the schema described in this document and cannot be processed.

5.7.3 OK

When the receiving device has finished acting on a message containing a request for acknowledgement, it shall send a reply message with status `OK`. This acknowledgement shall indicate that the action has been completed successfully.

There is no timeout period for this command since it is impossible to determine how long each and every action will take. Therefore, it is up to the sending device to determine the proper amount of time to wait after sending the command before deciding that the message was not acted upon.

5.7.4 Error

If the action was not completed correctly, a reply message with `status` error message shall be returned to the sending device along with a description of why the action could not be completed.

There is no timeout period for this command since it is impossible to determine how long each and every action will take. Therefore, it is up to the sending device to determine the proper amount of time to wait after sending the command before deciding that the message was not acted upon.

Further arrangements for managing “Error” and “Invalid” messages and any resulting alarms and actions are left up to implementation by each manufacturer.

Editorial Note: Users and reviewers of this Candidate Standard are encouraged to comment whether more specific arrangements for managing timeout, error and invalid messages and alarms need to be defined in the standard to ensure interoperability of equipment.

5.8 PmcpMessage Action Attributes

Many elements in a PmcpMessage may have an “action” attribute. The allowed values are “read”, “add”, “update” and “remove”. Only a request message may contain “action” attributes with the value “read”. A reply message shall not contain any “action” attribute.

- If an element has no “action” attribute, it is being sent for context and the receiver reads only the attributes necessary to uniquely identify the element. This element’s children may have an “action” attribute with any value.
- If an element has an “action” attribute with the value “read”, a reply message shall be sent in return, and it shall contain the current attributes and children for this element. The receiver of the request message should ignore all children elements and all attributes that are not necessary for unique identification.
- If an element has an “action” attribute with the value “add”, the whole element, including its children, may be added to the current environment of the receiver. If a child of such an element has an “action” attribute, its value shall be “add”. If there was already an element with the same ID, it and its children should be replaced.
- If there is an “action” attribute with the value “update”, all current attributes may be updated with the given values in the receiver environment. Each child element may have its own independent “action” attribute.
- If an element has an “action” attribute with the value “remove”, the referenced element may be deleted from the receiver environment of the receiving device. Only the attributes required for unique identification should be interpreted by the receiver. All children elements and all other attributes should be ignored.

5.9 PmcpMessage Children

Figure 5.1 shows the highest-level children of a PMCP message.

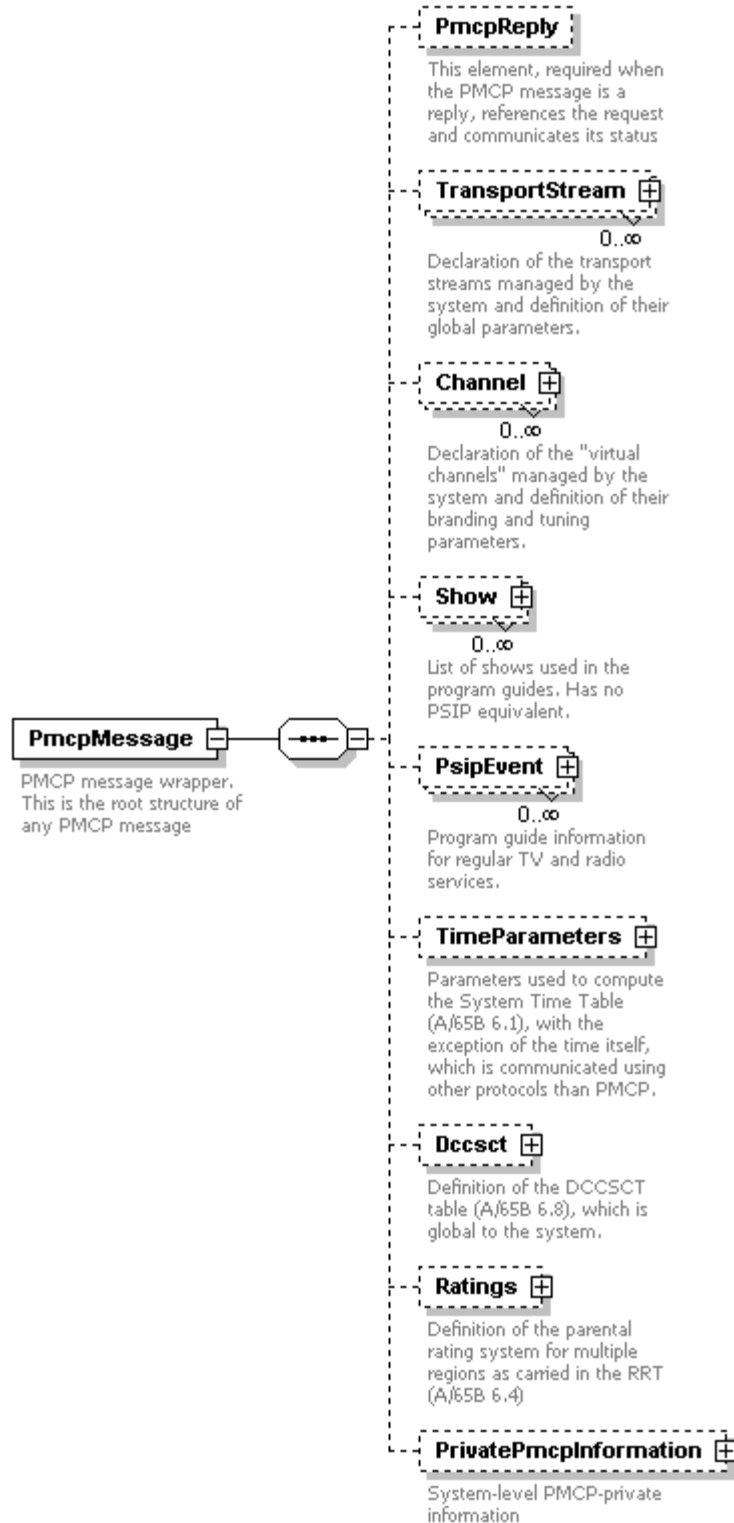


Figure 5.1 PMP message diagram.

In this diagram, the dotted lines surrounding a child element mean that this element is optional and may not be present. The “0..” symbol means that the element may be present an infinite number of times.

Other child elements are defined in the schema as children of the elements shown above. These carry specific metadata related to the parent element, they also may have children, and so on in a hierarchical fashion.

5.9.1 PmcpReply

The “Reply” element is a special case message used in various ways as described in Section 5.7.

5.9.2 Transport Stream

A “TransportStream” element carries the information about a transport stream that is managed by the system. It carries only the information that applies to the whole transport stream and not to a specific channel.

5.9.3 Channel

A “Channel” element carries the information about an ATSC “virtual channel” (see A/65B [4], Section 6.3 on the VCT). All the information found at this level is currently valid for the channel and supersedes whatever information is associated with the current PSIP event (see A/65B [4], Section 6.5 on the EIT, and Section 5.9.5.1 below).

5.9.4 Show

The “Show” element may be used to communicate metadata about a show independently of when it is scheduled. Both the “ContentId” and “ShowData” elements are required. The “ContentId” element shall contain the show label for one or more numbering schemes.

5.9.5 PsipEvent

The “PsipEvent” element is the main structure used to communicate both current and future electronic program guide (EPG) information. It shall always have an “EventId” element, used to label or reference the event. The channel used to carry the PSIP Event is referenced through a mandatory “channelNumber” attribute. Optional “tsid” and “network” attributes may be used to further specify the channel when the channel number is not unique in the system. The “Current” element may be used to reference the current event of the channel when no other reference is known. The “Default” element references a default PSIP event, used by the PSIP Generator to fill in the empty time slots of the channel. All other PSIP events shall be referenced using at least one of the following elements:

- PmcpEventId is the preferred referencing method and consists of the event creator device name combined with a sequential number assigned by this creator.
- InitialSchedule may be used either to assign the start time initially scheduled by the creator or to reference an event by its initial start time when the PmcpEventId is not known. The initially scheduled start time shall not be modified during the existence of a PSIP event. Adjustments to the actual start time shall be done through the “startTime” attribute of the “PsipEvent” element.

- PsipEventId may be used to reference an event by its PSIP event_id, as carried in the EIT. This value is assigned by the PSIP Generator. It is therefore not known before the event has been scheduled in the PSIP Generator.

5.9.5.1 Precedence for PSIP Event Metadata

The order of precedence for the receiving device with respect to default, current, and regular PSIP events shall be:

- The current parameters associated with the channel, where available, supersede channel information that was otherwise set with PSIP event metadata for the current event.
- Regular and current PSIP events are normally used to communicate schedule information.
- The default PSIP event is used whenever no other information is available about a particular schedule time slot.

The information about an event may be communicated in two non-exclusive ways:

- The PSIP event may be linked to a show defined either previously or in the same PMCP message through a “ContentId” element.
- The PSIP event may contain its own “ShowData” element.

When the same type of information is provided through both mechanisms in the same message, the information coming from the “ShowData” element shall take precedence.

Multiple events may be linked to the same show. This provides an efficient way of using the same metadata for multiple events.

5.9.6 Other Children

The PmcpsMessage children: TimeParameters, Dccsct and Ratings carry the values for the various parameters in the PSIP System Time Table (STT), Directed Channel Change Selection Code Table (DCCSCT), and Regional Rating Table (RRT) and map to those tables.

The Private PmcpsInformation element is the mechanism used to carry private information on a PCMP message.

5.10 PMCP Time Messages

All PMCP time fields defined in the PMCP Schema follow the standard XML date/time format and, using the timezone offset syntax, can refer to any time zone (see <http://www.w3.org/TR/xmlschema-2/#datetime>). Based on the techniques described in Annex C, PMCP time will be ultimately referenced to UTC. The PSIP Event has additional optional start frame time and duration frame attributes to allow times for Events to be specified with frame accuracy where this is required.

5.11 Heartbeat

In a connection-based implementation, any client shall be able to poll any other PMCP server and get a heartbeat message back. This heartbeat message defined in the schema shall include the device’s type and identification.

5.11.1 Heartbeat Timing

The acknowledgement to the heartbeat request shall be initiated no later than 100ms (configurable per connection) after the receipt of the heartbeat request message.

5.11.2 Multiple Requests

It is recommended that the sending device should not simply take a single lack of response to indicate a failed device, but instead poll the device again to verify that there is no response.

5.11.3 Failed Device

If a device does not respond to repeated polling messages, the sending device should assume that the device is no longer in service and should address the backup device if one exists.

Further arrangements for managing heartbeat messages and any resulting alarms and actions are left up to implementation by each manufacturer.

Editorial Note: Users and reviewers of this Candidate Standard are encouraged to comment whether specific arrangements for managing heartbeat messages and alarms need to be defined in the standard to ensure interoperability of equipment.

5.12 Message Priority and Conflict Management

In many cases it is foreseeable that a given device could receive multiple, potentially conflicting, pieces of information from different sources. How these conflicts are handled is left up to implementation by each manufacturer. Possible methods include “Last Message” mode where the last message sent (based on the message send time) is used, or a more intelligent approach where the receiving device takes into account the sender’s name and device type and the amount of time before air. It is expected that certain devices will have more relevant or more reliable information depending on how close to broadcast time it is for the related PSIP event. In these cases, having a message send time, and device name and type to identify the sending device will aid the receiving device in making a decision on how best to handle the messages.

It is recommended that the PSIP table generator and other systems’ validity rules should be configurable based on input from a user interface or configuration control system, as may be necessary for network and station operational changes.

ANNEX A: PMCP SCHEMASchema **PMCP1.0.xsd**targetNamespace: <http://www.atsc.org/pmcp/2003/1.0>

Elements

PmcpMessage

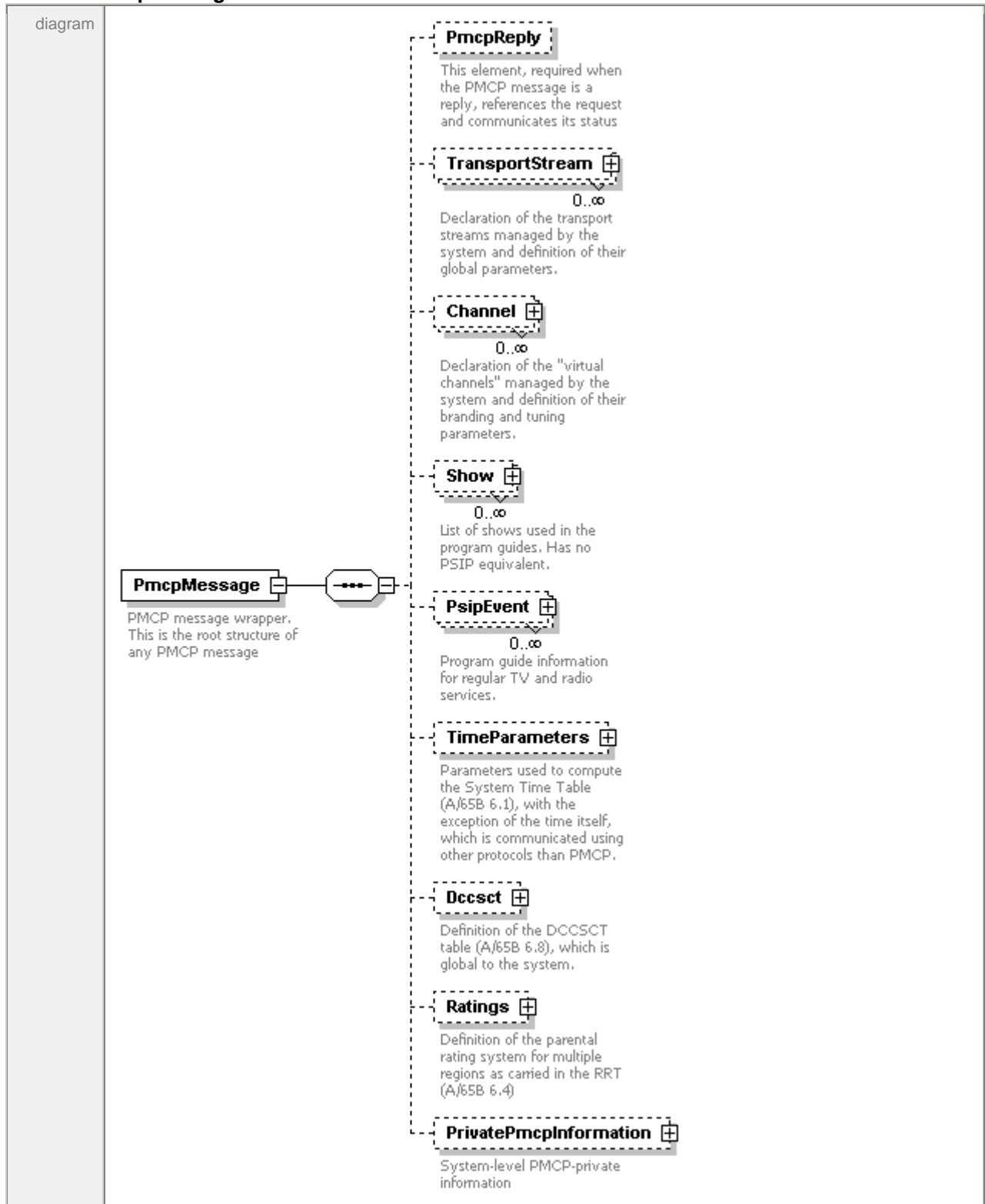
Complex types

Ac3AudioType
AlternateIdType
CaptionType
ChannelCopyType
ChannelType
ConditionalAccessType
ContentIdType
DccArrivingRequestType
DccDepartingRequestType
DccRequestType
DccsctType
DccTermType
DescriptorType
DimensionType
ElementaryStreamType
EventIdType
HouseNumberType
InitialScheduleType
IsanType
NewCountyType
NewGenreType
NewStateType
ParentalRatingType
PmcpEventIdType
PmcpReplyType
PrivateInformationType
PrivatePmcpInformationType
PsipEventIdType
PsipEventType
RatingsType
RatingValueType
RedistributionControlType
RegionType
ShowDataType
ShowType
TableType
TextType
TimeParametersType
TimeShiftedServiceType
TransportStreamType

Simple types

actionType
arrivingRequestTypeType
audioServiceType
bitRateKbpsType
bsidType
ccServiceType
channelNumberType
channelStatusType
countyCodeType
dccContextType
departingRequestTypeType
dsDayOfMonthType
dsHourType
elementaryErrorType
errorType
isanEpisodeType
isanRootType
isanVersionType
languageType
mainidType
messageType
modulationType
networkTypeType
numChannelsType
onePartType
pathSelectType
pidType
privateInformationDataType
psipEventIdType
serviceType
shortNameType
statusType
twoPartType

element **PmcpMessage**



children	<u>PmcpReply</u>	<u>TransportStream</u>	<u>Channel</u>	<u>Show</u>	<u>PsipEvent</u>	<u>TimeParameters</u>	<u>Dccsct</u>	<u>Ratings</u>
	<u>PrivatePmcpInformation</u>							
attributes	Name	Type	Use	Default	Annotation			
	id	xsd:unsignedLong	required		unique number assigned to the message by its originating system			
	origin	xsd:string	required		Device name of the originating system of the message			
	originType	xsd:string	required		Type of the originating system (see ATSC code point registry)			
	destination	xsd:string	optional	all	Device name of the intended destination for the message			
	dateTime	xsd:dateTime	required		Date and time of generation of the message			
	type	messageType	optional	information	Message type			
	error	errorType	optional					
annotation	PMCP message wrapper. This is the root structure of any PMCP message							

element **PmcpMessage/PmcpReply**

type	<u>PmcpReplyType</u>
annotation	This element, required when the PMCP message is a reply, references the request and communicates its status

element **PmcpMessage/TransportStream**

type	<u>TransportStreamType</u>
annotation	Declaration of the transport streams managed by the system and definition of their global parameters.

element **PmcpMessage/Channel**

type	<u>ChannelType</u>
annotation	Declaration of the "virtual channels" managed by the system and definition of their branding and tuning parameters.

element **PmcpMessage/Show**

type	<u>ShowType</u>
annotation	List of shows used in the program guides. Has no PSIP equivalent.

element **PmcpMessage/PsipEvent**

type	<u>PsipEventType</u>
annotation	Program guide information for regular TV and radio services.

element **PmcpMessage/TimeParameters**

type	<u>TimeParametersType</u>
annotation	Parameters used to compute the System Time Table (A/65B 6.1), with the exception of the time itself, which is communicated using other protocols than PMCP.

element **PmcpMessage/Dccsct**

type	<u>DccsctType</u>
Annotation	Definition of the DCCSCT table (A/65B 6.8), which is global to the system.


element **PmcpMessage/Ratings**

type	RatingsType
annotation	Definition of the parental rating system for multiple regions as carried in the RRT (A/65B 6.4)

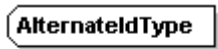
element **PmcpMessage/PrivatePmcpInformation**

type	PrivatePmcpInformationType
annotation	System-level PMCP-private information

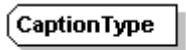
complexType **Ac3AudioType**

diagram					
used by	elements ChannelType/Ac3Audio ShowDataType/Ac3Audio				
attributes	Name	Type	Use	Default	Annotation
	audioid	xsd:unsignedByte	required		ID of the audio service in the virtual channel. Links to an elementary stream.
	lang	languageType	optional		Language of the audio stream carried in the ISO_639_language_descriptor
	serviceType	audioServiceType	optional	complete_main	Audio service type. Complete_main is the default (A/65B 6.9.1)
	numChannels	numChannelsType	optional	2/0	Number of audio channels in the elementary stream (A/65B 6.9.1)
	bitRateKbps	bitRateKbpsType	optional	448	Bit rate of the elementary stream in kbps (A/65B 6.9.1)
	exactBitRate	xsd:boolean	optional	false	Indicates if bitRateKbps is an exact value or an upper bound (A/65B 6.9.1)
	surround	xsd:boolean	optional		Indicates if the audio service is surround (A/65B 6.9.1)
	fullsvc	xsd:boolean	optional	true	Indicates whether the elementary stream can be decoded alone or must be presented along with other audio streams (A/65B 6.9.1)
	mainid	mainidType	optional		ID of the audio stream, if its fullsvc flag is set to true (A/65B 6.9.1)
	asvcflags	xsd:unsignedByte	optional		If the fullsvc flag is set to false, each bit in this byte indicates with which main audio streams this elementary stream can be presented (A/65B 6.9.1)
	bsid	bsidType	optional	8	Version of the AC-3 standard used by the audio stream. Default is 8 (A/65B 6.9.1)
	action	actionType	optional		
	error	errorType	optional		
Annotation	Communicates all the parameters of an audio stream.				

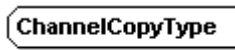
complexType **AlternateIdType**

diagram	 <p>Any proprietary string other than the house number used to identify the material locally or globally</p>																				
type	extension of xsd:string																				
used by	elements <u>ContentIdType/AlternateId</u> <u>ContentIdType/AlternateId</u> <u>ContentIdType/AlternateId</u>																				
attributes	<table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> <th>Use</th> <th>Default</th> <th>Annotation</th> </tr> </thead> <tbody> <tr> <td>IdType</td> <td>xsd:string</td> <td>required</td> <td></td> <td>This attribute uniquely identifies the type of alternate Id communicated in the element</td> </tr> <tr> <td>action</td> <td>actionType</td> <td>optional</td> <td></td> <td></td> </tr> <tr> <td>error</td> <td>ErrorType</td> <td>optional</td> <td></td> <td></td> </tr> </tbody> </table>	Name	Type	Use	Default	Annotation	IdType	xsd:string	required		This attribute uniquely identifies the type of alternate Id communicated in the element	action	actionType	optional			error	ErrorType	optional		
Name	Type	Use	Default	Annotation																	
IdType	xsd:string	required		This attribute uniquely identifies the type of alternate Id communicated in the element																	
action	actionType	optional																			
error	ErrorType	optional																			
annotation	Any proprietary string other than the house number used to identify the material locally or globally																				

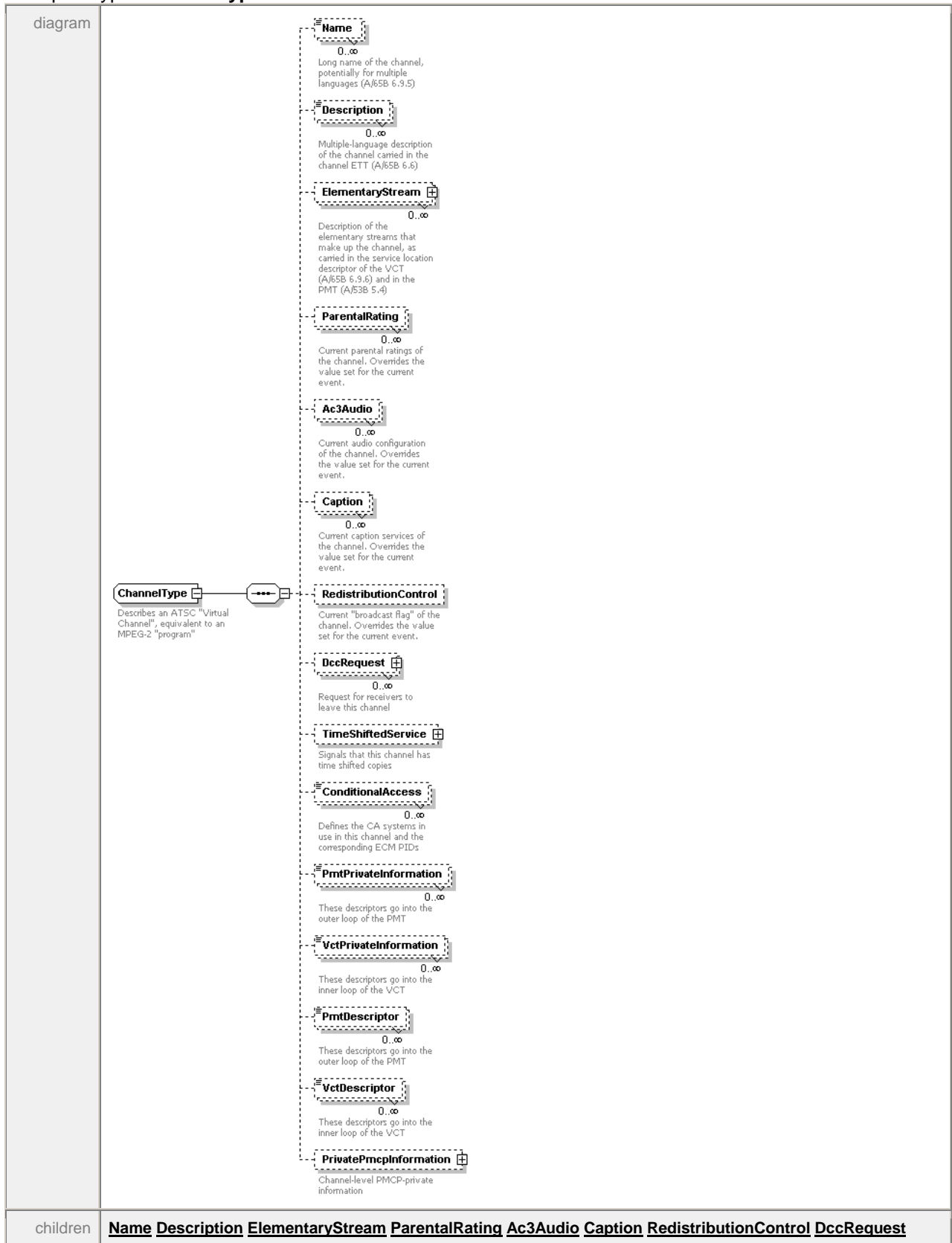
complexType **CaptionType**

diagram	 <p>Caption Service Descriptor (A/65B 6.9.3)</p>																																			
used by	elements <u>ChannelType/Caption</u> <u>ShowDataType/Caption</u>																																			
attributes	<table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> <th>Use</th> <th>Default</th> <th>Annotation</th> </tr> </thead> <tbody> <tr> <td>lang</td> <td>languageType</td> <td>required</td> <td></td> <td>Language of the caption service</td> </tr> <tr> <td>ccService</td> <td>ccServiceType</td> <td>optional</td> <td></td> <td>Indicates whether the caption service uses the 608 (analog) or 708 (digital) format, and in each case, where the service can be found</td> </tr> <tr> <td>wideAspectRatio</td> <td>xsd:boolean</td> <td>optional</td> <td></td> <td>Indicates the aspect ratio for which the caption service has been formatted</td> </tr> <tr> <td>easyReader</td> <td>xsd:boolean</td> <td>optional</td> <td></td> <td>Indicates if the caption service is formatted for beginner readers.</td> </tr> <tr> <td>action</td> <td>actionType</td> <td>optional</td> <td></td> <td></td> </tr> <tr> <td>error</td> <td>errorType</td> <td>optional</td> <td></td> <td></td> </tr> </tbody> </table>	Name	Type	Use	Default	Annotation	lang	languageType	required		Language of the caption service	ccService	ccServiceType	optional		Indicates whether the caption service uses the 608 (analog) or 708 (digital) format, and in each case, where the service can be found	wideAspectRatio	xsd:boolean	optional		Indicates the aspect ratio for which the caption service has been formatted	easyReader	xsd:boolean	optional		Indicates if the caption service is formatted for beginner readers.	action	actionType	optional			error	errorType	optional		
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action	actionType	optional																																		
error	errorType	optional																																		
annotation	Caption Service Descriptor (A/65B 6.9.3)																																			

complexType **ChannelCopyType**

diagram	 <p>Type for a time shifted service</p>															
used by	element <u>TimeShiftedServiceType/Copy</u>															
attributes	<table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> <th>Use</th> <th>Default</th> <th>Annotation</th> </tr> </thead> <tbody> <tr> <td>timeShift</td> <td>xsd:duration</td> <td>required</td> <td></td> <td>Delay compared to the reference channel</td> </tr> <tr> <td>channel</td> <td>channelNumberType</td> <td>required</td> <td></td> <td>Channel number of the time-shifted copy</td> </tr> </tbody> </table>	Name	Type	Use	Default	Annotation	timeShift	xsd:duration	required		Delay compared to the reference channel	channel	channelNumberType	required		Channel number of the time-shifted copy
Name	Type	Use	Default	Annotation												
timeShift	xsd:duration	required		Delay compared to the reference channel												
channel	channelNumberType	required		Channel number of the time-shifted copy												
annotation	Type for a time shifted service															

complexType **ChannelType**



<u>TimeShiftedService ConditionalAccess PmtPrivateInformation VctPrivateInformation PmtDescriptor VctDescriptor PrivatePmcplInformation</u>					
used by	element <u>PmcpMessage/Channel</u>				
attributes	Name	Type	Use	Default	Annotation
	channelNumber	channelNumberType	optional		Two-part or one-part channel number of the virtual channel
	tsid	xsd:unsignedShort	optional		TSID of the carrying transport stream (A/65B 6.3)
	network	xsd:unsignedShort	optional		Network identifier, used when the TSID is not unique in the system
	programNumber	xsd:unsignedShort	optional		MPEG-2 program number used by the virtual channel (A/65B 6.3)
	sourceId	xsd:unsignedShort	optional		PSIP source_id (A/65B 6.3)
	status	channelStatusType	optional		Current activity status of the channel (A/65B 6.3 hidden and hide_guide)
	type	serviceType	optional		Type of the primary service provided by the channel: TV, radio or data (A/65B 6.3 service_type)
	ca	xsd:boolean	optional		Specifies if this channel is partly or completely encrypted and access-controlled (A/65B 6.3 access_controlled)
	shortName	shortNameType	optional		PSIP short name (7 characters max.) (A/65B 6.3)
	outOfBand	xsd:boolean	optional		When true, signals that the PSIP data is not carried in the same physical channel as the virtual channel itself (A/65B 6.3.2)
	pmtPid	pidType	optional		PID used to carry the MPEG-2 PMT of the channel (A/53B 5.4)
	pcrPid	pidType	optional		PID used to carry the PCR fields of the channel, same as video PID per ATSC rules (A/53B 5.4)
	action	actionType	optional		
	error	errorType	optional		
annotation	Describes an ATSC "Virtual Channel", equivalent to an MPEG-2 "program"				

element **ChannelType/Name**

type	<u>TextType</u>
annotation	Long name of the channel, potentially for multiple languages (A/65B 6.9.5)

element **ChannelType/Description**

type	<u>TextType</u>
annotation	Multiple-language description of the channel carried in the channel ETT (A/65B 6.6)

element **ChannelType/ElementaryStream**

type	<u>ElementaryStreamType</u>
annotation	Description of the elementary streams that make up the channel, as carried in the service location descriptor of the VCT (A/65B 6.9.6) and in the PMT (A/53B 5.4)

element **ChannelType/ParentalRating**

type	<u>ParentalRatingType</u>
annotation	Current parental ratings of the channel. Overrides the value set for the current event.

element **ChannelType/Ac3Audio**

type	<u>Ac3AudioType</u>
annotation	Current audio configuration of the channel. Overrides the value set for the current event.

element ChannelType/Caption

type	<u>CaptionType</u>
annotation	Current caption services of the channel. Overrides the value set for the current event.

element ChannelType/RedistributionControl

type	<u>RedistributionControlType</u>
annotation	Current "broadcast flag" of the channel. Overrides the value set for the current event.

element ChannelType/DccRequest

type	<u>DccRequestType</u>
annotation	Request for receivers to leave this channel

element ChannelType/TimeShiftedService

type	<u>TimeShiftedServiceType</u>
annotation	Signals that this channel has time shifted copies

element ChannelType/ConditionalAccess

type	<u>ConditionalAccessType</u>
annotation	Defines the CA systems in use in this channel and the corresponding ECM PIDs

element ChannelType/PmtPrivateInformation

type	<u>PrivateInformationType</u>
annotation	These descriptors go into the outer loop of the PMT

element ChannelType/VctPrivateInformation

type	<u>PrivateInformationType</u>
annotation	These descriptors go into the inner loop of the VCT

element ChannelType/PmtDescriptor

type	<u>DescriptorType</u>
annotation	These descriptors go into the outer loop of the PMT

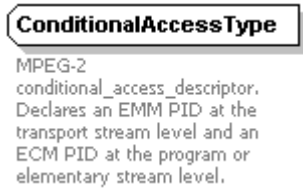
element ChannelType/VctDescriptor

type	<u>DescriptorType</u>
annotation	These descriptors go into the inner loop of the VCT

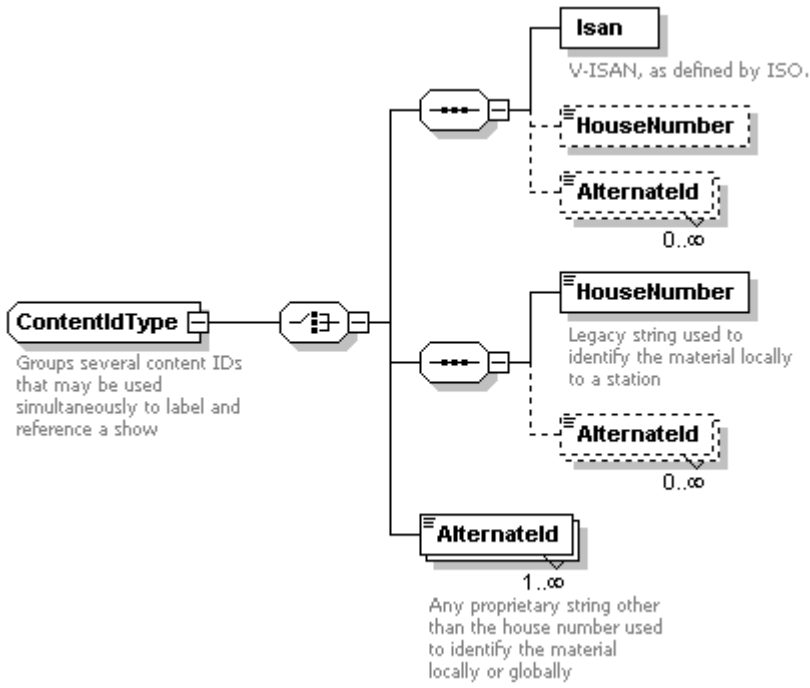
element ChannelType/PrivatePmcplInformation

type	<u>PrivatePmcplInformationType</u>
annotation	Channel-level PMCP-private information

complexType **ConditionalAccessType**

diagram						
type	extension of xsd:hexBinary					
used by	elements <u>TransportStreamType/ConditionalAccess</u>			<u>ChannelType/ConditionalAccess</u>		
attributes	Name	Type	Use	Default	Annotation	
	pid	pidType	required		EMM or ECM PID, depending on context	
	systemId	xsd:unsignedShort	required		Conditional access system ID	
	action	actionType	optional			
	error	errorType	optional			
annotation	MPEG-2 conditional_access_descriptor. Declares an EMM PID at the transport stream level and an ECM PID at the program or elementary stream level.					

complexType **ContentIdType**

diagram						
children	<u>Isan</u> <u>HouseNumber</u> <u>Alternateld</u> <u>HouseNumber</u> <u>Alternateld</u> <u>Alternateld</u>					
used by	elements <u>ShowType/ContentId</u> <u>PsipEventType/ContentId</u>					
attributes	Name	Type	Use	Default	Annotation	
	action	actionType	optional			
	error	errorType	optional			
annotation	Groups several content IDs that may be used simultaneously to label and reference a show					

element **ContentIdType/Isan**

type	<u>IsanType</u>
annotation	V-ISAN, as defined by ISO.

element **ContentIdType/HouseNumber**

type	<u>HouseNumberType</u>
------	------------------------

element **ContentIdType/Alternateld**

type	<u>AlternateldType</u>
------	------------------------

element **ContentIdType/HouseNumber**

type	<u>HouseNumberType</u>
annotation	Legacy string used to identify the material locally to a station

element **ContentIdType/Alternateld**

type	<u>AlternateldType</u>
------	------------------------

element **ContentIdType/Alternateld**

type	<u>AlternateldType</u>
annotation	Any proprietary string other than the house number used to identify the material locally or globally

complexType **DccArrivingRequestType**

diagram					
children	<u>Text</u>				
used by	element <u>DccRequestType/DccArrivingRequest</u>				
attributes	Name	Type	Use	Default	Annotation
	type	arrivingRequestTypeType	required		dcc_arriving_request_type (A/65B 6.9.12)
	action	actionType	optional		
	error	errorType	optional		
annotation	DCC Arriving Request Descriptor (A/65B 6.9.12)				

element **DccArrivingRequestType/Text**

type	<u>TextType</u>
annotation	Multi-lingual text to be displayed by the receiver (A/65B 6.9.12)

complexType **DccDepartingRequestType**

diagram					
children	Text				
used by	elements TransportStreamType/DccDepartingRequest DccRequestType/DccDepartingRequest				
attributes	Name	Type	Use	Default	Annotation
	type	departingRequestTypeType	required		dcc_departing_request_type (A/65B 6.9.11)
	action	actionType	optional		
	error	errorType	optional		
annotation	DCC Departing Request Descriptor (A/65B 6.9.11)				

element **DccDepartingRequestType/Text**

type	TextType
annotation	Multi-lingual text to be displayed by the receiver (A/65B 6.9.11)

complexType **DccRequestType**

diagram					
children	DccTerm DccDepartingRequest DccArrivingRequest DccTestPrivateInformation DccTestDescriptor				
used by	element ChannelType/DccRequest				
attributes	Name	Type	Use	Default	Annotation
	destination	channelNumberType	required		Channel number that the receiver should tune to upon execution of this request

	startTime	xsd:dateTime	optional	Start time of the DCC request
	startFrame	xsd:unsignedByte	optional	Frame count for the start time of the DCC event, when a one-second accuracy is not sufficient.
	endTime	xsd:dateTime	optional	End time of the DCC request
	endFrame	xsd:unsignedByte	optional	Frame count for the end time of the DCC event, when a one-second accuracy is not sufficient.
	dccContext	dccContextType	optional	DCC request type: permanent or temporary
	action	actionType	optional	
	error	errorType	optional	
annotation	Defines a DCC request, i.e. a request for a receiver to tune to another channel (A/65B 6.7)			

element **DccRequestType/DccTerm**

type	<u>DccTermType</u>
annotation	Defines a switching condition for a DCC request

element **DccRequestType/DccDepartingRequest**

type	<u>DccDepartingRequestType</u>
annotation	Communicates the action performed by a receiver when leaving a channel after executing the DCC request

element **DccRequestType/DccArrivingRequest**

type	<u>DccArrivingRequestType</u>
annotation	Communicates the action performed by a receiver when arriving in a channel after executing the DCC request

element **DccRequestType/DccTestPrivateInformation**

type	<u>PrivateInformationType</u>
annotation	These descriptors go into the middle loop of the DCCT

element **DccRequestType/DccTestDescriptor**

type	<u>DescriptorType</u>
annotation	These descriptors go into the middle loop of the DCCT

complexType **DccsctType**

diagram	<p>The diagram shows a central element DccsctType with a description: "Describes the Directed Channel Change Selection Code Table (A/65B 6.8)". It is connected to five child elements, each with a multiplicity of 0..∞:</p> <ul style="list-style-type: none"> NewGenre: Declares a new genre code carried in the DCCSCT NewState: Declares a new state code carried in the DCCSCT NewCounty: Declares a new county code carried in the DCCSCT DccsctOuterPrivateInformation: These descriptors go into the outer loop of the DCCSCT DccsctOuterDescriptor: These descriptors go into the outer loop of the DCCSCT 					
children	<u>NewGenre</u> <u>NewState</u> <u>NewCounty</u> <u>DccsctOuterPrivateInformation</u> <u>DccsctOuterDescriptor</u>					
used by	element <u>PmcpMessage/Dccsct</u>					
attributes	Name	Type	Use	Default	Annotation	
	action	actionType	optional			
	error	errorType	optional			
annotation	Describes the Directed Channel Change Selection Code Table (A/65B 6.8)					

element DccsctType/NewGenre

type	<u>NewGenreType</u>
annotation	Declares a new genre code carried in the DCCSCT

element DccsctType/NewState

type	<u>NewStateType</u>
annotation	Declares a new state code carried in the DCCSCT

element DccsctType/NewCounty

type	<u>NewCountyType</u>
annotation	Declares a new county code carried in the DCCSCT

element DccsctType/DccsctOuterPrivateInformation

type	<u>PrivateInformationType</u>
annotation	These descriptors go into the outer loop of the DCCSCT

element DccsctType/DccsctOuterDescriptor

type	<u>DescriptorType</u>
annotation	These descriptors go into the outer loop of the DCCSCT

complexType DccTermType

diagram																								
children	<u>DccTermPrivateInformation</u> <u>DccTermDescriptor</u>																							
used by	element <u>DccRequestType/DccTerm</u>																							
attributes	<table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> <th>Use</th> <th>Default</th> <th>Annotation</th> </tr> </thead> <tbody> <tr> <td>selectionType</td> <td>xsd:unsignedByte</td> <td>required</td> <td></td> <td>Type of the value in selection ID</td> </tr> <tr> <td>selectionId</td> <td>xsd:unsignedLong</td> <td>required</td> <td></td> <td rowspan="3">Specifies a switching condition associated to the DCC request</td> </tr> <tr> <td>action</td> <td>actionType</td> <td>optional</td> <td></td> </tr> <tr> <td>error</td> <td>errorType</td> <td>optional</td> <td></td> </tr> </tbody> </table>	Name	Type	Use	Default	Annotation	selectionType	xsd:unsignedByte	required		Type of the value in selection ID	selectionId	xsd:unsignedLong	required		Specifies a switching condition associated to the DCC request	action	actionType	optional		error	errorType	optional	
Name	Type	Use	Default	Annotation																				
selectionType	xsd:unsignedByte	required		Type of the value in selection ID																				
selectionId	xsd:unsignedLong	required		Specifies a switching condition associated to the DCC request																				
action	actionType	optional																						
error	errorType	optional																						
annotation	Type for a switching condition for a DCC request																							

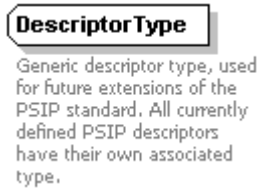
element DccTermType/DccTermPrivateInformation

type	<u>PrivateInformationType</u>
annotation	These descriptors go into the inner loop of the DCCT

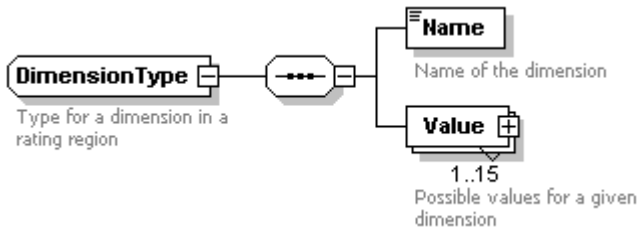
element DccTermType/DccTermDescriptor

type	<u>DescriptorType</u>
annotation	These descriptors go into the inner loop of the DCCT

complexType DescriptorType

diagram					
type	extension of xsd:hexBinary				
used by	elements DccsctType/DccsctOuterDescriptor TransportStreamType/DcctDescriptor DccTermType/DccTermDescriptor DccRequestType/DccTestDescriptor NewGenreType/Descriptor NewStateType/Descriptor NewCountyType/Descriptor RegionType/Descriptor PspipEventType/EitDescriptor TransportStreamType/MgtDescriptor TableType/MgtDescriptor ChannelType/PmtDescriptor ElementaryStreamType/PmtDescriptor TimeParametersType/SttDescriptor TransportStreamType/VctDescriptor ChannelType/VctDescriptor				
attributes	Name	Type	Use	Default	Annotation
	descriptorTag	xsd:unsignedByte	required		Descriptor tag
	action	actionType	optional		
	error	errorType	optional		
annotation	Generic descriptor type, used for future extensions of the PSIP standard. All currently defined PSIP descriptors have their own associated type.				

complexType DimensionType

diagram					
children	<u>Name</u> <u>Value</u>				
used by	element RegionType/Dimension				
attributes	Name	Type	Use	Default	Annotation
	graduatedScale	xsd:boolean	required		Indicates if the dimension is graduated
	action	actionType	optional		
	error	errorType	optional		
annotation	Type for a dimension in a rating region				

element DimensionType/Name

type	<u>TextType</u>
annotation	Name of the dimension

element **DimensionType/Value**

type	RatingValueType
annotation	Possible values for a given dimension

complexType **ElementaryStreamType**

diagram					
children	Name ConditionalAccess PmtPrivateInformation PmtDescriptor				
used by	element ChannelType/ElementaryStream				
attributes	Name	Type	Use	Default	Annotation
	Pid	pidType	required		PID used to carry the elementary stream
	type	xsd:unsignedByte	required		stream_type as defined by MPEG-2 and ATSC and carried in the PMT and service location descriptor
	audiold	xsd:unsignedByte	optional		ID of an audio stream in a channel. Links to an Ac3Audio element.
	lang	languageType	optional		Language of the elementary stream, carried in the MPEG-2 ISO_639_language_descriptor
	action	actionType	optional		
	error	errorType	optional		
annotation	Defines an elementary stream, i.e. an MPEG-2 PID. Used to build the service location descriptor and the PMT.				

element **ElementaryStreamType/Name**

type	TextType
annotation	Elementary stream name, carried in the component name descriptor (A/65B 6.9.8)

element ElementaryStreamType/ConditionalAccess

type	<u>ConditionalAccessType</u>
annotation	Defines the CA systems in use for the elementary stream and the corresponding ECM PIDs

element ElementaryStreamType/PmtPrivateInformation

type	<u>PrivateInformationType</u>
annotation	These descriptors go into the inner loop of the PMT

element ElementaryStreamType/PmtDescriptor

type	<u>DescriptorType</u>
annotation	These descriptors go into the inner loop of the PMT

complexType **EventIdType**

<p>diagram</p>					
children	<u>Current</u> <u>Default</u> <u>PmcpEventId</u> <u>InitialSchedule</u> <u>PsipEventId</u> <u>InitialSchedule</u> <u>PsipEventId</u> <u>PsipEventId</u>				
used by	element <u>PsipEventType/EventId</u>				
attributes	Name	Type	Use	Default	Annotation
	channelNumber	channelNumberType	required		Channel number of the channel that carries the event
	tsid	xsd:unsignedShort	optional		TSID of the transport stream that carries the event, used if the channel number is not unique in the system
	network	xsd:unsignedShort	optional		Network identifier of the channel that carries the event, used when the TSID is not unique in the system
	action	actionType	optional		
	error	errorType	optional		
annotation	Event Identification. Provides several mechanisms for labeling and referencing events.				

element **EventIdType/Current**

annotation	References the current event of the channel, when no other identification method is known
------------	---

element **EventIdType/Default**

annotation	References the default event of the channel, used by the PSIP Generator when no other event information is known about a time slot
------------	--

element **EventIdType/PmcpEventId**

type	PmcpEventIdType
annotation	Unique event identifier assigned by the creator of an event. Preferred referencing method

element **EventIdType/InitialSchedule**

type	InitialScheduleType
------	----------------------------

element **EventIdType/PsipEventId**

type	PsipEventIdType
------	------------------------

element **EventIdType/InitialSchedule**

type	InitialScheduleType
annotation	Communicates the initial scheduled start time. May be used to reference an event when no other ID is known.

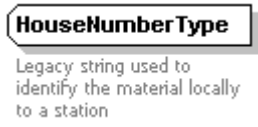
element **EventIdType/PsipEventId**

type	PsipEventIdType
------	------------------------

element **EventIdType/PsipEventId**

type	PsipEventIdType
annotation	PSIP event ID assigned and broadcast by the PSIP Generator in the EITs (A/65B 6.5)

complexType **HouseNumberType**


diagram					
type	extension of xsd:string				
used by	elements ContentIdType/HouseNumber ContentIdType/HouseNumber				
attributes	Name	Type	Use	Default	Annotation
	action	actionType	optional		
	error	errorType	optional		
annotation	Legacy string used to identify the material locally to a station				

complexType **InitialScheduleType**

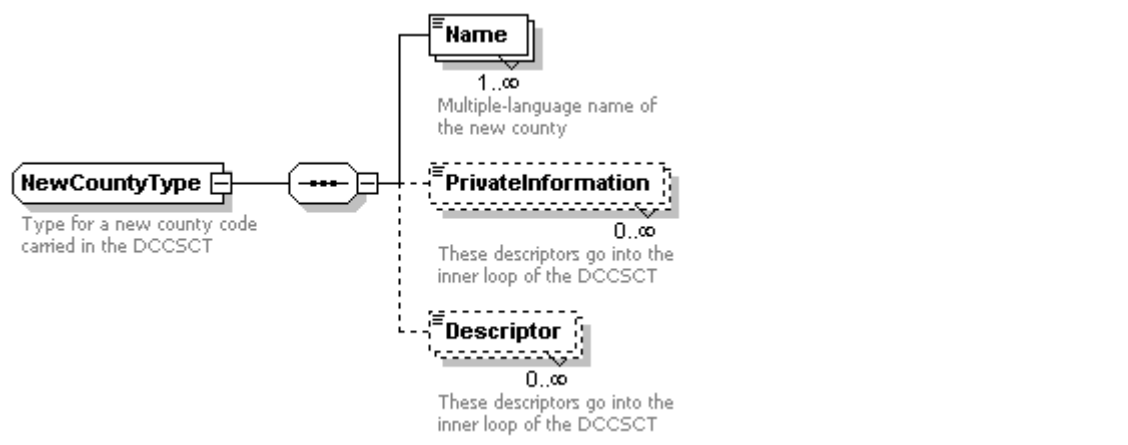
diagram					
---------	---	--	--	--	--

used by	elements <u>EventIdType/InitialSchedule</u> <u>EventIdType/InitialSchedule</u>				
attributes	Name	Type	Use	Default	Annotation
	startTime	xsd:dateTime	required		Start time initially scheduled for the event.
	action	actionType	optional		
	error	errorType	optional		
annotation	Communicates the initial scheduled start time. May be used to reference an event when no other ID is known.				

complexType **IsanType**

diagram					
used by	element <u>ContentIdType/Isan</u>				
attributes	Name	Type	Use	Default	Annotation
	root	isanRootType	required		
	episode	isanEpisodeType	optional		
	version	isanVersionType	optional		
	action	actionType	optional		
	error	errorType	optional		
annotation	V-ISAN, as defined by ISO. Only the root is required, allowing its use as an ISAN or even to reference all episodes				

complexType **NewCountyType**

diagram					
children	<u>Name</u> <u>PrivateInformation</u> <u>Descriptor</u>				
used by	element <u>DccsctType/NewCounty</u>				
attributes	Name	Type	Use	Default	Annotation
	stateCode	xsd:unsignedByte	required		State code of the new county
	countyCode	countyCodeType	required		County code of the new county
	action	actionType	optional		
	error	errorType	optional		
annotation	Type for a new county code carried in the DCCSCT				

element **NewCountyType/Name**

type	<u>TextType</u>
annotation	Multiple-language name of the new county

element NewCountyType/PrivateInformation

type	<u>PrivateInformationType</u>
annotation	These descriptors go into the inner loop of the DCCSCT

element NewCountyType/Descriptor

type	<u>DescriptorType</u>
annotation	These descriptors go into the inner loop of the DCCSCT

complexType NewGenreType

diagram					
children	<u>Name PrivateInformation Descriptor</u>				
used by	element	<u>DccsctType/NewGenre</u>			
attributes	Name genreCode action error	Type xsd:unsignedByte actionType errorType	Use required optional optional	Default	Annotation Code of the new genre
annotation	Type for a genre code carried in the DCCSCT				

element NewGenreType/Name

type	<u>TextType</u>
annotation	Multiple-language name of the new genre

element NewGenreType/PrivateInformation

type	<u>PrivateInformationType</u>
annotation	These descriptors go into the inner loop of the DCCSCT

element NewGenreType/Descriptor

type	<u>DescriptorType</u>
------	------------------------------

annotation	These descriptors go into the inner loop of the DCCSCT
------------	--

complexType NewStateType

diagram					
children	<u>Name PrivateInformation Descriptor</u>				
used by	element	<u>DccsctType/NewState</u>			
attributes	Name	Type	Use	Default	Annotation
	stateCode	xsd:unsignedByte	required		Code of the new state
	action	actionType	optional		
	error	errorType	optional		
annotation	Type for a new state code carried in the DCCSCT				

element NewStateType/Name

type	<u>TextType</u>
annotation	Multiple-language name of the new state

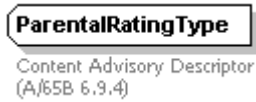
element NewStateType/PrivateInformation

type	<u>PrivateInformationType</u>
annotation	These descriptors go into the inner loop of the DCCSCT


element NewStateType/Descriptor

type	<u>DescriptorType</u>
annotation	These descriptors go into the inner loop of the DCCSCT

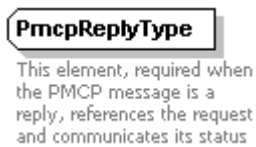
complexType **ParentalRatingType**

diagram					
used by	elements	<u>ChannelType/ParentalRating ShowDataType/ParentalRating</u>			
attributes	Name	Type	Use	Default	Annotation
	region	xsd:unsignedByte	required		Rating region, as defined by the ATSC Code Point Registry
	dimension	xsd:string	required		Name of the dimension
	value	xsd:string	required		Name of the rating value
	action	actionType	optional		
	error	errorType	optional		
annotation	Content Advisory Descriptor (A/65B 6.9.4)				


complexType **PmcpEventIdType**

diagram					
used by	element	<u>EventIdType/PmcpEventId</u>			
attributes	Name	Type	Use	Default	Annotation
	creator	xsd:string	required		Device name of the initial event creator
	id	xsd:unsignedLong	required		Number assigned by the creator
	action	actionType	optional		
	error	errorType	optional		
annotation	Unique event identifier assigned by the creator of an event. Preferred referencing method				


complexType **PmcpReplyType**

diagram					
used by	element	<u>PmcpMessage/PmcpReply</u>			
attributes	Name	Type	Use	Default	Annotation
	id	xsd:unsignedLong	required		id of the request message
	origin	xsd:string	required		Originating system of the request message
	originType	xsd:string	optional		Type of the originating system for the request message
	destination	xsd:string	optional	all	Intended destination for the request message
	dateTime	xsd:dateTime	required		Date and time of generation of the request message
	status	statusType	required		Indicates the result of processing the request
annotation	This element, required when the PMCP message is a reply, references the request and communicates its status				


complexType **PrivateInformationType**

diagram	 <p>ATSC Private Information descriptor, used for sending private data in an ATSC table (A/53B Amendment 2, 5.7.3.4)</p>				
type	extension of <u>privateInformationDataType</u>				
used by	elements <u>DccsctType/DccsctOuterPrivateInformation</u> <u>DccTermType/DccTermPrivateInformation</u> <u>DccRequestType/DccTestPrivateInformation</u> <u>TransportStreamType/DcctPrivateInformation</u> <u>PsipEventType/EitPrivateInformation</u> <u>TransportStreamType/MgtPrivateInformation</u> <u>TableType/MgtPrivateInformation</u> <u>ChannelType/PmtPrivateInformation</u> <u>ElementaryStreamType/PmtPrivateInformation</u> <u>NewGenreType/PrivateInformation</u> <u>NewStateType/PrivateInformation</u> <u>NewCountyType/PrivateInformation</u> <u>RegionType/PrivateInformation</u> <u>TimeParametersType/SttPrivateInformation</u> <u>TransportStreamType/VctPrivateInformation</u> <u>ChannelType/VctPrivateInformation</u>				
facets	maxLength 251				
attributes	Name	Type	Use	Default	Annotation
	formatIdentifier	xsd:unsignedLong	required		Format Identifier registered by SMPTE
	action	ActionType	optional		
	error	errorType	optional		
annotation	ATSC Private Information descriptor, used for sending private data in an ATSC table (A/53B Amendment 2, 5.7.3.4)				

complexType **PrivatePmcpInformationType**

diagram	 <p>Any sequence of well-formed private xml elements. Allows systems to carry additional private information in a PMCP message</p>				
used by	elements <u>PmcpMessage/PrivatePmcpInformation</u> <u>ChannelType/PrivatePmcpInformation</u> <u>PsipEventType/PrivatePmcpInformation</u> <u>TransportStreamType/PrivatePmcpInformation</u> <u>ShowType/PrivatePmcpInformation</u>				
annotation	Any sequence of well-formed private xml elements. Allows systems to carry additional private information in a PMCP message				

complexType **PsipEventIdType**

diagram					
used by	elements <u>EventIdType/PsipEventId</u> <u>EventIdType/PsipEventId</u> <u>EventIdType/PsipEventId</u>				
attributes	Name	Type	Use	Default	Annotation
	eventId	psipEventIdType	required		Event_id as defined by PSIP and carried in the EIT
	action	actionType	optional		
	error	errorType	optional		

complexType **PsipEventType**

<p>diagram</p>																																																								
<p>children</p>	<p><u>EventId</u> <u>ContentId</u> <u>ShowData</u> <u>EitPrivateInformation</u> <u>EitDescriptor</u> <u>PrivatePmcpInformation</u></p>																																																							
<p>used by</p>	<p>element <u>PmcpMessage/PsipEvent</u></p>																																																							
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<p>annotation</p>	<p>Describes a PSIP "Event", i.e. an element of the program guide.</p>																																																							

element PsipEventType/EventId

type	<u>EventIdType</u>
annotation	Allows referencing an event using one or more methods

element PsipEventType/ContentId

type	<u>ContentIdType</u>
annotation	References a show or specifies the content ID of the event

element PsipEventType/ShowData

type	<u>ShowDataType</u>
annotation	Show information of the PSIP event

element PsipEventType/EitPrivateInformation

type	<u>PrivateInformationType</u>
annotation	These descriptors go into the event loop of the EIT (A/65B 6.5)

element PsipEventType/EitDescriptor

type	<u>DescriptorType</u>
annotation	These descriptors go into the event loop of the EIT (A/65B 6.5)

element PsipEventType/PrivatePmcpInformation

type	<u>PrivatePmcpInformationType</u>
annotation	Event-level PMCP-private information

complexType RatingsType

diagram	<p>Describes the ratings system and is used to build the Rating Region Table (A/65B 6.4)</p> <p>1..255 Rating system for one region</p>				
children	<u>Region</u>				
used by	Element	<u>PmcpMessage/Ratings</u>			
attributes	Name	Type	Use	Default	Annotation
	action	actionType	optional		
	error	errorType	optional		
annotation	Describes the ratings system and is used to build the Rating Region Table (A/65B 6.4)				

element RatingsType/Region

type	<u>RegionType</u>
annotation	Rating system for one region

complexType RatingValueType

diagram					
children	<u>AbbrevName Name</u>				
used by	element <u>DimensionType/Value</u>				
attributes	Name action error	Type actionType errorType	Use optional optional	Default	Annotation
annotation	Type for a rating value				

element RatingValueType/AbbrevName

type	<u>TextType</u>
annotation	Abbreviated name of the value

element RatingValueType/Name

type	<u>TextType</u>
annotation	Long name of the value

complexType RedistributionControlType

diagram					
used by	elements <u>ChannelType/RedistributionControl ShowDataType/RedistributionControl</u>				
attributes	Name action error	Type actionType errorType	Use optional optional	Default	Annotation
annotation	Redistribution Control Descriptor (A/65B 6.9.13)				

complexType **RegionType**

diagram	<p>The diagram shows a class RegionType with the description "Type for the rating system of a region". It has four child elements: Name (text), Dimension (1..255), PrivateInformation (0..∞), and Descriptor (0..∞). The PrivateInformation and Descriptor elements are shown with dashed boxes, indicating they are optional or have specific constraints.</p>				
children	Name Dimension PrivateInformation Descriptor				
used by	element	RatingsType/Region			
attributes	Name	Type	Use	Default	Annotation
	id	xsd:unsignedByte	required		Region ID, as defined by the ATSC Code Point Registry
	action	actionType	optional		
	error	errorType	optional		
annotation	Type for the rating system of a region				

element **RegionType/Name**

type	TextType
annotation	Name of the region

element **RegionType/Dimension**

type	DimensionType
annotation	Existing dimensions for the region

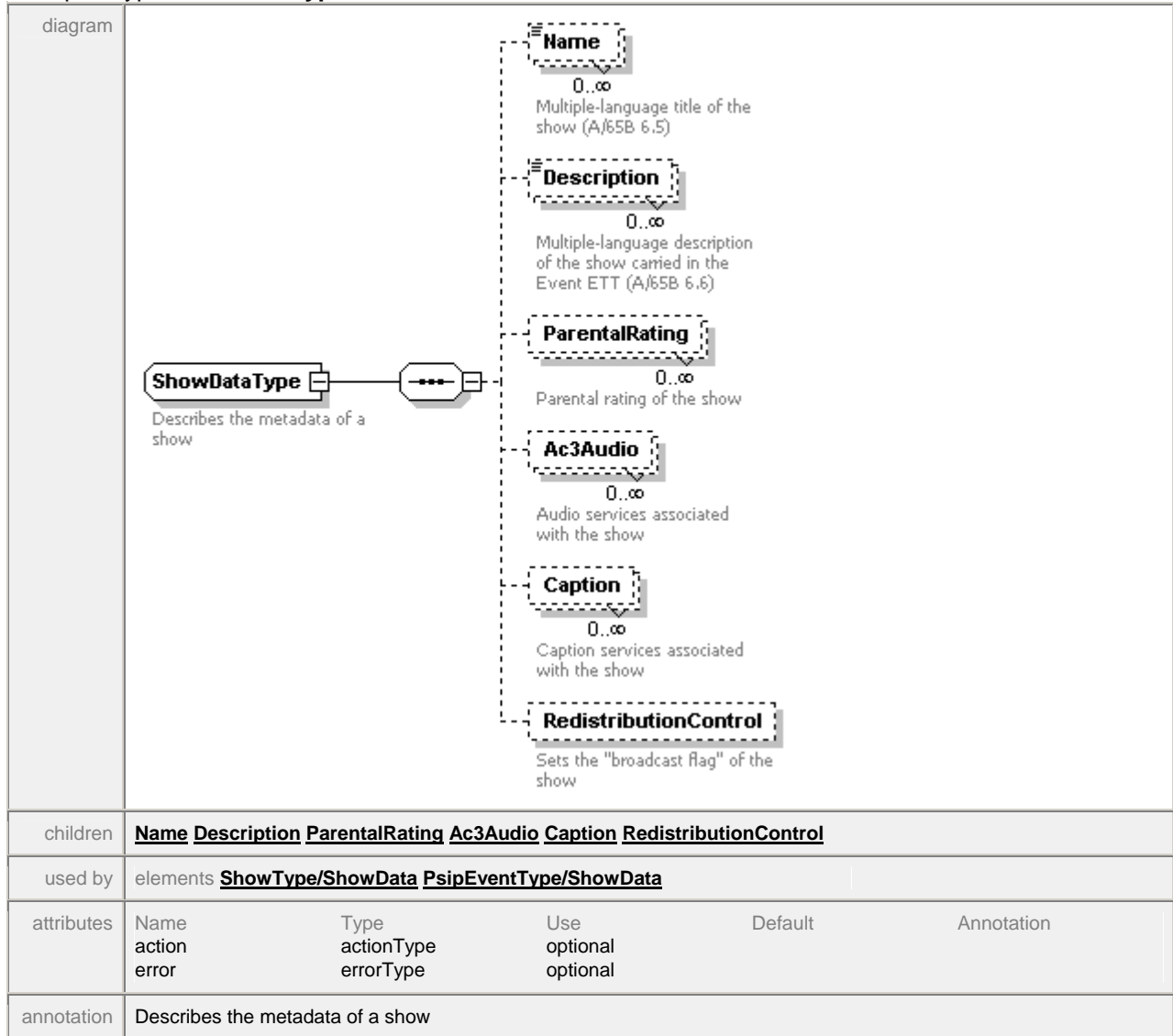
element **RegionType/PrivateInformation**

type	PrivateInformationType
annotation	These descriptors go into the outer loop of the RRT

element **RegionType/Descriptor**

type	DescriptorType
annotation	These descriptors go into the outer loop of the RRT

complexType **ShowDataType**



element **ShowDataType/Name**

type	<u>TextType</u>
annotation	Multiple-language title of the show (A/65B 6.5)

element **ShowDataType/Description**

type	<u>TextType</u>
annotation	Multiple-language description of the show carried in the Event ETT (A/65B 6.6)

element **ShowDataType/ParentalRating**

type	<u>ParentalRatingType</u>
annotation	Parental rating of the show

element **ShowDataType/Ac3Audio**

type	<u>Ac3AudioType</u>
annotation	Audio services associated with the show

element **ShowDataType/Caption**

type	<u>CaptionType</u>
annotation	Caption services associated with the show

element **ShowDataType/RedistributionControl**

type	<u>RedistributionControlType</u>
annotation	Sets the "broadcast flag" of the show

complexType **ShowType**

diagram					
children	<u>ContentId</u> <u>ShowData</u> <u>PrivatePmcpInformation</u>				
used by	element	<u>PmcpMessage/Show</u>			
attributes	Name	Type	Use	Default	Annotation
	action	actionType	optional		
	error	errorType	optional		
annotation	Describes a show, i.e. an abstract entity which becomes a PSIP Event when it is scheduled				

element **ShowType/ContentId**

type	<u>ContentIdType</u>
annotation	Communicates at least one of the possible IDs for the show

element **ShowType/ShowData**

type	<u>ShowDataType</u>
annotation	Carries the actual information about the show

element **ShowType/PrivatePmcplInformation**

type	<u>PrivatePmcplInformationType</u>
annotation	Show-level PMCP-private information

complexType **TableType**

diagram	<p>Contains the information about a PSIP table, used to build the MGT (A/65B 6.2)</p> <p>MgtPrivateInformation 0..∞ These descriptors go into the inner loop of the MGT</p> <p>MgtDescriptor 0..∞ These descriptors go into the inner loop of the MGT</p>				
children	<u>MgtPrivateInformation</u> <u>MgtDescriptor</u>				
used by	element <u>TransportStreamType/Table</u>				
attributes	Name	Type	Use	Default	Annotation
	tableType	xsd:unsignedShort	required		MGT table type (A/65B 6.2)
	tablePid	pidType	optional		PID used to carry the table (A/65B 6.2)
	periodMs	xsd:positiveInteger	optional		Repetition period of the table, in milliseconds
	action	actionType	optional		
	error	errorType	optional		
annotation	Contains the information about a PSIP table, used to build the MGT (A/65B 6.2)				

element **TableType/MgtPrivateInformation**

type	<u>PrivateInformationType</u>
annotation	These descriptors go into the inner loop of the MGT

element **TableType/MgtDescriptor**

type	<u>DescriptorType</u>
annotation	These descriptors go into the inner loop of the MGT

complexType TextType

diagram					
type	extension of xsd:string				
used by	elements <u>RatingValueType/AbbrevName</u> <u>ChannelType/Description</u> <u>ShowDataType/Description</u> <u>TransportStreamType/Name</u> <u>ChannelType/Name</u> <u>ElementaryStreamType/Name</u> <u>ShowDataType/Name</u> <u>NewGenreType/Name</u> <u>NewStateType/Name</u> <u>NewCountyType/Name</u> <u>RegionType/Name</u> <u>DimensionType/Name</u> <u>RatingValueType/Name</u> <u>DccDepartingRequestType/Text</u> <u>DccArrivingRequestType/Text</u>				
attributes	Name	Type	Use	Default	Annotation
	lang	languageType	required		
	action	actionType	optional		
	error	errorType	optional		
annotation	Multiple string structure of PSIP (A/65B 6.10)				

complexType TimeParametersType

diagram					
children	<u>SttPrivateInformation</u> <u>SttDescriptor</u>				
used by	element <u>PmcpMessage/TimeParameters</u>				
attributes	Name	Type	Use	Default	Annotation
	gpsUtcOffset	xsd:unsignedByte	optional		Current GPS UTC offset, as published by the International Earth Rotation Service (A/65B 6.1)
	dsStatus	xsd:boolean	optional		Current daylight savings status (A/65B 6.1 and Annex A)
	dsDayOfMonth	dsDayOfMonthType	optional		If DST is to change within a month, day of change (A/65B 6.1 and Annex A)
	dsHour	dsHourType	optional		If DST is to change within a month, hour of change (A/65B 6.1 and Annex A)
	action	actionType	optional		
	error	errorType	optional		
annotation	Declares the parameters that go into the System Time Table (A/65B 6.1), except for the time itself, which is communicated through other means				

element TimeParametersType/SttPrivateInformation

type	<u>PrivateInformationType</u>
annotation	These descriptors go into the STT

element TimeParametersType/SttDescriptor

type	<u>DescriptorType</u>
------	------------------------------

annotation	These descriptors go into the STT
------------	-----------------------------------

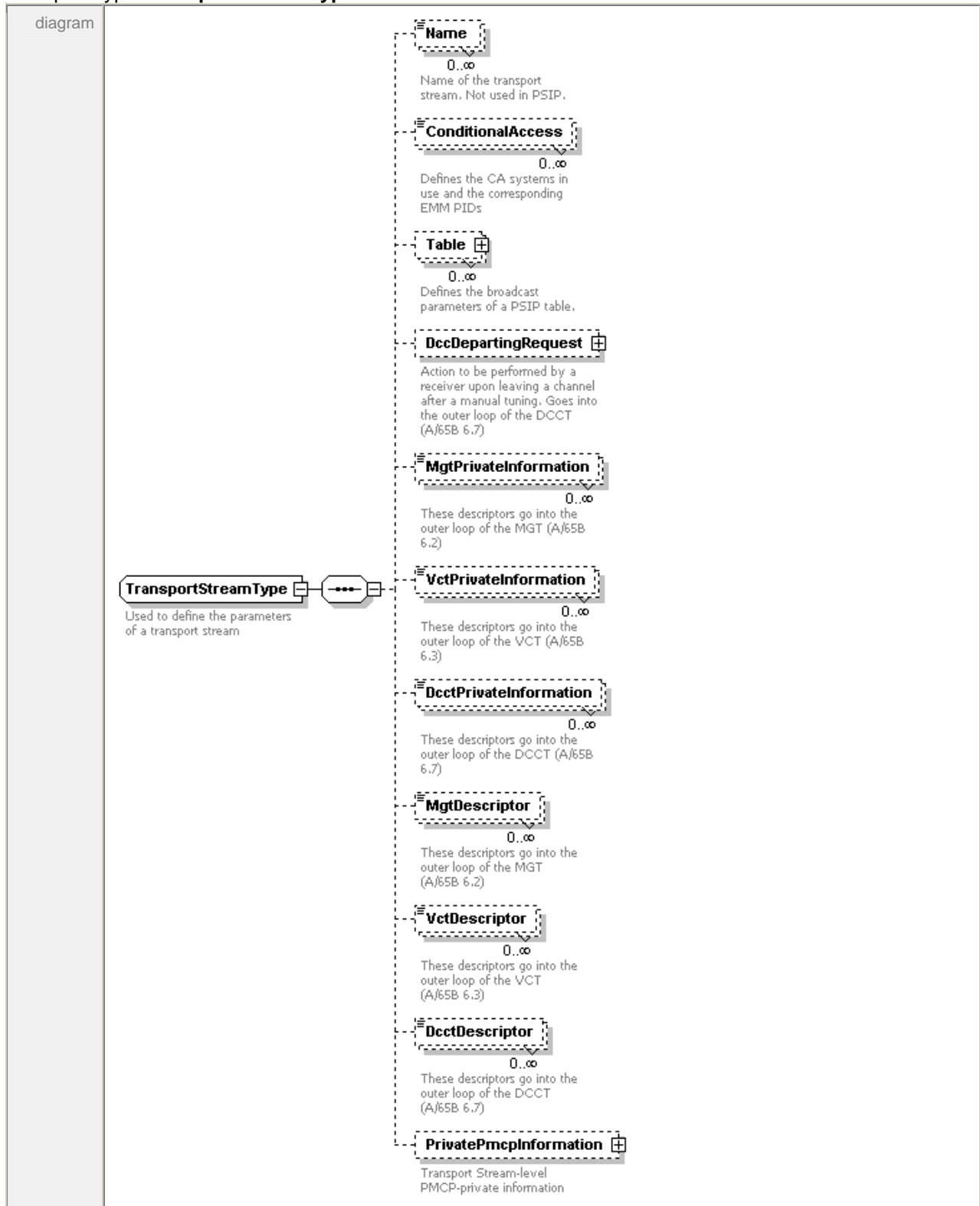
complexType TimeShiftedServiceType

diagram					
children	Copy				
used by	element <u>ChannelType/TimeShiftedService</u>				
attributes	Name	Type	Use	Default	Annotation
	action	actionType	optional		
	error	errorType	optional		
annotation	Time Shifted Service Descriptor (A/65B 6.9.7)				

element TimeShiftedServiceType/Copy

type	<u>ChannelCopyType</u>
annotation	Time shifted service

complexType **TransportStreamType**



children	<u>Name ConditionalAccess Table DccDepartingRequest MgtPrivateInformation VctPrivateInformation DcctPrivateInformation MgtDescriptor VctDescriptor DcctDescriptor PrivatePmcplInformation</u>				
used by	element <u>PmcpMessage/TransportStream</u>				
attributes	Name	Type	Use	Default	Annotation
	tsid	xsd:unsignedShort	required		TSID of the transport stream (A/65B 6.3)
	network	xsd:unsignedShort	optional		Network identifier, used when the TSID is not unique in the system
	frequency	xsd:unsignedLong	optional		RF frequency occupied by the transport stream (A/65B 6.3)
	networkType	networkTypeType	optional		Type of the network where the transport stream is carried
	modulation	modulationType	optional		Modulation used to carry the transport stream (A/65B 6.3)
	pathSelect	pathSelectType	optional		For cable systems with two separate cables, indicates which one carries the transport stream (A/65B 6.3.2)
	action	actionType	optional		
	error	errorType	optional		
annotation	Used to define the parameters of a transport stream				

element **TransportStreamType/Name**

type	<u>TextType</u>
annotation	Name of the transport stream. Not used in PSIP.

element **TransportStreamType/ConditionalAccess**

type	<u>ConditionalAccessType</u>
annotation	Defines the CA systems in use and the corresponding EMM PIDs

element **TransportStreamType/Table**

type	<u>TableType</u>
annotation	Defines the broadcast parameters of a PSIP table.

element **TransportStreamType/DccDepartingRequest**

type	<u>DccDepartingRequestType</u>
annotation	Action to be performed by a receiver upon leaving a channel after a manual tuning. Goes into the outer loop of the DCCT (A/65B 6.7)

element **TransportStreamType/MgtPrivateInformation**

type	<u>PrivateInformationType</u>
annotation	These descriptors go into the outer loop of the MGT (A/65B 6.2)

element **TransportStreamType/VctPrivateInformation**

type	<u>PrivateInformationType</u>
annotation	These descriptors go into the outer loop of the VCT (A/65B 6.3)

element **TransportStreamType/DcctPrivateInformation**

type	<u>PrivateInformationType</u>
annotation	These descriptors go into the outer loop of the DCCT (A/65B 6.7)

element **TransportStreamType/MgtDescriptor**

type	<u>DescriptorType</u>
annotation	These descriptors go into the outer loop of the MGT (A/65B 6.2)

element **TransportStreamType/VctDescriptor**

type	<u>DescriptorType</u>
annotation	These descriptors go into the outer loop of the VCT (A/65B 6.3)

element **TransportStreamType/DcctDescriptor**

type	<u>DescriptorType</u>
annotation	These descriptors go into the outer loop of the DCCT (A/65B 6.7)

element **TransportStreamType/PrivatePmcpInformation**

type	<u>PrivatePmcpInformationType</u>
annotation	Transport Stream-level PMCP-private information

simpleType **actionType**

type	restriction of <code>xsd:string</code>
used by	attributes <u>ContentIdType/@action ShowDataType/@action EventIdType/@action DccDepartingRequestType/@action DccArrivingRequestType/@action IsanType/@action HouseNumberType/@action AlternateldType/@action PmcpEventIdType/@action InitialScheduleType/@action PsipEventIdType/@action NewGenreType/@action NewStateType/@action NewCountyType/@action RegionType/@action DimensionType/@action RatingValueType/@action DccTermType/@action TransportStreamType/@action ChannelType/@action ShowType/@action PsipEventType/@action TimeParametersType/@action DccsctType/@action RatingsType/@action TextType/@action ConditionalAccessType/@action TableType/@action PrivateInformationType/@action DescriptorType/@action ElementaryStreamType/@action ParentalRatingType/@action Ac3AudioType/@action CaptionType/@action RedistributionControlType/@action DccRequestType/@action TimeShiftedServiceType/@action</u>
facets	enumeration read enumeration add enumeration update enumeration remove
annotation	Enables the sender of a message to indicate, for each element, which action should be performed on the current element. The rules governing the allowed values can be found in the PMCP Standard.

simpleType **arrivingRequestType**

type	restriction of <code>xsd:string</code>
used by	attribute <u>DccArrivingRequestType/@type</u>
facets	enumeration cancel enumeration display_10s enumeration display_until_action
annotation	dcc_arriving_request_type (A/65B 6.9.12)

simpleType **audioServiceType**

type	restriction of xsd:string																
used by	attribute <u>Ac3AudioType/@serviceType</u>																
facets	<table border="0"> <tr><td>enumeration</td><td>complete_main</td></tr> <tr><td>enumeration</td><td>music_and_effects</td></tr> <tr><td>enumeration</td><td>visually_impaired</td></tr> <tr><td>enumeration</td><td>hearing_impaired</td></tr> <tr><td>enumeration</td><td>Dialogue</td></tr> <tr><td>enumeration</td><td>Commentary</td></tr> <tr><td>enumeration</td><td>Emergency</td></tr> <tr><td>enumeration</td><td>voice_over</td></tr> </table>	enumeration	complete_main	enumeration	music_and_effects	enumeration	visually_impaired	enumeration	hearing_impaired	enumeration	Dialogue	enumeration	Commentary	enumeration	Emergency	enumeration	voice_over
enumeration	complete_main																
enumeration	music_and_effects																
enumeration	visually_impaired																
enumeration	hearing_impaired																
enumeration	Dialogue																
enumeration	Commentary																
enumeration	Emergency																
enumeration	voice_over																
annotation	Possible audio service types (A/65B 6.9.1)																

simpleType **bitRateKbpsType**

type	restriction of xsd:unsignedShort
used by	attribute <u>Ac3AudioType/@bitRateKbps</u>
facets	maxInclusive 448
annotation	Type for bit rate of AC-3 elementary stream in kbps (A/65B 6.9.1)

simpleType **bsidType**

type	restriction of xsd:unsignedByte
used by	attribute <u>Ac3AudioType/@bsid</u>
facets	maxExclusive 32
annotation	Type for version of AC-3 standard used by an AC-3 audio stream (A/65B 6.9.1)

simpleType **ccServiceType**

type	restriction of xsd:string
used by	Attribute <u>CaptionType/@ccService</u>
facets	pattern (line21_field[1-2]) (eia708_([1-9] ([1-5][0-9]) (6[0-3])))
annotation	Type for caption service type (A/65B 6.9.3 cc_type, line21_field, caption_service_number)

simpleType **channelNumberType**

type	union of (<u>onePartType</u> , <u>twoPartType</u>)
used by	Attributes <u>ChannelCopyType/@channel</u> <u>ChannelType/@channelNumber</u> <u>EventIdType/@channelNumber</u> <u>DccRequestType/@destination</u>
annotation	Specifies the format of a two-part or one-part channel number

simpleType **channelStatusType**

type	restriction of xsd:string						
used by	attribute <u>ChannelType/@status</u>						
facets	<table border="0"> <tr><td>enumeration</td><td>active</td></tr> <tr><td>enumeration</td><td>inactive</td></tr> <tr><td>enumeration</td><td>hidden</td></tr> </table>	enumeration	active	enumeration	inactive	enumeration	hidden
enumeration	active						
enumeration	inactive						
enumeration	hidden						

annotation	Channel activity status (A/65B 6.3 hidden and hide_guide)
------------	---

simpleType countyCodeType

type	restriction of xsd:unsignedShort
used by	attribute <u>NewCountyType/@countyCode</u>
facets	maxExclusive 1024
annotation	Type for a county code

simpleType dccContextType

type	restriction of xsd:string
used by	attribute <u>DccRequestType/@dccContext</u>
facets	enumeration temporary_retune enumeration channel_redirect
annotation	Possible types of DCC requests

simpleType departingRequestTypeType

type	restriction of xsd:string
used by	attribute <u>DccDepartingRequestType/@type</u>
facets	enumeration cancel enumeration display_10s enumeration display_until_action
annotation	dcc_departing_request_type (A/65B 6.9.11)

simpleType dsDayOfMonthType

type	restriction of xsd:unsignedByte
used by	attribute <u>TimeParametersType/@dsDayOfMonth</u>
facets	maxInclusive 31
annotation	Number of day in month (A/65B 6.1 and Annex A)

simpleType dsHourType

type	restriction of xsd:unsignedByte
used by	attribute <u>TimeParametersType/@dsHour</u>
facets	maxInclusive 18
annotation	Hour of the day (A/65B 6.1 and Annex A)

simpleType elementaryErrorType

type	restriction of xsd:string
used by	simpleType <u>errorType</u>
facets	pattern Element_does_not_exist *_out_of_range *_missing *_change_denied

annotation	Type for an elementary error
------------	------------------------------

simpleType **errorType**

type	list of <u>elementaryErrorType</u>
used by	Attributes <u>TimeShiftedServiceType/@error</u> <u>ContentIdType/@error</u> <u>ShowDataType/@error</u> <u>EventIdType/@error</u> <u>DccDepartingRequestType/@error</u> <u>DccArrivingRequestType/@error</u> <u>IsanType/@error</u> <u>HouseNumberType/@error</u> <u>AlternateIdType/@error</u> <u>PmcpEventIdType/@error</u> <u>InitialScheduleType/@error</u> <u>PsipEventIdType/@error</u> <u>NewGenreType/@error</u> <u>NewStateType/@error</u> <u>NewCountyType/@error</u> <u>RegionType/@error</u> <u>DimensionType/@error</u> <u>RatingValueType/@error</u> <u>DccTermType/@error</u> <u>PmcpMessage/@error</u> <u>TransportStreamType/@error</u> <u>ChannelType/@error</u> <u>ShowType/@error</u> <u>PsipEventType/@error</u> <u>TimeParametersType/@error</u> <u>DccsctType/@error</u> <u>RatingsType/@error</u> <u>TextType/@error</u> <u>ConditionalAccessType/@error</u> <u>TableType/@error</u> <u>PrivateInformationType/@error</u> <u>DescriptorType/@error</u> <u>ElementaryStreamType/@error</u> <u>ParentalRatingType/@error</u> <u>Ac3AudioType/@error</u> <u>CaptionType/@error</u> <u>RedistributionControlType/@error</u> <u>DccRequestType/@error</u>
annotation	Used in a message of type "reply" with a status of "error" to indicate where and why an error occurred

simpleType **isanEpisodeType**

type	restriction of <code>xsd:string</code>
used by	Attribute <u>IsanType/@episode</u>
facets	Pattern <code>[0-F]{4}</code>
annotation	Type for the episode part of an ISAN or V-ISAN

simpleType **isanRootType**

type	restriction of <code>xsd:string</code>
used by	attribute <u>IsanType/@root</u>
facets	pattern <code>[0-F]{4}-[0-F]{4}-[0-F]{4}</code>
annotation	Type for the root part of an ISAN or V-ISAN

simpleType **isanVersionType**

type	restriction of <code>xsd:string</code>
used by	attribute <u>IsanType/@version</u>
facets	pattern <code>[0-F]{4}-[0-F]{4}</code>
annotation	Type for the version part of a V-ISAN

simpleType **languageType**

type	restriction of <code>xsd:string</code>
used by	attributes <u>TextType/@lang</u> <u>ElementaryStreamType/@lang</u> <u>Ac3AudioType/@lang</u> <u>CaptionType/@lang</u>
facets	pattern <code>[a-z]{3}</code>
annotation	Three-letter language code per ISO-639-2

simpleType **mainidType**

type	restriction of <code>xsd:unsignedByte</code>
------	--

used by	attribute <u>Ac3AudioType/@mainid</u>
facets	maxExclusive 8
annotation	Type for mainid of an AC-3 audio stream (A/65B 6.9.1)

simpleType messageType

type	restriction of xsd:string
used by	attribute <u>PmcpMessage/@type</u>
facets	enumeration information enumeration request enumeration reply
annotation	Possible message types

simpleType modulationType

type	restriction of xsd:string
used by	attribute <u>TransportStreamType/@modulation</u>
facets	enumeration analog enumeration SCTE_mode_1 enumeration SCTE_mode_2 enumeration 8 VSB enumeration 16 VSB enumeration private
annotation	Possible modulations

simpleType networkTypeType

type	restriction of xsd:string
used by	attribute <u>TransportStreamType/@networkType</u>
facets	enumeration terrestrial enumeration cable enumeration satellite
annotation	Possible network types

simpleType numChannelsType

type	restriction of xsd:string
used by	attribute <u>Ac3AudioType/@numChannels</u>
facets	enumeration 1/0 enumeration 2/0 enumeration 3/0 enumeration 2/1 enumeration 3/1 enumeration 2/2 enumeration 3/2 enumeration 1 enumeration 2_or_less enumeration 3_or_less enumeration 4_or_less enumeration 5_or_less enumeration 6_or_less

annotation	Possible values for the number of audio channels in an AC-3 elementary stream (A/65B 6.9.1)
------------	---

simpleType onePartType

type	restriction of xsd:unsignedInt
used by	simpleType <u>channelNumberType</u>
facets	maxExclusive 16384
annotation	Type for one-part channel number for cable

simpleType pathSelectType

type	restriction of xsd:string
used by	attribute <u>TransportStreamType/@pathSelect</u>
facets	enumeration path_1 enumeration path_2
annotation	Possible paths for cable systems with multiple cables

simpleType pidType

type	restriction of xsd:unsignedShort
used by	attributes <u>ChannelType/@pcrPid</u> <u>ConditionalAccessType/@pid</u> <u>ElementaryStreamType/@pid</u> <u>ChannelType/@pmtPid</u> <u>TableType/@tablePid</u>
facets	maxExclusive 8192
annotation	Specifies the format of an MPEG-2 PID.

simpleType privateInformationDataType

type	restriction of xsd:hexBinary
used by	complexType <u>PrivateInformationType</u>
facets	maxLength 251
annotation	Specifies the format of private data to be carried in ATSC tables

simpleType psipEventIdType

type	restriction of xsd:unsignedShort
used by	Attribute <u>PsipEventIdType/@eventId</u>
facets	maxExclusive 16384
annotation	Type for a PSIP Event_id

simpleType serviceType

type	restriction of xsd:string
used by	Attribute <u>ChannelType/@type</u>
facets	enumeration analog_television enumeration digital_television enumeration digital_radio

	enumeration data_broadcast
annotation	Type of the primary service provided by the channel: TV, radio or data (A/65B 6.3 service_type)

simpleType shortNameType

type	restriction of xsd:string
used by	attribute <u>ChannelType/@shortName</u>
facets	maxLength 7
annotation	PSIP short name (7 characters max.) (A/65B 6.3)

simpleType statusType

type	restriction of xsd:string
used by	attribute <u>PmcpReplyType/@status</u>
facets	enumeration valid enumeration invalid enumeration OK enumeration error
annotation	Status of a reply message

simpleType twoPartType

type	restriction of xsd:string
used by	simpleType <u>channelNumberType</u>
facets	pattern [1-9][0-9]{0,2}-[0-9]{1,3}
annotation	Type for two-part channel number (Major-Minor)

ANNEX B: PMCP USE CASES (*Informative*)

Printouts of sample PMCP XML documents are provided below to illustrate the use of some of the PMCP messages:

- HeartbeatRequest.xml
- HeartbeatReply.xml
- ErrorMessage.xml
- ScheduleDownload.xml
- ScheduleRead.xml
- DurationChange.xml
- EventNameChange.xml
- ShowNameChange.xml
- EventShift.xml
- Captions.xml
- AudioInformationStart.xml
- AudioInformationNext.xml
- AudioInformationStop.xml
- PrivateInformation.xml

HeartbeatRequest.xml

```
<!--Sample PMCP document showing how to send a heartbeat request-->
<PmcpMessage xmlns="http://www.atsc.org/pmcp/2003/1.0" id="12345" origin="automation_main" originType="Automation"
destination="psip_generator" dateTime="2003-12-16T09:30:47-05:00" type="request"/>
```

HeartbeatReply.xml

```
<!--Sample PMCP document showing how to reply to a heartbeat request-->
<PmcpMessage xmlns="http://www.atsc.org/pmcp/2003/1.0" id="17365" origin="psip_generator"
originType="Table_Generator" destination="automation_main" dateTime="2003-12-16T09:30:48-05:00" type="reply">
  <PmcpReply id="12345" origin="automation_main" destination="psip_generator" dateTime="2003-12-16T09:30:47-
05:00" status="OK"/>
</PmcpMessage>
```

ScheduleDownload.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<!--Sample PMCP file showing an initial schedule download-->
<PmcpMessage xmlns="http://www.atsc.org/pmcp/2003/1.0" id="4294967295" origin="Listing Service"
originType="Listing_Service" dateTime="2000-12-16T09:30:47-05:00" destination="PSIP Generator">
  <PspEvent action="add" duration="PT30M">
    <EventId channelNumber="57-2">
      <InitialSchedule startTime="2000-12-16T10:00:00-05:00"/>
    </EventId>
    <ShowData>
      <Name lang="eng">Barney & Friends</Name>
      <Description lang="eng">Exercise/Dance</Description>
    </ShowData>
  </PspEvent>
</PmcpMessage>
```



```

        <ParentalRating region="1" dimension="Children" value="TV-Y"/>
        <Ac3Audio audiold="1" lang="eng"/>
        <Caption lang="eng"/>
    </ShowData>
</PspEvent>
<PspEvent action="add" duration="PT30M">
    <EventId channelNumber="57-2">
        <InitialSchedule startTime="2000-12-16T10:30:00-05:00"/>
    </EventId>
    <ShowData>
        <Name lang="eng">Dragon Tales</Name>
        <Description lang="eng">Crash Landings/The Big Cake Mix-Up</Description>
        <ParentalRating region="1" dimension="Children" value="TV-Y"/>
        <Ac3Audio audiold="1" lang="eng"/>
        <Ac3Audio audiold="2" lang="spa"/>
        <Caption lang="eng"/>
    </ShowData>
</PspEvent>
<PspEvent action="add" duration="PT30M">
    <EventId channelNumber="57-2">
        <InitialSchedule startTime="2000-12-16T11:00:00-05:00"/>
    </EventId>
    <ShowData>
        <Name lang="eng">Between The Lions</Name>
        <Description lang="eng">Pecos Bill Cleans Up The West</Description>
        <ParentalRating region="1" dimension="Children" value="TV-Y"/>
        <Ac3Audio audiold="1" lang="eng"/>
        <Ac3Audio audiold="2" lang="eng" serviceType="visually_impaired"/>
        <Caption lang="eng"/>
    </ShowData>
</PspEvent>
<PspEvent action="add" duration="PT30M">
    <EventId channelNumber="57-2">
        <InitialSchedule startTime="2000-12-16T11:30:00-05:00"/>
    </EventId>
    <ShowData>
        <Name lang="eng">Arthur</Name>
        <Description lang="eng">My Music Rules/That's A Baby Show</Description>
        <ParentalRating region="1" dimension="Children" value="TV-Y"/>
        <Ac3Audio audiold="1" lang="eng"/>
        <Ac3Audio audiold="2" lang="eng" serviceType="visually_impaired"/>
        <Caption lang="eng"/>
    </ShowData>
</PspEvent>
<PspEvent action="add" duration="PT30M">
    <EventId channelNumber="57-2">
        <InitialSchedule startTime="2000-12-16T12:00:00-05:00"/>
    </EventId>
    <ShowData>
        <Name lang="eng">Nova</Name>
        <Description lang="eng">Dying to Be Thin</Description>
        <ParentalRating region="1" dimension="Entire Audience" value="TV-PG"/>
        <Ac3Audio audiold="1" lang="eng"/>
        <Ac3Audio audiold="2" lang="eng" serviceType="visually_impaired"/>
        <Caption lang="eng"/>
    </ShowData>
</PspEvent>
<PspEvent action="add" duration="PT30M">
    <EventId channelNumber="57-2">
        <InitialSchedule startTime="2000-12-16T12:30:00-05:00"/>
    </EventId>
    <ShowData>
        <Name lang="eng">Great Food</Name>
        <Description lang="eng">Rick Stein's &quot;Toddlers Can Cook!&quot;</Description>
        <ParentalRating region="1" dimension="Entire Audience" value="TV-G"/>
        <Ac3Audio audiold="1" lang="eng"/>

```

```

    <Caption lang="eng"/>
  </ShowData>
</PspEvent>
<PspEvent action="add" duration="PT3H">
  <EventId channelId="57-3">
    <InitialSchedule startTime="2000-12-16T10:00:00-05:00"/>
  </EventId>
  <ShowData>
    <Name lang="eng">PBS Kids Bookworm Bunch</Name>
    <ParentalRating region="1" dimension="Children" value="TV-Y"/>
    <Ac3Audio audioid="1" lang="eng"/>
    <Caption lang="eng"/>
  </ShowData>
</PspEvent>
</PmcpMessage>

```

ScheduleRead.xml

```

<?xml version="1.0" encoding="UTF-8"?>
<!--Sample PMCP document showing how to read ("pull") a portion of the schedule information for a channel-->
<PmcpMessage xmlns="http://www.atsc.org/pmcp/2003/1.0" id="4297993104" origin="PspGenerator"
originType="Table_Generator" dateTime="2003-12-17T09:30:47-05:00" type="request">
  <PspEvent action="read" duration="PT24H">
    <EventId channelId="34-3">
      <InitialSchedule startTime="2003-12-18T00:00:00-05:00"/>
    </EventId>
  </PspEvent>
</PmcpMessage>

```

ErrorMessage.xml

```

<?xml version="1.0" encoding="UTF-8"?>
<!--Sample PMCP showing an error message-->
<PmcpMessage xmlns="http://www.atsc.org/pmcp/2003/1.0" id="4294967295" origin="PspGenerator" dateTime="2003-12-17T09:30:47-05:00">
  <PmcpReply id="5464758" origin="Traffic" dateTime="2003-12-17T09:30:45-05:00" status="error"/>
  <PspEvent>
    <EventId channelId="56-3">
      <PmcpEventId creator="Traffic" id="657484"/>
    </EventId>
    <ShowData error="Name_missing"/>
  </PspEvent>
  <PspEvent error="element_does_not_exist">
    <EventId channelId="56-3">
      <PmcpEventId creator="Traffic" id="657485"/>
    </EventId>
  </PspEvent>
  <PspEvent error="ShowData_change_denied duration_out_of_range">
    <EventId channelId="56-3">
      <PmcpEventId creator="Traffic" id="657486"/>
    </EventId>
  </PspEvent>
</PmcpMessage>

```

DurationChange.xml

```

<?xml version="1.0" encoding="UTF-8"?>
<!--Sample PMCP document showing how to change the duration of an event-->
<PmcpMessage xmlns="http://www.atsc.org/pmcp/2003/1.0" id="4294967295" origin="Traffic" dateTime="2003-12-17T09:30:47-05:00">
  <PspEvent action="update" duration="PT1H19M" durationFrame="17">
    <EventId channelId="57-1">
      <InitialSchedule startTime="2000-12-16T10:00:00-05:00"/>
    </EventId>
  </PspEvent>

```

```
</PmcpMessage>
```

EventNameChange.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<!--Sample PMCP document showing how to change the name of an event using its initial scheduled start time as a
reference-->
<PmcpMessage xmlns="http://www.atsc.org/pmcp/2003/1.0" id="4294967295" origin="Traffic" dateTime="2003-12-
17T09:30:47-05:00">
  <PspEvent>
    <EventId channelNumber="57-1">
      <InitialSchedule startTime="2000-12-16T10:00:00-05:00"/>
    </EventId>
    <ShowData>
      <Name lang="eng" action="update">Welcome to Sesame Street</Name>
    </ShowData>
  </PspEvent>
</PmcpMessage>
```

ShowNameChange.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<!--Sample PMCP document showing how to change the name of a show-->
<PmcpMessage xmlns="http://www.atsc.org/pmcp/2003/1.0" id="4294967295" origin="Traffic" dateTime="2003-12-
17T09:30:47-05:00">
  <Show action="update">
    <ContentId>
      <Isan root="3E5F-6429-DE45" episode="3F34" version="5783-0000"/>
    </ContentId>
    <ShowData>
      <Name lang="eng" action="update">Welcome to Sesame Street</Name>
    </ShowData>
  </Show>
</PmcpMessage>
```

EventShift.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<!--Sample PMCP document showing how to change the start time of an event using the initial scheduled start time as a
reference-->
<PmcpMessage xmlns="http://www.atsc.org/pmcp/2003/1.0" id="4294967295" origin="Traffic" dateTime="2003-12-
17T09:30:47-05:00">
  <PspEvent action="update" startTime="2000-12-16T11:00:00-05:00" startFrame="15">
    <EventId channelNumber="57-1">
      <InitialSchedule startTime="2000-12-16T10:00:00-05:00"/>
    </EventId>
  </PspEvent>
</PmcpMessage>
```

Captions.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<!--Sample PMCP document showing various caption services-->
<PmcpMessage xmlns="http://www.atsc.org/pmcp/2003/1.0" id="4947205" origin="Traffic" originType="Traffic"
dateTime="2003-12-18T09:32:47Z">
  <PspEvent duration="PT30M" action="add">
    <EventId channelNumber="57-3">
      <InitialSchedule startTime="2003-12-18T09:40:00Z"/>
    </EventId>
    <ShowData>
      <Name lang="eng">Caillou</Name>
      <Description lang="eng">Big Brother Caillou</Description>
      <ParentalRating region="1" dimension="Children" value="TV-Y"/>
      <Ac3Audio audioId="1" lang="eng"/>
      <Caption lang="eng" ccService="line21_field1"/>
    </ShowData>
  </PspEvent>
</PmcpMessage>
```

```

    <Caption lang="spa" ccService="line21_field2"/>
    <Caption lang="eng" ccService="eia708_1"/>
    <Caption lang="spa" ccService="eia708_9"/>
    <Caption lang="fre" ccService="eia708_10"/>
    <Caption lang="ger" ccService="eia708_59"/>
    <Caption lang="ita" ccService="eia708_60"/>
    <Caption lang="por" ccService="eia708_63"/>
  </ShowData>
</PspipEvent>
</PmcpMessage>

```

AudioInformationStart.xml

```

<?xml version="1.0" encoding="UTF-8"?>
<!--Channel information (overrides current event)-->
<PmcpMessage xmlns="http://www.atsc.org/pmcp/2003/1.0" id="4294967567" origin="AC-3 audio encoder"
dateTime="2003-12-17T09:30:47-05:00">
  <Channel channelNumber="57-2">
    <Ac3Audio action="add" audiold="1" lang="eng" numChannels="3/2" surround="true"/>
  </Channel>
</PmcpMessage>

```

AudioInformationNext.xml

```

<?xml version="1.0" encoding="UTF-8"?>
<!--Channel information (overrides current event)-->
<PmcpMessage xmlns="http://www.atsc.org/pmcp/2003/1.0" id="4294967568" origin="AC-3 audio encoder"
dateTime="2003-12-17T09:31:03-05:00">
  <Channel channelNumber="57-2">
    <Ac3Audio action="add" audiold="1" lang="spa" numChannels="2/0" surround="false"/>
  </Channel>
</PmcpMessage>

```

AudioInformationStop.xml

```

<?xml version="1.0" encoding="UTF-8"?>
<!--Channel information cancelled (current event used again)-->
<PmcpMessage xmlns="http://www.atsc.org/pmcp/2003/1.0" id="4294967568" origin="AC-3 audio encoder"
dateTime="2003-12-17T09:31:03-05:00">
  <Channel channelNumber="57-2">
    <Ac3Audio action="remove" audiold="1"/>
  </Channel>
</PmcpMessage>

```

PrivateInformation.xml

```

<?xml version="1.0" encoding="UTF-8"?>
<!--Sample PMCP document showing how to send some private information using the PMCP protocol-->
<PmcpMessage xmlns="http://www.atsc.org/pmcp/2003/1.0" id="1" origin="SIMS(1)" originType="Program_Management"
dateTime="2003-07-28T15:00:00">
  <PrivatePmcpInformation>
    <PvtTable-Name>Segment Classes</PvtTable-Name>
    <PvtTable-Layout>
      <PvtColumn PvtColumn-Name="code" PvtColumn-Type="char(3)"/>
      <PvtColumn PvtColumn-Name="description" PvtColumn-Type="char(30)"/>
      <PvtColumn PvtColumn-Name="active" PvtColumn-Type="char(1)"/>
      <PvtColumn PvtColumn-Name="special_order_only" PvtColumn-Type="char(1)"/>
    </PvtTable-Layout>
    <PvtTable-Record>
      <PvtColumn PvtColumn-Name="code" PvtColumn-Value="NB"/>
      <PvtColumn PvtColumn-Name="description" PvtColumn-Value="News Break"/>
      <PvtColumn PvtColumn-Name="active" PvtColumn-Value="Y"/>
      <PvtColumn PvtColumn-Name="special_order_only" PvtColumn-Value="N"/>
    </PvtTable-Record>
  </PrivatePmcpInformation>
</PmcpMessage>

```

```
<PvtColumn PvtColumn-Name="code" PvtColumn-Value="NC"/>
<PvtColumn PvtColumn-Name="description" PvtColumn-Value="No Cops - All day"/>
<PvtColumn PvtColumn-Name="active" PvtColumn-Value="Y"/>
<PvtColumn PvtColumn-Name="special_order_only" PvtColumn-Value="N"/>
</PvtTable-Record>
</PrivatePmcpInformation>
</PmcpMessage>
```

ANNEX C: PSIP METADATA SYSTEM ARCHITECTURE (Informative)

C.1 System Components

Figure C.1 shows a generic digital television system related to the production of PSIP, with interconnections showing various categories of metadata/data. Note that the blocks relate to the functions of the different devices and subsystems involved and do not necessarily indicate specific items of equipment. The level of implementation of these functional blocks will vary from station to station and in some cases may be absent or only partially implemented.

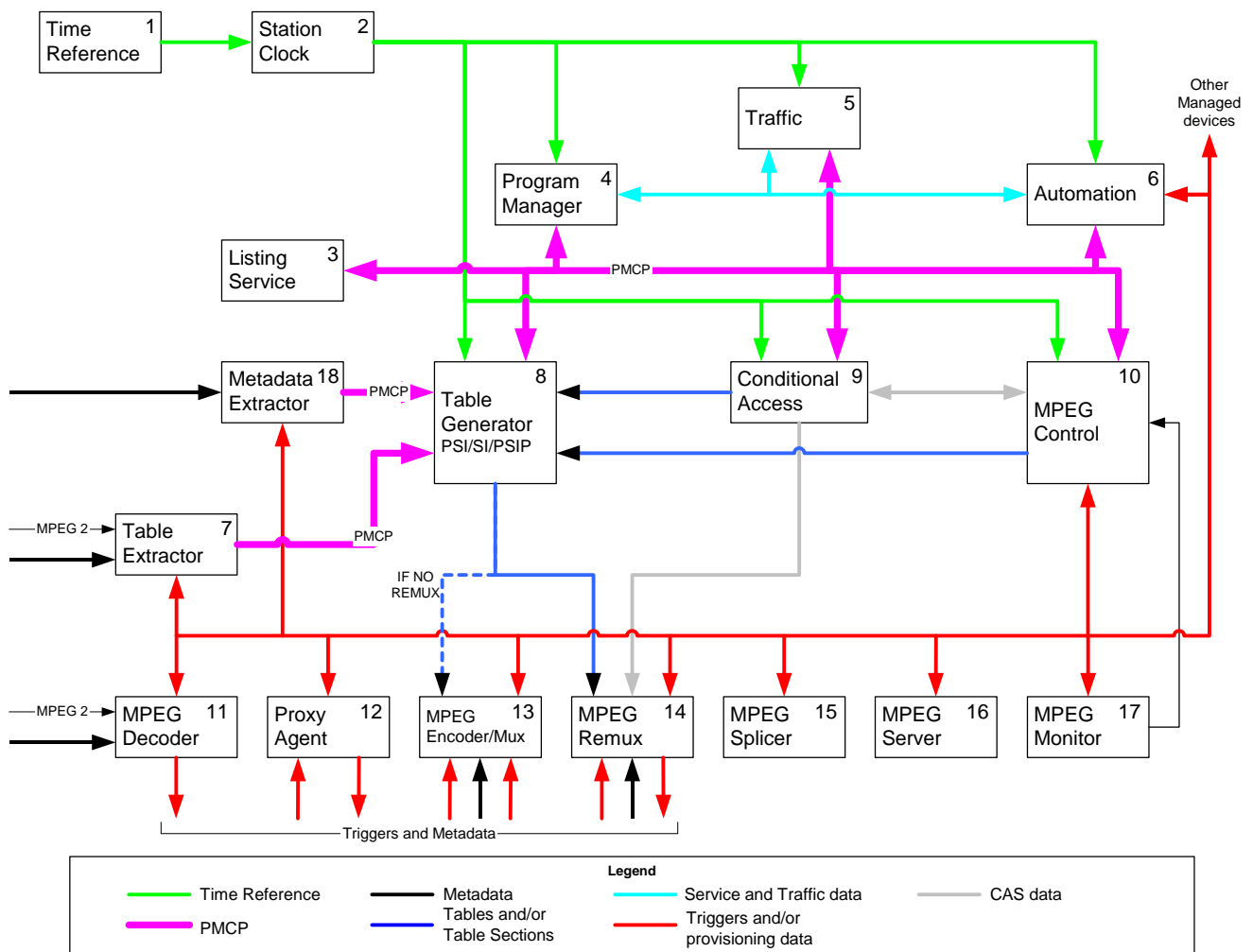


Figure C.1 PSIP metadata system.

The blocks in Figure C.1 have the following functions:

1. Time Reference A source of accurate time signals, usually referenced directly or indirectly to UTC.

2. **Station Clock** A device that generates and/or distributes time signals to devices and systems within the station. May include a highly stable internal clock that is updated on a regular basis from an external standard reference such as GPS or the US Naval Observatory. Typically provides local time at the station, referenced to UTC. Outputs SMPTE time code and/or NTP (network time protocol) and/or proprietary time clock signals. May be combined with a video sync generator.
3. **Listing Service** A third-party service using a database where program information is collected and compiled into programming data, for delivery to broadcasters and to other media for program guide publication.
4. **Program Manager** A management and planning system, including a database of program elements, used to produce the broadcast schedule to be carried over one or more channels.
5. **Traffic** A management system comprising a database for tracking the sale of advertising and the scheduling of advertising, promotional announcements, program elements, and other interstitial material.
6. **Automation System** A management and control system comprising a database of schedule information used for triggering multiple devices with precision timing, for frame or near frame accurate operation of a broadcast system.
7. **Table Extractor** A bridge device that monitors a transport stream for the presence of PIDs carrying tables, and parses the table data for use by other devices.
8. **Table Generator** Also referred to as the PSIP Generator. A server device that creates defined system information table structures, including PSIP, associated with a multiplex of programs, that are inserted into a transport stream for play out in the multiplex.
9. **Conditional Access** A component or collection of components used for encrypting a PID, a program event, a channel or collection of channels, or any combination of the above, in order to restrict access to the material to certain authorized groups of users only.
10. **MPEG Control** A manager, control system, or set of controls used to manipulate the configuration and operation of any of the components of an MPEG system. May control device parameters directly or enable, modify or delete profiles used to operate the equipment, and manage redundancy and log errors.
11. **MPEG Decoder** A device that transforms a compressed MPEG-encoded bitstream into an analog or uncompressed digital video or audio signal.
12. **Proxy Agent**
 - 1) A device (usually a computer) that bridges between two protocols so that incompatible interface messages can be passed from one domain to another.
 - 2) A device used for protocol translations for extending signal reach beyond network limitations.

- | | |
|------------------------|---|
| 13. MPEG Encoder | A transformation device used to convert a video, audio or raw data signal into a compressed bitstream of packetized data (packetized elementary stream or PES) carried as a multiplex of PIDs over a transport stream in real time. |
| 14. MPEG Remultiplexer | A device capable in real time of disassembling and re-assembling packet streams from one or more MPEG-2 transport stream inputs into one or more transport stream outputs containing a multiplex of packets. |
| 15. MPEG Splicer | A real time device that allows switching between compressed bitstreams, providing seamless or near-seamless program transitions triggered from commands either in the transport stream or from an external control system. |
| 16. MPEG Server | A disk-based storage device that stores content in the MPEG domain. |
| 17. MPEG Monitor | A device that monitors the attributes of a compressed bitstream and that may log and report out-of-limit parameters and occurrences. |
| 18. Metadata Extractor | A device that extracts metadata transported with an associated video or audio signal and forwards it for use by other devices |

C.2 PMCP Data Flow

Programming metadata flow between devices and systems will vary depending on the requirements of the broadcaster, the number and type of program and traffic support services used, and the degree of automation implemented. Arrangements are described below for one possible flow of information using PMCP. Not all broadcasters will implement all functions mentioned. Time periods mentioned for metadata transfer may change in the future since it is possible that the use of PMCP and other new technological advances will change operational practices.

C.2.1 Program Planning and Listing Service

Long-term program planning and scheduling may take place in the Program Manager (4). This system may take input from station staff and also from the network that the station belongs to (if any). A draft television schedule usually covering many weeks or months for the television station output channel(s) is typically sent monthly using PMCP to the Listing Service (3) and to Traffic (5) (updates may be sent more frequently). The listing service may add detailed information about the particular shows, including actual durations, titles and content details, and then may send a revised schedule back to the station using PMCP. The Listing Service may also distribute program schedules to other news media for publication. For schedules sent to the station, a 16-day rolling schedule may be used, with daily or more frequent downloads.

C.2.2 Traffic, PSIP Generator, and Automation

At the station the schedule with program information may be received by Traffic and the PSIP Table Generator (8), and may also be fed back to program management. The PSIP Generator may use the information from the Listing Service to populate much of the PSIP table information. Meanwhile Traffic establishes the detailed daily schedule and on-air playlist, taking account of network and local programming, advertisements, promotional and other interstitial material. One or more Alternate Schedules may also be created to cater for different operational

scenarios, live program over-runs, emergencies, etc. The detailed playlist, typically covering one day (often more at weekends and holidays) is distributed from Traffic to Automation (6), usually one to three days before the airdate, and an associated schedule with PSIP events is sent from Traffic to the PSIP Generator using PMCP.

Once control of the schedule has been handed over to Automation, any changes to the schedule may be communicated from Automation to the PSIP Generator using PMCP. It should be noted that the Traffic and Automation system databases may not hold all the detailed show content information downloaded from the listing service to the PSIP generator, so updates about the schedule sent from Traffic or Automation to the PSIP Generator may update PSIP event times, durations and other information, while leaving other show details already entered into the PSIP tables intact.

C.2.3 Other Sources of PSIP Information

Where the Network generates PSIP information for network programs, this can be distributed to the station along with a program in an MPEG bitstream. The metadata may be extracted using the Table Extractor (7) and fed to the PSIP generator using PMCP.

Some PSIP information associated with a show (e.g., caption service information, parental advisory, AC-3 audio, broadcast flag) can be carried in data packets inserted into the baseband video or audio streams. This metadata may be extracted using the Metadata Extractor (18) and fed to the PSIP generator using PMCP to update the appropriate current channel parameters.

Some PSIP information can be generated by particular hardware associated with the MPEG encoding and distribution process, and may not be known to upstream planning systems, or may over-ride previously entered values (e.g. audio stereo or surround sound mode). This metadata may be sent by MPEG Control (10) and fed to the PSIP Generator using PMCP to update the appropriate current channel parameters.

C.2.4 Last-Minute Schedule Changes

Automation controls the on-air program switching of the station output in real-time. If last-minute changes to the schedule are required, this may take place in Traffic, in which case a new play list is produced and equivalent schedule updates are sent to the PSIP Generator. If the schedule changes are made in Automation, with manual intervention from the master control operator, then Automation may send updates for particular events to the PSIP Generator using PMCP.

If a decision is taken to switch to an alternate schedule, then new schedule information is sent to the PSIP Generator. This could be in the form of updates from automation, or as a new schedule download from traffic to the PSIP generator.

C.3 Station Timing

An accurate time reference is required for a station to broadcast programs to a published schedule, synchronized with program contributions from a network or other sources, and including accurate PSIP time information. Use of the following techniques will help ensure that automation control and on-air switching can be carried out with frame accuracy, and that PSIP time accuracy will meet the +/- 1 second requirement of A/65B.

C.3.1 Time Reference

The automation system and any other time-sensitive systems and equipment affecting on-air operations should be locked to a feed of SMPTE time code or other timing signal from a station master clock system. The PSIP table generator and other computer-based systems should be locked to the station master clock or to a source of the same standard time distributed through the local area network. Depending on broadcast operational requirements, the time used by the station may be local time or UTC (sometimes informally referred to as GMT – Greenwich Mean Time, now an obsolete term).

The accuracy of the station clock should be maintained with a standard external reference. Several methods exist including radio broadcast signals, telephone dial-up, Internet access and GPS. Whichever way the time signal is received, to maintain a uniform time system the ultimate time reference should be a national laboratory source of UTC (in the US this is the US Naval Observatory in Washington DC).

Systems and equipment external to the station that send signals and information affecting current operations in real time should also be referenced directly or indirectly to UTC.

Systems such as the traffic system, program management system, and program listing service, typically process program schedule and timing information in non-real time and off line from the on-air broadcast chain. It is noted that timing reference accuracy for these systems may therefore be less stringent than for on-air devices. However, if such systems may on occasions be required to send PSIP information or other metadata for current on-air program events, then they should use the same ultimate timing reference and have the same timing accuracy as the PSIP generator.

C.3.2 GPS Time

GPS time is defined as the number of seconds elapsed since 0000 Universal Time on January 6, 1980. It is offset from UTC by an integer number of seconds (currently 13) due to leap seconds added to UTC but not to GPS time. The time offset is distributed with the GPS signal, so any station clock or other device that is referenced to GPS is locked to UTC and is aware of actual UTC time.

C.4 Assumptions

The following assumptions apply to equipment and systems designed for use with PMCP:

- a) Metadata for a given program element in the transport stream may arrive at multiple locations and multiple times.
- b) The actual broadcast time, duration and/or content of a PSIP event may change and the associated metadata may need to be updated.
- c) When a change occurs in the transport stream it is acceptable that updates to affected system information and PSIP tables may miss the first instance of transmission of the table after the transport stream change occurs. Therefore equipment that makes a change in one or more characteristics of the transport stream may report the changes to other affected equipment immediately after the change is made. This does not preclude advance notice for tables that send advance information.

- d) Automation, Traffic, and some other systems may handle program segments at a more detailed level than used for PSIP events. Only information about the primary automation event that coincides with the start of the PSIP event (as determined by station policy) will be communicated from these systems to other equipment and systems as the PSIP event. Primary and secondary automation events at other times may effect the configuration of the transmitted bitstream and such information may be communicated as channel information updates at any time.

ANNEX D: LIST OF ELECTRONIC FILES

The following electronic files are available from ATSC: see <http://www.atsc.org/standards.html>.

PMCP Schema

- PMCP1.0.xsd

PMCP Use Cases

- AudioInformationNext.xml
- AudioInformationStart.xml
- AudioInformationStop.xml
- Captions.xml
- DurationChange.xml
- ErrorMessage.xml
- EventNameChange.xml
- EventShift.xml
- HeartbeatReply.xml
- HeartbeatRequest.xml
- PrivateInformation.xml
- ScheduleDownload.xml
- ScheduleRead.xml
- ShowNameChange.xml