SMPTE STANDARD

Media Device Control – Part 2: Protocol (MDCP)

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Approved
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Foreword

SMPTE (the Society of Motion Picture and Television Engineers) is an internationally-recognized standards developing organization. Headquartered and incorporated in the United States of America, SMPTE has members in over 80 countries on six continents. SMPTE's Engineering Documents, including Standards, Recommended Practices, and Engineering Guidelines, are prepared by SMPTE's Technology Committees. Participation in these Committees is open to all with a bona fide interest in their work. SMPTE cooperates closely with other standards-developing organizations, including ISO, IEC and ITU.

SMPTE Engineering Documents are drafted in accordance with the rules given in Part XIII of its Operations Manual.

SMPTE ST 2071-2 was prepared by Technology Committee 34CS on Media Systems, Control and Services.

Intellectual Property

At the time of publication no notice had been received by SMPTE claiming patent rights essential to the implementation of this Standard. However, attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. SMPTE shall not be held responsible for identifying any or all such patent rights.

1 Scope

The Media Device Control (MDC) specification defines a platform and protocol agnostic framework for the control of network-attached devices over Internet Protocol (IP) networks. The framework, known as the Media Device Control Framework (MDCF) defined by SMPTE ST 2071-1, can be implemented with nearly any Internet Protocol based transport protocol, but in order to support interoperability between implementations a single, minimal compliance, transport protocol must be defined. This single, minimal compliance protocol is referred to as the Media Device Control Protocol (MDCP). The Media Device Control Protocol (MDCP) is based on existing industry standards, simplifying the implementation and reducing the cost to implement, while supporting the implementation of vendor specific APIs, third party APIs, protocol extensions and the implementation of many existing standards relating to the control of media devices. Additional protocols may be implemented, but all implementations must implement the Media Device Control Protocol (MDCP) as it is defined within this document. These additional protocols should provide an additional means for controlling devices, but must not be required nor expose functionality that is not available via the Media Device Control Protocol (MDCP).

2 Conformance Notation

Normative text is text that describes elements of the design that are indispensable or contains the conformance language keywords: "shall", "should", or "may". Informative text is text that is potentially helpful to the user, but not indispensable, and can be removed, changed, or added editorially without affecting interoperability. Informative text does not contain any conformance keywords.

All text in this document is, by default, normative, except: the Introduction, any section explicitly labeled as "Informative" or individual paragraphs that start with "Note:"

The keywords "shall" and "shall not" indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.

The keywords, "should" and "should not" indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

The keywords "may" and "need not" indicate courses of action permissible within the limits of the document.

The keyword “reserved” indicates a provision that is not defined at this time, shall not be used, and may be defined in the future. The keyword “forbidden” indicates “reserved” and in addition indicates that the provision will never be defined in the future.

A conformant implementation according to this document is one that includes all mandatory provisions ("shall") and, if implemented, all recommended provisions ("should") as described. A conformant implementation need not implement optional provisions ("may") and need not implement them as described.

Unless otherwise specified, the order of precedence of the types of normative information in this document shall be as follows: Normative prose shall be the authoritative definition; Tables shall be next; followed by formal languages; then figures; and then any other language forms.

3 Document Elements

The SMPTE 2071 suite is comprised of the following elements, which form an integral piece of this Standard. Additionally, the WSDL and schema files may be found at http://smpte-ra.org/schemas/2071/2012/mdcf.

1.	Prose	ST2071-2.docx		[Normative]
2.	XML Schema	st2071-2a.xsd	http://www.smpte-ra.org/schemas/2071/2012/mdcf/types	[Normative]
3.	XML Schema	st2071-2b.xsd	http://www.smpte-ra.org/schemas/2071/2012/mdcf/identity	[Normative]
4.	XML Schema	st2071-2c.xsd	http://www.smpte-ra.org/schemas/2071/2012/mdcf/device	[Normative]
5.	XML Schema	st2071-2d.xsd	http://www.smpte-ra.org/schemas/2071/2012/mdcf/device/control	[Normative]
6.	XML Schema	st2071-2e.xsd	http://www.smpte-ra.org/schemas/2071/2012/mdcf/device/event	[Normative]
7.	XML Schema	st2071-2f.xsd	http://www.smpte-ra.org/schemas/2071/2012/mdcf/device/mode	[Normative]
8.	XML Schema	st2071-2g.xsd	http://www.smpte-ra.org/schemas/2071/2012/mdcf/media	[Normative]
9.	XML Schema	st2071-2h.xsd	http://www.smpte-ra.org/schemas/2071/2012/mdcf/query	[Normative]
10.	XML Schema	st2071-2i.xsd	http://www.smpte-ra.org/schemas/2071/2012/mdcf/security	[Normative]
11.	WSDL	st2071-2j.wsdl	http://www.smpte-ra.org/schemas/2071/2012/mdcf/device	[Normative]
12.	WSDL	st2071-2k.wsdl	http://www.smpte-ra.org/schemas/2071/2012/mdcf/device/control	[Normative]
13.	WSDL	st2071-2l.wsdl	http://www.smpte-ra.org/schemas/2071/2012/mdcf/device/event	[Normative]
14.	WSDL	st2071-2m.wsdl	http://www.smpte-ra.org/schemas/2071/2012/mdcf/device/mode	[Normative]
15.	WSDL	st2071-2n.wsdl	http://www.smpte-ra.org/schemas/2071/2012/mdcf/media	[Normative]
16.	WSDL	st2071o.wsdl	http://www.smpte-ra.org/schemas/2071/2012/mdcf/query	[Normative]
17.	WSDL	st2071p.wsdl	http://www.smpte-ra.org/schemas/2071/2012/mdcf/security	[Normative]

4 Normative References

The following standards contain provisions that, through reference in this text, constitute provisions of this recommended practice. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this recommended practice are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

[RFC 4122] Internet Engineering Task Force (IETF) (2005, July). IETF RFC 4122, A Universally Unique Identifier (UUID) URN Namespace. http://www.ietf.org/rfc/rfc4122.txt

[Web Service Compatibility] Web Services Interoperability Organization (OASIS-WS-I) (2010, November). WS-I Basic Profile Version 1.2 (Final). http://www.ws-i.org/Profiles/BasicProfile-1.2.html

[SMPTE ST 2071-1] SMPTE ST 2071-1:2012, Media Device Control — Part 1: Framework (MDCF)

5 Messaging Services

Messages are data packets exchanged between nodes for the purpose of executing operations, broadcasting notification events, and exchanging data. The Media Device Control specification defines this exchange of messages as the Media Device Control Protocol (MDCP). The Media Device Control Protocol (MDCP) shall be implemented as WS-I Basic Profile 1.2 (WS-I BP 1.2) compliant web services using the SOAP 1.1 in HTTP protocol binding. Service definitions shall be represented using Web Service Definition Language version 1.1 (WSDL 1.1) and may use WS-Addressing 1.0 for the addressing of request and/or response messages.

6 The MDCF Data and Operation Model

In compliance with the WS-I Basic Profile 1.2, the MDCF data and operation model shall be transposed to XML Schema 1.0 and WSDL 1.1. The WSDL and the corresponding SOAP envelopes shall conform to the requirements outlined in the WS-I Basic Profile 1.2 and the SOAP 1.1 in HTTP protocol binding.

6.1 Mapping the MDCF Data Model to WSDL

When transposing the MDCF data and operations model to XML 1.0 and WSDL 1.1, the following rules shall apply:

1. MDCF attributes shall be mapped to document-literal port type operations with an operation name equal to the word “get” prepended to the attribute name as it is defined in the MDCF data and operations model. For example, an attribute named “SomeAttribute” would transpose to a port type operation named “getSomeAttribute”. The resulting operation shall accept no input parts and shall specify one output part matching the data type of the attribute.

2. MDCF operations shall be mapped to document-literal port type operations with an operation name equal to the name as it is assigned to the operation in the MDCF data and operations model. For example, an operation named “SomeOperation” would transpose to a port type operation named “SomeOperation”. The resulting operation shall accept only one input part containing an XML document representing the input parameters of the operation, and one output part matching the return type of the operation.

3. Port type operations shall define faults representative of the error conditions that may arise. Errors conditions that invalidate the state of the operation shall terminate the operation and raise the appropriate fault.

4. Each port type operation shall specify a unique WS-Addressing 1.0 compliant *Action* attribute for both the input and output message parts.

6.2 Message Format and Structure

6.2.1 SOAP Envelope

The standard SOAP 1.1 envelope shall be used. The SOAP 1.1 Binding for MTOM 1.0 may be used to transport binary data or improve the performance of large result sets.

6.2.2 SOAP Headers

The web services endpoint may require the support of WS-Addressing 1.0.

6.2.2.1 *MessageID*

The *MessageID* header shall be specified if WS-Addressing 1.0 support is indicated. The *MessageID* shall be a UUID as defined by RFC 4122. For example:

urn:uuid:12345678-1234-1234-1234-123456789abc

6.2.2.2 *To*

The *To* header may be specified if WS-Addressing 1.0 support is indicated. The *To* header shall contain the endpoint address of the SOAP receiver.

6.2.2.3 *ReplyTo*

The *ReplyTo* header may be specified if WS-Addressing 1.0 support is indicated. The *ReplyTo* header shall contain the endpoint address of the SOAP sender.

6.2.2.4 *Action*

The *Action* header shall be specified if WS-Addressing 1.0 support is indicated. The *Action* header shall be derived from the *Action* attribute specified in the WSDL for the operation message part. If no *Action* attribute is specified for the operation message part, the value of the *Action* header shall be derived implicitly from the WSDL — refer to the WS-Addressing 1.0 documentation for specific details.

6.2.2.5 *RelatesTo*

The *RelatesTo* header may be specified if WS-Addressing 1.0 support is indicated. The *RelatesTo* header shall contain the *MessageID* of the corresponding request.

6.2.3 SOAP Body

The SOAP Body shall be specified in accordance to the WS-I Basic Profile 1.2, containing only one child XML element.

7 Device Services

Devices are typically aggregations of capabilities, implementing more than one Capability interface. In order to represent this relationship in WSDL, each device may be represented as a WSDL service. If implemented, the WSDL service definition shall define each Capability interface implemented by the device as a distinct web service endpoint, and the URL(s) pointing to the WSDL service definition shall be defined in the URLs attribute of the Device interface and DeviceInformation data structure.

Each device shall implement the Device Capability interface.

7.1 Device Endpoints

Each Capability interface implemented by a device shall be exposed as a unique web service endpoint. Each of these endpoints shall be defined as a WSDL port type and there shall be a one-to-one relationship between the Capability interfaces and web service endpoints implemented by a device. Each Capability implemented by a device shall provide the URL(s) to the web service endpoint implementing that Capability via the URLs attribute of the Capability data structure.

Annex A Bibliography (Informative)

[XML] World Wide Web Consortium (W3C) (2008, November) Extensible Markup Language 1.0 (Fifth Edition). http://www.w3.org/TR/2008/REC-xml-20081126/

[XML Namespaces] World Wide Web Consortium (W3C) (2009, December) Namespaces in XML 1.0 (Third Edition). http://www.w3.org/TR/2009/REC-xml-names-20091208/

[XML Schema] World Wide Web Consortium (W3C) (2004, October) XML Schema Part 1: Structures (Second Edition). http://www.w3.org/TR/2004/REC-xmlschema-1-20041028/

[XML Schema] World Wide Web Consortium (W3C) (2004, October) XML Schema Part 2: Datatypes (Second Edition). http://www.w3.org/TR/2004/REC-xmlschema-2-20041028/

[WSDL] World Wide Web Consortium (W3C) (2001, March) Web Services Description Language (WSDL) 1.1. http://www.w3.org/TR/2001/NOTE-wsdl-20010315

[SOAP] World Wide Web Consortium (W3C) (2001, May) Simple Object Access Protocol (SOAP) 1.1. http://www.w3.org/TR/2000/NOTE-SOAP-20000508/