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# **Devices Profile for Web Services Version 1.1**

# **OASIS Standard**

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#### Abstract:

This profile defines a minimal set of implementation constraints to enable secure Web service messaging, discovery, description, and eventing on resource-constrained endpoints.

#### Status:

This document was last revised or approved by the OASIS Web Services Discovery and Web Services Devices Profile (WS-DD) TC on the above date. The level of approval is also listed above. Check the "Latest Version" or "Latest Approved Version" location noted above for possible later revisions of this document.

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# 1 1 Introduction

2 The Web services architecture includes a suite of specifications that define rich functions and that may be

composed to meet varied service requirements. To promote both interoperability between resource constrained Web service implementations and interoperability with more flexible client implementations,

- 5 this profile identifies a core set of Web service specifications in the following areas:
  - Sending secure messages to and from a Web service
    - Dynamically discovering a Web service
  - Describing a Web service
    - Subscribing to, and receiving events from, a Web service

In each of these areas of scope, this profile defines minimal implementation requirements for compliant
 Web service implementations.

# 12 **1.1 Requirements**

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- 13 This profile intends to meet the following requirements:
- Identify a minimal set of Web service specifications needed to enable secure messaging,
   dynamic discovery, description, and eventing.
- Constrain Web services protocols and formats so Web services can be implemented on
   peripheral-class and consumer electronics-class hardware.
- Define minimum requirements for compliance without constraining richer implementations.

# 19 1.2 Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD
 NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described
 in [RFC2119].

# 23 **1.2.1 Notational Conventions**

- 24 This specification uses the following syntax to define normative outlines for messages:
  - The syntax appears as an XML instance, but values in italics indicate data types instead of literal values.
- Characters are appended to elements and attributes to indicate cardinality:
- 28 o "?" (0 or 1)
- 29 o "\*" (0 or more)
  - "+" (1 or more)
- The character "|" is used to indicate a choice between alternatives.
- The characters "(" and ")" are used to indicate that contained items are to be treated as a group with respect to cardinality or choice.
- The characters "[" and "]" are used to call out references and property names.
- Ellipses (i.e., "...") indicate points of extensibility. Additional children and/or attributes MAY be
   added at the indicated extension points but MUST NOT contradict the semantics of the parent
   and/or owner, respectively. By default, if a receiver does not recognize an extension, the receiver
   SHOULD ignore the extension; exceptions to this processing rule, if any, are clearly indicated
   below.
- XML namespace prefixes (see Table 1) are used to indicate the namespace of the element being defined.

- 42 This specification uses the **[action]** and Fault properties **[WS-Addressing]** to define faults.
- 43 Normative statements in this profile are called out explicitly as follows:
- 44 Rnnn: Normative statement text goes here.
- 45 where "nnnn" is replaced by the statement number. Each statement contains exactly one requirement
- 46 level keyword (e.g., "MUST") and one conformance target keyword (e.g., "MESSAGE").

# 47 **1.2.2 Terms and Definitions**



#### 48

#### 49 **Figure 1: Arrangement of clients and devices**

#### 50 MESSAGE

51 Protocol elements that are exchanged, usually over a network, to affect a Web service. Always 52 includes a SOAP ENVELOPE. Typically also includes transport framing information such as 53 HTTP headers, TCP headers, and IP headers.

#### 54 SOAP ENVELOPE

55 An XML Infoset that consists of a document information item [XML Infoset] with exactly one 56 member in its [children] property, which MUST be the SOAP Envelope [SOAP 1.2] element 57 information item.

#### 58 MIME SOAP ENVELOPE

59 A SOAP ENVELOPE serialized using MIME Multipart Serialization [MTOM].

#### 60 TEXT SOAP ENVELOPE

- 61 A SOAP ENVELOPE serialized as application/soap+xml.
- 62 CLIENT
- 63 A network endpoint that sends MESSAGEs to and/or receives MESSAGEs from a SERVICE.

#### 64 SERVICE

65 A software system that exposes its capabilities by receiving and/or sending MESSAGEs on one 66 or several network endpoints.

#### 67 DEVICE

68 A distinguished type of SERVICE that hosts other SERVICEs and sends and/or receives one or 69 more specific types of MESSAGEs.

#### 70 HOSTED SERVICE

A distinguished type of SERVICE that is hosted by another SERVICE. The lifetime of the
 HOSTED SERVICE is a subset of the lifetime of its host. The HOSTED SERVICE is visible (not
 encapsulated) and is addressed separately from its host. Each HOSTED SERVICE has exactly
 one host. (The relationship is not transitive.)

#### 75 SENDER

76 A CLIENT or SERVICE that sends a MESSAGE.

#### 77 RECEIVER

78 A CLIENT or SERVICE that receives a MESSAGE.

### 79 1.3 XML Namespaces

80 The XML namespace URI that MUST be used be implementations of this specification is:

81 http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01

Table 1 lists XML namespaces that are used in this specification. The choice of any namespace prefix is arbitrary and not semantically significant.

#### 84 Table 1: Prefixes and XML namespaces used in this specification.

Prefix	XML Namespace	Specification(s)
soap	http://www.w3.org/2003/05/soap-evelope	[SOAP 1.2]
wsa	http://www.w3.org/2005/08/addressing	[WS-Addressing]
wsd	http://docs.oasis-open.org/ws-dd/ns/discovery/2009/01	[WS-Discovery]
dpws	http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01	This profile
wsdl	http://schemas.xmlsoap.org/wsdl/	[WSDL 1.1]
wse	http://schemas.xmlsoap.org/ws/2004/08/eventing	[WS-Eventing]
wsp	http://www.w3.org/ns/ws-policy	[WS-Policy, WS- PolicyAttachment]
WSX	http://schemas.xmlsoap.org/ws/2004/09/mex	[WS- MetadataExchange]

# 85 **1.4 XSD File**

Dereferencing the XML namespace defined in Section 0

- 87 XML Namespaces will produce the Resource Directory Description Language (RDDL) [RDDL] document
- that describes this namespace, including the XML Schema [XML Schema Part 1, 2] declarations
- 89 associated with this specification.

# 90 **1.5 Normative References**

#### 91 [RFC 2119]

86

- 92 S. Bradner, *Key words for use in RFCs to Indicate Requirement Levels*,
- 93 http://www.ietf.org/rfc/rfc2119.txt, IETF RFC 2119, March 1997.

#### 94 **[AES/TLS]**

P.Chown, Advanced Encryption Standard (AES) Ciphersuites for Transport Layer Security (TLS),
 http://www.ietf.org/rfc/rfc3268.txt, IETF RFC 3268, June 2004.

97	[BP 1.1, Section 4]
98 99	K. Ballinger, et al, <i>Basic Profile Version 1.1, Section 4: Service Description</i> , http://www.ws- i.org/Profiles/BasicProfile-1.1-2004-08-24.html#description, August 2004.
100	[HTTP/1.1]
101 102	R.Fielding, et al, <i>Hypertext Transfer Protocol HTTP/1.1</i> , http://www.ietf.org/rfc/rfc2616.txt, IETF RFC 2616. June 1999.
103	[HTTP Authentication]
104	I Franks et al HTTP Authentication: Basic and Digest Access Authentication
105	http://www.ietf.org/rfc/rfc2617.txt. IETF RFC 2617. June 1999.
106	[MIME]
107 108	N. Freed, et al, <i>Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies</i> , http://www.ietf.org/rfc/rfc2045.txt, IETF RFC 2045, November 1996.
109	[MTOM]
110 111	N. Mendelsohn, et al, SOAP Message Transmission Optimization Mechanism, http://www.w3.org/TR/2005/REC-soap12-mtom-20050125/, January 2005.
112	[RDDL]
113 114	Jonathan Borden, et al, Resource Directory Description Language (RDDL) 2.0, http://www.openhealth.org/RDDL/20040118/rddl-20040118.html, 18 January 2004.
115	[RFC 4122]
116 117	P. Leach, et al, A Universally Unique IDentifier (UUID) URN Namespace, http://www.ietf.org/rfc/rfc4122.txt, IETF RFC 4122, July 2005.
118	[SHA]
119 120	Secure Hash Standard, http://csrc.nist.gov/publications/fips/fips180-3/fips180-3_final.pdf, October 2008.
121	[SOAP 1.2, Part 1]
122 123	M. Gudgin, et al, SOAP Version 1.2 Part 1: Messaging Framework, http://www.w3.org/TR/2007/REC-soap12-part1-20070427/, April 2007.
124	[SOAP 1.2, Part 2]
125 126	M. Gudgin, et al, SOAP Version 1.2 Part 2: Adjuncts, Section 7: SOAP HTTP Binding, http://www.w3.org/TR/2007/REC-soap12-part2-20070427/#soapinhttp, April 2007.
127	[SOAP-over-UDP]
128 129	OASIS Standard, SOAP-over-UDP, http://docs.oasis-open.org/ws-dd/soapoverudp/1.1/os/wsdd- soapoverudp-1.1-spec-os.docx, 1 July 2009.
130	[TLS]
131	T. Dierks, et al, <i>The TLS Protocol, Version 1.0</i> , http://www.ietf.org/rfc/rfc2246.txt, IETF RFC 2246,
132	January 1999.
100	[W3-Addressing]
134 135	ws-addr-core-20060509, 9 May 2006.
136	[WS-Addressing SOAP Binding]
137	W3C Recommendation, Web Services Addressing 1.0 - SOAP Binding,
138	http://www.w3.org/TR/2006/REC-ws-addr-soap-20060509, 9 May 2006.
139	[WS-Discovery]
140 141	open org/ws-dd/discovery/1.1/os/wsdd-discovery-1.1-spec-os.docx.1.July 2009
142	IWSDI 1 11
142	E Christensen et al Web Services Description Language (WSDL) 1.1
144	http://www.w3.org/TR/2001/NOTE-wsdl-20010315, March 2001.
145	[WSDL Binding for SOAP 1.2]
146	K. Ballinger, et al, WSDL 1.1 Binding Extension for SOAP 1.2,
147	http://www.w3.org/Submission/2006/SUBM-wsdl11soap12-20060405/, 5 April 2006.

#### 148 [WS-Eventing]

149D. Box, et al, Web Services Eventing (WS-Eventing), http://www.w3.org/Submission/2006/SUBM-150WS-Eventing-20060315/, 15 March 2006.

#### 151 [WS-MetadataExchange]

- 152 K. Ballinger, et al, Web Services Metadata Exchange 1.1 (WS-MetadataExchange),
- 153 http://www.w3.org/Submission/2008/SUBM-WS-MetadataExchange-20080813/, 13 August 2008.

### 154 **[WS-Policy]**

W3C Recommendation, Web Services Policy 1.5 - Framework, http://www.w3.org/TR/2007/REC ws-policy-20070904/, 4 September 2007.

#### 157 [WS-PolicyAttachment]

W3C Recommendation, *Web Services Policy 1.5 - Attachment*, http://www.w3.org/TR/2007/REC-ws-policy-attach-20070904/, 4 September 2007.

#### 160 [WS-Transfer]

J. Alexander, et al, *Web Service Transfer (WS-Transfer)*,
 http://www.w3.org/Submission/2006/SUBM-WS-Transfer-20060927/, 27 September 2006.

#### 163 [X.509.v3]

158

159

164

165

ITU-T X.509.v3 Information technology - Open Systems Interconnection - The Directory: Publickey and attribute certificate frameworks (ISO/IEC/ITU 9594-8)

#### 166 [XML Schema, Part 1]

W3C Recommendation, *XML Schema Part 1: Structures Second Edition*,
 http://www.w3.org/TR/2004/REC-xmlschema-1-20041028/, 28 October 2004.

#### 169 [XML Schema, Part 2]

W3C Recommendation, *XML Schema Part 2: Datatypes Second Edition*,
 http://www.w3.org/TR/2004/REC-xmlschema-2-20041028/, 28 October 2004.

### 172 **1.6 Non-Normative References**

#### 173 [IPv6 Autoconfig]

S. Thomson, et al, *IPv6 Stateless Address Autoconfiguration*, http://www.ietf.org/rfc/2462.txt,
 IETF RFC 2462, December 1998.

#### 176 **[DHCP]**

177

178

R. Droms, et al, *Dynamic Host Configuration Protocol*, http://www.ietf.org/rfc/2131.txt, IETF RFC 2131, March 1997.

#### 179 [XML Infoset]

J. Cowan, et al, *XML Information Set (Second Edition)*, http://www.w3.org/TR/2004/REC-xml infoset/20040204/, February 2004.

#### 182 [WS-Security]

- 183 OASIS Standard Specification, Web Services Security: SOAP Message Security 1.1 (WS-
- 184 Security 2004), http://docs.oasis-open.org/wss/v1.1/wss-v1.1-spec-os-
- 185 SOAPMessageSecurity.pdf, 1 February 2006.

# 186 **2 Messaging**

187 The scope of this section is the following set of Web services specifications. All of the requirements in 188 these specifications are included by reference except where superseded by normative statements herein:

- 189 [SOAP 1.2, Part 1]
- 190 [SOAP 1.2, Part 2]
- 191 [SOAP-over-UDP]
- 192 [HTTP/1.1]
- 193 [WS-Addressing]
- 194 [RFC 4122]
- 195 [MTOM]

196 It is assumed that a DEVICE has obtained valid IPv4 and/or IPv6 addresses that do not conflict with other

addresses on the network. Mechanisms for obtaining IP addresses are out of the scope of this profile. For more information, see [DHCP] and [IPv6 Autoconfig].

### 199 **2.1 URI**

200	R0025: A SERVICE MAY fail to process any URI with more than MAX_URI_SIZE octets.
201	R0027: A SERVICE SHOULD NOT generate a URI with more than MAX_URI_SIZE octets.

202 The constant MAX\_URI\_SIZE is defined in Appendix B -- Constants.

### 203 **2.2 UDP**

204 205	R0029: A SERVICE SHOULD NOT send a SOAP ENVELOPE that has more octets than the MTU over UDP.
206	To improve reliability, a SERVICE should minimize the size of SOAP ENVELOPEs sent over UDP.
207	However, some SOAP ENVELOPEs are larger than an MTU; for example, a signed Hello SOAP
208	ENVELOPE. If a SOAP ENVELOPE is larger than an MTU, the underlying IP network stacks fragment
209	and reassemble the UDP packet.
210	R5018: A SERVICE MAY reject a SOAP ENVELOPE received over UDP that has more than
211	MAX_UDP_ENVELOPE_SIZE octets.
212	R5019: A CLIENT MAY reject a SOAP ENVELOPE received over UDP that has more than
213	MAX_UDP_ENVELOPE_SIZE octets.
214 215 216	Unlike TCP or HTTP messages, UDP datagrams are received in one chunk, which may lead to excessive resource requirements when receiving large datagrams on small embedded systems. The constant MAX_UDP_ENVELOPE_SIZE is defined in Appendix B Constants.

### 217 **2.3 HTTP**

218	R0001: A SERVICE MUST support transfer-coding = "chunked".
219	R0012: A SERVICE MUST at least support the SOAP HTTP Binding.
220	R5000: A CLIENT MUST at least support the SOAP HTTP Binding.
221 222	R0013: A SERVICE MUST at least implement the Responding SOAP Node of the SOAP Request- Response Message Exchange Pattern (http://www.w3.org/2003/05/soap/mep/request-response/).

223 224	R0014: A SERVICE MAY choose not to implement the Responding SOAP Node of the SOAP Response Message Exchange Pattern (http://www.w3.org/2003/05/soap/mep/soap-response/).
225	R0015: A SERVICE MAY choose not to support the SOAP Web Method Feature.
226	R0014 and R0015 relax requirements in [SOAP 1.2].
227 228 229 230	R0030: A SERVICE MUST at least implement the Responding SOAP Node of an HTTP one-way Message Exchange Pattern where the SOAP ENVELOPE is carried in the HTTP Request and the HTTP Response has a Status Code of 202 Accepted and an empty Entity Body (no SOAP ENVELOPE).
231 232	R0017: A SERVICE MUST at least support Request Message SOAP ENVELOPEs and one-way SOAP ENVELOPEs that are delivered using HTTP POST.
233	2.4 SOAP Envelope
234	R0034: A SERVICE MUST at least receive and send SOAP 1.2 [SOAP 1.2] SOAP ENVELOPEs.
235 236	R0003: A SERVICE MAY reject a TEXT SOAP ENVELOPE with more than MAX_ENVELOPE_SIZE octets.
237 238	R0026: A SERVICE SHOULD NOT send a TEXT SOAP ENVELOPE with more than MAX_ENVELOPE_SIZE octets.
239	Large SOAP ENVELOPEs are expected to be serialized using attachments.
240	R5001: A SERVICE MUST at least support SOAP ENVELOPEs with UTF-8 encoding.
241	R5002: A SERVICE MAY choose not to accept SOAP ENVELOPEs with UTF-16 encoding.
242	2.5 WS-Addressing
243	R5005: A SERVICE MUST at least support WS-Addressing 1.0 [WS-Addressing].
244	R5006: A SERVICE MAY reject messages using other versions of WS-Addressing.
245 246	Some underlying specifications (e.g., WS-Transfer [WS-Transfer]) explicitly allow other versions of WS- Addressing. DPWS applications should rely solely on WS-Addressing 1.0.
247 248	R0004: A DEVICE SHOULD use a urn:uuid scheme IRI as the [address] property of its Endpoint Reference.
249 250 251	R0005: A DEVICE MUST use a stable, globally unique identifier that is constant across re-initializations of the device, and constant across network interfaces and IPv4/v6 addresses as the [address] property of its Endpoint Reference.
252 253	R0006: A DEVICE MUST persist the [address] property of its Endpoint Reference across re-initialization and changes in the metadata of the DEVICE and any SERVICEs it hosts.
254 255	Because the [address] property of an Endpoint Reference [WS-Addressing] is a SOAP-layer address, there is no requirement to use anything other than a UUID for the [address] property.
256 257	R0042: A HOSTED SERVICE SHOULD use an HTTP transport address as the [address] property of its Endpoint References.
258	Use of other possible values of [address] by a HOSTED SERVICE is out of scope of this profile.
259 260 261	R0031: A SERVICE MUST NOT generate a wsa:InvalidAddressingHeader SOAP Fault [WS-Addressing SOAP Binding] if the [address] of the [reply endpoint] of an HTTP Request Message SOAP ENVELOPE is "http://www.w3.org/2005/08/addressing/anonymous".
262 263 264	R0041: If an HTTP Request Message SOAP ENVELOPE generates a SOAP Fault, a SERVICE MAY discard the SOAP Fault if the [address] of the [fault endpoint] of the HTTP Request Message is not "http://www.w3.org/2005/08/addressing/anonymous".

- R0031 and R0041 ensure that messages with non-anonymous address in both the [reply endpoint] and the [fault endpoint] do not result in a fault being sent.
- The SOAP HTTP Binding requires the Response Message SOAP ENVELOPE to be transmitted as the HTTP Response of the corresponding Request Message SOAP ENVELOPE.
- 269 R0019: A SERVICE MUST include a Message Information Header representing a [relationship] property
   270 of type wsa:Reply in each Response Message SOAP ENVELOPE the service generates.
- Per WS-Addressing [WS-Addressing], a response SOAP ENVELOPE must include a wsa:RelatesTo
  SOAP ENVELOPE header block. Since "http://www.w3.org/2005/08/addressing/reply" is the default value
  for the [relationship] property, the RelationshipType attribute should be omitted from the wsa:RelatesTo
  SOAP ENVELOPE header block.
- 275 R0040: A SERVICE MUST include a Message Information Header representing a [relationship] property
   276 of "http://www.w3.org/2005/08/addressing/reply"in each SOAP Fault SOAP ENVELOPE the
   277 service generates.

### 278 2.6 Attachments

279	R0022: If a SERVICE supports attachments, the SERVICE MUST support the HTTP Transmission
280	Optimization Feature.
281 282	The HTTP Transmission Optimization Feature implies support for the Optimized MIME Multipart Serialization and Abstract Transmission Optimization features.
283	R0036: A SERVICE MAY reject a MIME SOAP ENVELOPE if the Content-Transfer-Encoding header field
284	mechanism of any MIME part is not "binary".
285	R0037: A SERVICE MUST NOT send a MIME SOAP ENVELOPE unless the Content-Transfer-Encoding
286	header field mechanism of every MIME part is "binary".
287 288 289	Even for the SOAP Envelope, the "binary" Content-Transfer-Encoding mechanism is more appropriate than the "8bit" mechanism which is suitable only for data that may be represented as relatively short lines of at most 998 octets [MIME].
290 291 292 293	While DPWS-compliant services are required to support binary encoded MIME parts at a minimum, R0036 allows for them to support others (non-DPWS compliant clients) if they choose. While a service might choose to support more than what is required in DPWS, a DPWS-compliant client cannot assume that the service it is interacting with supports anything beyond binary MIME parts.
294	R0038: A SERVICE MAY reject a MIME SOAP ENVELOPE if the root part is not the first body part in the
295	Multipart/Related entity.
296	R0039: A SERVICE MUST NOT send a MIME SOAP ENVELOPE unless root part is the first body part in
297	the Multipart/Related entity.
298 299	Per MTOM, the root part of the MIME SOAP ENVELOPE contains an XML representation of the modified SOAP Envelope, with additional parts that contain binary representations of each attachment. This root

300 part must be the first part so a RECEIVER does not have to buffer attachments.

# 301 **3 Discovery**

The scope of this section is the following set of Web services specifications. All of the requirements in these specifications are included by reference except where superseded by normative statements herein:

304 • [WS-Discovery]

If a CLIENT and a SERVICE are not on the same subnet, the CLIENT may not be able to discover the
 SERVICE. However, if a CLIENT has an Endpoint Reference and transport address for a SERVICE
 through some other means, the CLIENT and SERVICE should be able to communicate within the scope
 of this profile.

309	R1013: A DEVICE MUST be a compliant WS-Discovery [WS-Discovery] Target Service.
310	R1001: A HOSTED SERVICE SHOULD NOT be a Target Service.
311 312 313	If each SERVICE were to participate in WS-Discovery, the network traffic generated by a relatively small number of DEVICEs hosting a relatively small number of HOSTED SERVICEs could overwhelm a bandwidth-limited network. Therefore, only DEVICEs act as Target Services.
314 315 316	R1019: A DEVICE MUST at least support the "http://docs.oasis-open.org/ws- dd/ns/discovery/2009/01/rfc3986" and "http://docs.oasis-open.org/ws- dd/ns/discovery/2009/01/strcmp0" Scope matching rules.
317 318	R1020: If a DEVICE includes Types in a Hello, Probe Match, or Resolve Match SOAP ENVELOPE, it MUST include the dpws:Device Type.
319 320 321	Including the dpws:Device Type indicates a DEVICE supports the Devices Profile, and indicates a CLIENT may retrieve metadata about the DEVICE and its relationship to any HOSTED SERVICEs using Get [WS-Transfer].
322 323	R1009: A DEVICE MUST at least support receiving Probe and Resolve SOAP ENVELOPEs and sending Hello and Bye SOAP ENVELOPEs over multicast UDP.
324 325	R1016: A DEVICE MUST at least support sending Probe Match and Resolve Match SOAP ENVELOPEs over unicast UDP.
326 327	R1018: A DEVICE MAY ignore a multicast UDP Probe or Resolve SOAP ENVELOPE if the [address] of the [reply endpoint] is not "http://www.w3.org/2005/08/addressing/anonymous".
328 329 330	WS-Discovery acknowledges that a CLIENT may include reply information in UDP Probe and Resolve SOAP ENVELOPEs to specify a transport other than SOAP over UDP. However, to establish a baseline for interoperability, DEVICEs are required only to support UDP responses.
331 332	R1015: A DEVICE MUST support receiving a Probe SOAP ENVELOPE as an HTTP Request at any HTTP transport address where the DEVICE endpoint is available.
333 334	R5021: A DEVICE MAY reject a unicast Probe SOAP ENVELOPE received as an HTTP Request if the [address] property of the [destination] is not "urn:docs-oasis-open:ws-dd:ns:discovery:2009:01".
335 336 337 338	To support the scenario where a DEVICE has a known HTTP transport address, a CLIENT may send an ad-hoc Probe over HTTP to that address and expect to receive a ProbeMatches response, using the same message pattern as defined by the ProbeOp operation of the DiscoveryProxy portType in [WS-Discovery]. This requirement does not imply that the DEVICE must perform as a Discovery Proxy.
339 340	How the client obtains the DEVICE HTTP address is not defined in this specification, and this HTTP address does not necessarily relate to HOSTED SERVICE addresses.
341	A DEVICE MAY also listen for Directed Probes at http:// <host address="">:3702/.</host>
342 343 344	R1021: If a DEVICE matches a Probe SOAP ENVELOPE received as an HTTP Request, it MUST send a Probe Matches SOAP ENVELOPE response containing a Probe Match section representing the DEVICE.

345 346	R1022: If a DEVICE does not match a Probe SOAP ENVELOPE received as an HTTP Request, it MUST send a Probe Matches SOAP ENVELOPE response with no Probe Match sections.
347	R5022: If a DEVICE includes a Probe Match section as an HTTP Response as described in R1021, it
348	MUST include all of its Types and Scopes in the Probe Match section.

349 DEVICEs MAY omit their Types and Scopes in their UDP WS-Discovery messages to reduce message

350 size and prevent fragmentation. However, they are obligated to return all Types and Scopes in their

351 HTTP ProbeMatches messages as increased risk of packet loss due to fragmentation is not a

352 consideration.

# 353 **4 Description**

The scope of this section is the following set of Web services specifications. All of the requirements in these specifications are included by reference except where superseded by normative statements herein:

- [XML Schema Part 1, Part 2]
- 357 [WSDL 1.1]
- 358 [BP 1.1, Section 4]
- [WSDL Binding for SOAP 1.2]
- 360 [WS-MetadataExchange]
- 361 [WS-Policy]
- 362 [WS-PolicyAttachment]
- 363 [WS-Transfer]

A DEVICE acts primarily as a metadata resource for device-wide data, and for the HOSTED SERVICES on the device. A CLIENT retrieves the XML representation of these characteristics by sending a WS-Transfer Get SOAP ENVELOPE to the DEVICE. The resulting metadata contains characteristics of the device and topology information relating the DEVICE to its HOSTED SERVICEs. WS-Transfer Get is used here because the device-wide metadata is the XML representation of the DEVICE.

369 CLIENTs may also retrieve metadata for individual HOSTED SERVICEs by sending a WS-

370 MetadataExchange GetMetadata SOAP ENVELOPE to the HOSTED SERVICE. The resulting metadata 371 contains limited topology information about the HOSTED SERVICE, its hosting DEVICE, its WSDL, and

any additional sections specific to the type of service. GetMetadata is used here because the XML

373 representation of the HOSTED SERVICE (possibly accessible with WS-Transfer Get) is not defined.

Through WSDL, this description also conveys the MESSAGEs a HOSTED SERVICE is capable of receiving and sending. Through WS-Policy, description conveys the capabilities and requirements of a HOSTED SERVICE, particularly the transports over which it may be reached and its security capabilities.

- 377 R5007: A DEVICE MUST support receiving a WS-Transfer Get SOAP ENVELOPE using the HTTP
   378 binding defined in this profile.
- 379
   379 R2044: In a Get Response SOAP ENVELOPE, a DEVICE MUST include only a wsx:Metadata element in 380 the SOAP ENVELOPE Body.
- 381 All metadata from the device should be contained in the wsx:Metadata element in the Get Response.
- R2045: A DEVICE MAY generate a wsa:ActionNotSupported SOAP Fault in response to a Put, Delete, or
   Create SOAP ENVELOPE.
- A DEVICE is not required to support all of the operations defined in [WS-Transfer].

R5008: A HOSTED SERVICE MUST support receiving a WS-MetadataExchange GetMetadata SOAP
 ENVELOPE using the HTTP binding defined in this profile.

# 387 **4.1 Characteristics**

To express DEVICE characteristics that are typically fixed across all DEVICEs of the same model by their manufacturer, this profile defines extensible ThisModel metadata as follows:

390 <dpws:ThisModel ...> 391 <dpws:Manufacturer xml:lang="..."? >xs:string</dpws:Manufacturer>+ 392 <dpws:ManufacturerUrl>xs:anyURI</dpws:ManufacturerUrl>? 393 <dpws:ModelName xml:lang="..."? >xs:string</dpws:ModelName>+ 394 <dpws:ModelNumber>xs:string</dpws:ModelNumber>? 395 <dpws:ModelUrl>xs:anyURI</dpws:ModelUrl>? 396 <dpws:PresentationUrl>xs:anyURI</dpws:PresentationUrl>?

397	
398 399	 The following describes additional informative constraints on the outline above:
400	dpws:ThisModel/ dpws:Manufacturer
401 402	Name of the manufacturer of the DEVICE. It MUST have fewer than MAX_FIELD_SIZE Unicode characters, SHOULD be localized, and SHOULD be repeated for each supported locale.
403	dpws:ThisModel/ dpws:ManufacturerUrl
404 405	URL to a Web site for the manufacturer of the DEVICE. It MUST have fewer than MAX_URI_SIZE octets.
406	dpws:ThisModel/ dpws:ModelName
407 408 409	User-friendly name for this model of device chosen by the manufacturer. It MUST have fewer than MAX_FIELD_SIZE Unicode characters, SHOULD be localized, and SHOULD be repeated for each supported locale.
410	dpws:ThisModel/ dpws:ModelNumber
411 412	Model number for this model of DEVICE. It MUST have fewer than MAX_FIELD_SIZE Unicode characters.
413	dpws:ThisModel/ dpws:ModelUrl
414	URL to a Web site for this model of DEVICE. It MUST have fewer than MAX_URI_SIZE octets.
415	dpws:ThisModel/ dpws:PresentationUrl
416 417 418 419 420	URL to a presentation resource for this DEVICE. It MAY be relative to the HTTP transport address over which metadata was retrieved, and MUST have fewer than MAX_URI_SIZE octets. If PresentationUrl is specified, the DEVICE MAY provide the resource in multiple formats, but MUST at least provide an HTML page. CLIENTs and DEVICEs MAY use HTTP content negotiation [HTTP/1.1] to determine the format and content of the presentation resource.
421 422	DEVICEs that use a relative URL MAY use HTTP Redirection 3xx codes [HTTP/1.1] to direct CLIENTs to a dedicated web server running on another port.
423	CORRECT:
424 425 426 427 428 429	<pre><dpws:thismodel xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01">     <dpws:manufacturer>ACME Manufacturing</dpws:manufacturer>     <dpws:modelname xml:lang="en-GB">ColourBeam 9</dpws:modelname>     <dpws:modelname xml:lang="en-US">ColorBeam 9</dpws:modelname> </dpws:thismodel></pre>
430 431	A Dialect [WS-MetadataExchange] equal to "http://docs.oasis-open.org/ws- dd/ns/dpws/2009/01/ThisModel" indicates an instance of the ThisModel metadata format.
432	No Identifier [WS-MetadataExchange] is defined for instances of the ThisModel metadata format.
433 434	R2038: A DEVICE MUST have one Metadata Section with Dialect equal to "http://docs.oasis- open.org/ws-dd/ns/dpws/2009/01/ThisModel" for its ThisModel metadata.
435 436	R2012: In any Get Response SOAP ENVELOPE, a DEVICE MUST include the Metadata Section with Dialect equal to "http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/ThisModel".
437 438 439	Get [WS-Transfer] is the interoperable means for a CLIENT to retrieve the resource representation data for a DEVICE – which includes the ThisModel metadata for a DEVICE. A DEVICE MAY also provide other means for a CLIENT to retrieve its ThisModel metadata.
440 441 442	R2001: If a DEVICE changes any of its ThisModel metadata, it MUST increment the Metadata Version exposed in Hello, Probe Match, and Resolve Match SOAP ENVELOPEs as wsd:MetadataVersion.
443	Caching for the ThisModel metadata is controlled by the wsd:MetadataVersion construct [WS-Discovery].

447 <dpws:FriendlyName xml:lang="..."? >xs:string</dpws:FriendlyName>+ 448 <dpws:FirmwareVersion>xs:string</dpws:FirmwareVersion>? 449 <dpws:SerialNumber>xs:string</dpws:SerialNumber>? 450 . . . 451 </dpws:ThisDevice> 452 The following describes additional, normative constraints on the outline above: dpws:ThisDevice/dpws:FriendlyName 453 454 User-friendly name for this DEVICE. It MUST have fewer than MAX\_FIELD\_SIZE Unicode 455 characters, SHOULD be localized, and SHOULD be repeated for each supported locale. dpws:ThisDevice/dpws:FirmwareVersion 456 Firmware version for this DEVICE. It MUST have fewer than MAX FIELD SIZE Unicode 457 458 characters. 459 dpws:ThisDevice/dpws:SerialNumber 460 Manufacturer-assigned serial number for this DEVICE. It MUST have fewer than 461 MAX FIELD SIZE Unicode characters. 462 CORRECT: 463 <dpws:ThisDevice 464 xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" > 465 <dpws:FriendlyName xml:lang="en-GB" > ACME ColourBeam Printer 466 467 </dpws:FriendlyName> 468 <dpws:FriendlyName xml:lang="en-US" > 469 ACME ColorBeam Printer 470 </dpws:FriendlyName> 471 </dpws:ThisDevice> 472 A Dialect [WS-MetadataExchange] equal to "http://docs.oasis-open.org/wsdd/ns/dpws/2009/01/ThisDevice" indicates an instance of the ThisDevice metadata format. 473 474 No Identifier [WS-MetadataExchange] is defined for instances of the ThisDevice metadata format. R2039: A DEVICE MUST have a Metadata Section with Dialect equal to "http://docs.oasis-open.org/ws-475 476 dd/ns/dpws/2009/01/ThisDevice" for its ThisDevice metadata. R2014: In any Get Response SOAP ENVELOPE, a DEVICE MUST include the Metadata Section with 477 478 Dialect equal to "http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/ThisDevice". 479 CORRECT: 480 <soap:Envelope 481 xmlns:soap="http://www.w3.org/2003/05/soap-envelope" 482 xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" 483 xmlns:wsx="http://schemas.xmlsoap.org/ws/2004/09/mex" 484 xmlns:wsa="http://www.w3.org/2005/08/addressing" > 485 <soap:Header> 486 <wsa:Action> 487 http://schemas.xmlsoap.org/ws/2004/09/transfer/GetResponse 488 </wsa:Action> 489 <wsa:RelatesTo> 490 urn:uuid:82204a83-52f6-475c-9708-174fa27659ec 491 </wsa:RelatesTo> 492 <wsa:To> 493 http://www.w3.org/2005/08/addressing/anonymous 494 </wsa:To> wsdd-dpws-1.1-spec-os 1 July 2009

To express DEVICE characteristics that typically vary from one DEVICE to another of the same kind, this

profile defines extensible ThisDevice metadata as follows:

<dpws:ThisDevice ...>

444

495	
496	<soap:body></soap:body>
497	<wsx:metadata></wsx:metadata>
498	<wsx:metadatasection< th=""></wsx:metadatasection<>
499	Dialect="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/ThisModel"
500	>
501	<dpws:thismodel></dpws:thismodel>
502	<pre><dpws:manufacturer>ACME Manufacturing</dpws:manufacturer></pre>
503	<dpws:modelname xml:lang="en-GB"></dpws:modelname>
504	ColourBeam 9
505	
506	<dpws:modelname xml:lang="en-US"></dpws:modelname>
507	ColorBeam 9
508	
509	
510	
511	<wsx:metadatasection< th=""></wsx:metadatasection<>
512	<pre>Dialect="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/ThisDevice"</pre>
513	>
514	<dpws:thisdevice></dpws:thisdevice>
515	<dpws:friendlyname xml:lang="en-GB"></dpws:friendlyname>
516	ACME ColourBeam Printer
517	
518	<dpws:friendlyname xml:lang="en-US"></dpws:friendlyname>
519	ACME ColorBeam Printer
520	
521	
522	
523	
524	Other Metadata Sections omitted for brevity
525	
526	
527	
528	
529	Get [WS-Transfer] is the interoperable means for a CLIENT to retrieve the resource representation data
530	for a DEVICE – which includes the ThisDevice metadata for a DEVICE. A DEVICE MAY also provide
531	other means for a CLIENT to retrieve its ThisDevice metadata.
532	P2002: If a DEVICE changes any of its This Device metadata, it MUST increment the Metadata Version
532	avposed in Hello, Brobe Match, and Resolve Match SOAD ENIVELODEs as
555	exposed in helio, flobe ivialon, and resolve ivialon soar envelores as

534 wsd:MetadataVersion.

535 Caching for the ThisDevice metadata is controlled by the wsd:MetadataVersion construct [WS-Discovery].

# 536 **4.2 Hosting**

537 To express the relationship between a HOSTED SERVICE and its hosting DEVICE, this profile defines 538 relationship metadata as follows:

```
539
      <dpws:Relationship Type="xs:anyURI" ... >
540
       (<dpws:Host>
541
          <wsa:EndpointReference>endpoint-reference</wsa:EndpointReference>
542
          <dpws:Types>list of xs:QName</dpws:Types>?
543
          . . .
544
        </dpws:Host>)?
545
       (<dpws:Hosted>
546
          <wsa:EndpointReference>endpoint-reference</wsa:EndpointReference>+
547
          <dpws:Types>list of xs:QName</dpws:Types>
548
          <dpws:ServiceId>xs:anyURI</dpws:ServiceId>
```

549 550 551	)*
552	
553	The following describes additional, normative constraints on the outline above:
554	dpws:Relationship
555	This is a general mechanism for defining a relationship between two or more SERVICEs.
556	dpws:Relationship/@Type
557 558 559 560	The type of the relationship. The nature of the relationship and the content of the dpws:Relationship element are determined by this value. This value should be compared directly, as a case-sensitive string, with no attempt to make a relative URI into an absolute URI, to unescape, or to otherwise canonicalize it.
561	dpws:Relationship/@Type = "http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/host"
562 563	This is a specific, hosting relationship type to indicate the relationship between a HOSTED SERVICE and its hosting DEVICE. This relationship type defines the following additional content:
564	dpws:Relationship/dpws:Host
565 566	This is a section describing a hosting DEVICE. At least one of ./dpws:Host or ./dpws:Hosted MUST be included.
567	dpws:Relationship/dpws:Host/wsa:EndpointReference
568 569 570 571	Endpoint Reference for the host, which includes the stable identifier for the host which MUST be persisted across re-initialization (see also R0005 and R0006). If ./dpws:Host is omitted, implied value is the Endpoint Reference of the DEVICE that returned this metadata in a Get Response SOAP ENVELOPE.
572	dpws:Relationship/dpws:Host/dpws:Types
573 574	Unordered set of Types implemented by the host. (See [WS-Discovery].) If omitted or ./dpws:Host is omitted, no implied value.
575	dpws:Relationship/dpws:Hosted
576 577 578 579 580	This is a section describing a HOSTED SERVICE It MUST be included by a DEVICE for each of its HOSTED SERVICEs. It MUST be included by a HOSTED SERVICE for itself. For the hosting relationship type, if a host has more than one HOSTED SERVICE, including one relationship that lists all HOSTED SERVICEs is equivalent to including multiple relationships that each list some subset of the HOSTED SERVICEs.
581	dpws:Relationship/dpws:Hosted/wsa:EndpointReference
582	Endpoint References for a HOSTED SERVICE.
583	dpws:Relationship/dpws:Hosted/dpws:Types
584 585	Unordered set of Types implemented by a HOSTED SERVICE. All implemented Types SHOULD be included.
586	dpws:Relationship/dpws:Hosted/dpws:ServiceId
587 588 589 590	Identifier for a HOSTED SERVICE which MUST be persisted across re-initialization and MUST NOT be shared across multiple Hosted elements. ServiceId MUST be unique within a DEVICE. This value should be compared directly, as a case-sensitive string, with no attempt to make a relative URI into an absolute URI, to unescape, or to otherwise canonicalize it.
591	CORRECT:
592 593 594 595 596 597	<dpws:relationship Type="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/host" xmlns:img="http://printer.example.org/imaging" xmlns:wsa="http://www.w3.org/2005/08/addressing" xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" &gt; <dpws:hosted></dpws:hosted></dpws:relationship 

598	<pre><wsa:endpointreference></wsa:endpointreference></pre>
599	<wsa:address>http://172.30.184.244/print</wsa:address>
600	
601	<dpws:types></dpws:types>
602	img:PrintBasicPortType img:PrintAdvancedPortType
603	
604	<dpws:serviceid></dpws:serviceid>
605	http://printer.example.org/imaging/PrintService
606	
607	
608	
609	A Dialect [WS-MetadataExchange] equal to "http://docs.oasis-open.org/ws-
610	dd/ns/dpws/2009/01/Relationship" indicates an instance of the Relationship metadata format.
611	No Identifier [WS-MetadataExchange] is defined for instances of the Relationship metadata format.
612	R2040: If a DEVICE has any HOSTED SERVICEs, it MUST have at least one Metadata Section with
613	Dialect equal to "http://docs.pasis-open.org/ws-dd/ns/dpws/2009/01/Relationshin" for its
614	Relationshin metadata
014	
615	R2029: In any Get Response SOAP ENVELOPE, a DEVICE MUST include any Metadata Section(s) with
616	Dialect equal to "http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/Relationship".
617	Get [WS-Transfer] is the interoperable means for a CLIENT to retrieve the resource representation data
618	for a DEVICE – which includes the relationship metadata for itself and HOSTED SERVICEs
T	
619	R5020: A HOSTED SERVICE MUST have one Metadata Section with http://docs.oasis-open.org/ws-
620	dd/ns/dpws/2009/01/Relationship".
621	GetMetadata [WS-MetadataExchange] is the interoperable means for a CLIENT to retrieve metadata for
622	a HOSTED SERVICE – which includes the relationship metadata for itself and its hosting DEVICE.
-	······································
600	A DEVICE or HOSTED SERVICE MAX provide other means for a CLIENT to retrieve its relationship
623 624	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship
623 624	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata.
623 624 625	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT:
623 624 625 626	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <soap:envelope< th=""></soap:envelope<>
623 624 625 626 627	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <soap:envelope </soap:envelope 
623 624 625 626 627 628	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <soap:envelope </soap:envelope 
623 624 625 626 627 628 629	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <soap:envelope xmlns:gen="http://example.org/general" xmlns:img="http://printer.example.org/imaging" xmlns:soap="http://www.w3.org/2003/05/soap-envelope"</soap:envelope 
623 624 625 626 627 628 629 630	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <soap:envelope xmlns:gen="http://example.org/general" xmlns:img="http://printer.example.org/imaging" xmlns:soap="http://www.w3.org/2003/05/soap-envelope" xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01"</soap:envelope 
623 624 625 626 627 628 629 630 631	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <soap:envelope xmlns:gen="http://example.org/general" xmlns:img="http://printer.example.org/imaging" xmlns:soap="http://printer.example.org/imaging" xmlns:soap="http://www.w3.org/2003/05/soap-envelope" xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" xmlns:wsx="http://schemas.xmlsoap.org/ws/2004/09/mex"</soap:envelope 
623 624 625 626 627 628 629 630 631 632	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <soap:envelope xmlns:gen="http://example.org/general" xmlns:img="http://printer.example.org/imaging" xmlns:soap="http://printer.example.org/imaging" xmlns:soap="http://www.w3.org/2003/05/soap-envelope" xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" xmlns:wsx="http://schemas.xmlsoap.org/ws/2004/09/mex" xmlns:wsa="http://www.w3.org/2005/08/addressing" &gt;</soap:envelope 
623 624 625 626 627 628 629 630 631 632 633	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <soap:envelope xmlns:gen="http://example.org/general" xmlns:img="http://printer.example.org/imaging" xmlns:soap="http://www.w3.org/2003/05/soap-envelope" xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" xmlns:wsx="http://schemas.xmlsoap.org/ws/2004/09/mex" xmlns:wsa="http://www.w3.org/2005/08/addressing" &gt; <soap:header></soap:header></soap:envelope 
623 624 625 626 627 628 629 630 631 632 633 634	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <pre> </pre> <pre> </pre>
623 624 625 626 627 628 629 630 631 632 633 634 635	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <pre>     soap:Envelope     xmlns:gen="http://example.org/general"     xmlns:img="http://printer.example.org/imaging"     xmlns:soap="http://www.w3.org/2003/05/soap-envelope"     xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01"     xmlns:wsx="http://schemas.xmlsoap.org/ws/2004/09/mex"     xmlns:wsa="http://www.w3.org/2005/08/addressing" &gt;     <soap:header>         <wsa:action>         http://schemas.xmlsoap.org/ws/2004/09/transfer/GetResponse</wsa:action></soap:header></pre>
623 624 625 626 627 628 629 630 631 632 633 634 635 636	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <soap:envelope xmlns:gen="http://example.org/general" xmlns:img="http://printer.example.org/imaging" xmlns:soap="http://www.w3.org/2003/05/soap-envelope" xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" xmlns:wsx="http://schemas.xmlsoap.org/ws/2004/09/mex" xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/09/mex" <soap:header> <wsa:action> http://schemas.xmlsoap.org/ws/2004/09/transfer/GetResponse </wsa:action></soap:header></soap:envelope 
623 624 625 626 627 628 629 630 631 632 633 634 635 636 637	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <soap:envelope xmlns:gen="http://example.org/general" xmlns:img="http://printer.example.org/imaging" xmlns:soap="http://printer.example.org/imaging" xmlns:soap="http://printer.example.org/ws-dd/ns/dpws/2009/01" xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" xmlns:wsx="http://schemas.xmlsoap.org/ws/2004/09/mex" xmlns:wsa="http://www.w3.org/2005/08/addressing" &gt; <soap:header> <wsa:action> http://schemas.xmlsoap.org/ws/2004/09/transfer/GetResponse </wsa:action></soap:header></soap:envelope 
623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <pre>     scap:Envelope     xmlns:gen="http://example.org/general"     xmlns:img="http://printer.example.org/imaging"     xmlns:soap="http://www.w3.org/2003/05/soap-envelope"     xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01"     xmlns:wsx="http://schemas.xmlsoap.org/ws/2004/09/mex"     xmlns:wsa="http://www.w3.org/2005/08/addressing" &gt;     <soap:header>     <wsa:action>         http://schemas.xmlsoap.org/ws/2004/09/transfer/GetResponse          urn:uuid:82204a83-52f6-475c-9708-174fa27659ec</wsa:action></soap:header></pre>
623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <soap:envelope xmlns:gen="http://example.org/general" xmlns:img="http://printer.example.org/imaging" xmlns:soap="http://www.w3.org/2003/05/soap-envelope" xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" xmlns:wsx="http://docs.oasis-open.org/ws/2004/09/mex" xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/09/mex" xmlns:wsa="http://www.w3.org/2005/08/addressing" &gt; <soap:header> <wsa:action> http://schemas.xmlsoap.org/ws/2004/09/transfer/GetResponse  urn:uuid:82204a83-52f6-475c-9708-174fa27659ec </wsa:action></soap:header></soap:envelope 
623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <soap:envelope xmlns:gen="http://example.org/general" xmlns:img="http://printer.example.org/imaging" xmlns:soap="http://printer.example.org/imaging" xmlns:soap="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" xmlns:wsx="http://schemas.xmlsoap.org/ws/2004/09/mex" xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/09/mex" xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/09/transfer/GetResponse  http://schemas.xmlsoap.org/ws/2004/09/transfer/GetResponse  urn:uuid:82204a83-52f6-475c-9708-174fa27659ec </soap:envelope 
623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <soap:envelope xmlns:gen="http://example.org/general" xmlns:img="http://printer.example.org/imaging" xmlns:soap="http://www.w3.org/2003/05/soap-envelope" xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" xmlns:wsx="http://schemas.xmlsoap.org/ws/2004/09/mex" xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/09/mex" xmlns:wsa="http://www.w3.org/2005/08/addressing" &gt; <soap:header> <wsa:action> http://schemas.xmlsoap.org/ws/2004/09/transfer/GetResponse  urn:uuid:82204a83-52f6-475c-9708-174fa27659ec  kts:To&gt; http://www.w3.org/2005/08/addressing/anonymous</wsa:action></soap:header></soap:envelope 
623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <soap:envelope xmlns:gen="http://example.org/general" xmlns:img="http://printer.example.org/imaging" xmlns:soap="http://www.w3.org/2003/05/soap-envelope" xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" xmlns:wsx="http://schemas.xmlsoap.org/ws/2004/09/mex" xmlns:wsa="http://www.w3.org/2005/08/addressing" &gt; <soap:header> <wsa:action> http://schemas.xmlsoap.org/ws/2004/09/transfer/GetResponse </wsa:action> (wsa:RelatesTo&gt; urn:uuid:82204a83-52f6-475c-9708-174fa27659ec  http://www.w3.org/2005/08/addressing/anonymous </soap:header></soap:envelope 
623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <soap:envelope <mmlns:img="http: example.org="" general"<br="">mmlns:img="http://printer.example.org/imaging" mmlns:soap="http://www.w3.org/2003/05/soap-envelope" mmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" mmlns:wsa="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" mmlns:wsa="http://schemas.xmlsoap.org/ws/2004/09/mex" mmlns:wsa="http://www.w3.org/2005/08/addressing" &gt; <soap:header> <soap:header> <wsa:action> http://schemas.xmlsoap.org/ws/2004/09/transfer/GetResponse  urn:uuid:82204a83-52f6-475c-9708-174fa27659ec  http://www.w3.org/2005/08/addressing/anonymous  </wsa:action></soap:header></soap:header></mmlns:img="http:></soap:envelope 
623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <soap:envelope <mlns:gen="http: example.org="" general"<br="">mulns:soap="http://printer.example.org/imaging" mulns:soap="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" mulns:wsx="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" mulns:wsx="http://schemas.mlsoap.org/ws/2004/09/mex" mulns:wsa="http://www.w3.org/2005/08/addressing" &gt; <soap:header> <wsa:action> http://schemas.mlsoap.org/ws/2004/09/transfer/GetResponse  urn:uuid:82204a83-52f6-475c-9708-174fa27659ec  http://www.w3.org/2005/08/addressing/anonymous  </wsa:action></soap:header> <soap:body></soap:body></mlns:gen="http:></soap:envelope 
623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <pre> </pre> <pre> </pre>
623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <pre> </pre> <pre> <pre> <pre> <pre> <pre> <pre> <pre> <pre> <pre> </pre> </pre> </pre> </pre> </pre> </pre> </pre> <pre> </pre> </pre> </pre> <pre> </pre> </pre> </pre> </pre> </pre> <pre> </pre> </pre> </pre> </pre> </pre> </pre> </pre> </pre> </pre> <pre> <p< th=""></p<></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre>
623 624 625 626 627 628 629 630 631 632 633 634 635 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <soap:envelope xmlns:gen="http://example.org/general" xmlns:img="http://printer.example.org/imaging" xmlns:soap="http://www.w3.org/2003/05/soap-envelope" xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" xmlns:wsx="http://schemas.xmlsoap.org/ws/2004/09/mex" xmlns:wsa="http://www.w3.org/2005/08/addressing" &gt; <soap:header> <twsa:action> http://schemas.xmlsoap.org/ws/2004/09/transfer/GetResponse  urn:uuid:82204a83-52f6-475c-9708-174fa27659ec  wtsa:RelatesTo&gt; http://www.w3.org/2005/08/addressing/anonymous  <tsoap:header> <soap:bedy> <wsx:metadata> <wsx:metadata> <wsx:metadatasection Dialect</wsx:metadatasection </wsx:metadata></wsx:metadata></soap:bedy></tsoap:header></twsa:action></soap:header></soap:envelope 
623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <pre>  <soap:header> <soap:header>  uurn:uuid:82204a83-52f6-475c-9708-174fa27659ec  <ty>  <wsa:to> http://www.w3.org/2005/08/addressing/anonymous   </wsa:to> http://www.w3.org/2005/08/addressing/anonymous    http://www.w3.org/2005/08/addressing/anonymous     </ty></soap:header></soap:header></pre>
623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649	A DEVICE or HOSTED SERVICE MAY provide other means for a CLIENT to retrieve its relationship metadata. CORRECT: <pre>  <pre>     urn:uuid:82204a83-52f6-475c-9708-174fa27659ec   </pre></pre>

651	Type="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/host" >
652	<dpws:hosted></dpws:hosted>
653	<wsa:endpointreference></wsa:endpointreference>
654	<pre><wsa:address>http://172.30.184.244/print</wsa:address></pre>
655	
656	<wsa:endpointreference></wsa:endpointreference>
657	<pre><wsa:address>http://[fdaa:23]/print1</wsa:address></pre>
658	
659	<dpws:types></dpws:types>
660	<pre>img:PrintBasicPortType img:PrintAdvancedPortType</pre>
661	
662	<dpws:serviceid></dpws:serviceid>
663	http://printer.example.org/imaging/PrintService
664	
665	
666	<dpws:hosted></dpws:hosted>
667	<wsa:endpointreference></wsa:endpointreference>
668	<pre><wsa:address>http://172.30.184.244/scan</wsa:address></pre>
669	
670	<wsa:endpointreference></wsa:endpointreference>
671	<pre><wsa:address>http://[fdaa:24]/scan</wsa:address></pre>
672	
673	<dpws:types>img:ScanBasicPortType</dpws:types>
674	<dpws:serviceid></dpws:serviceid>
675	http://printer.example.org/imaging/ScanService
676	
677	
678	
679	
680	
681	Other Metadata Sections omitted for brevity
00Z	( loss Material Astron
600	
695	
005	
686	R2030: If a DEVICE changes any of its relationship metadata, it MUST increment the Metadata Version
687	exposed in Hello, Probe Match, and Resolve Match SOAP ENVELOPEs as
688	wsd:MetadataVersion.
689	Caching for relationship metadata is controlled by the wsd:MetadataVersion construct [WS-Discovery].
690	R2042: A DEVICE MUST NOT change its relationship metadata based on temporary changes in the
691	network availability of the SERVICEs described by the metadata.
692	Relationship metadata is intended to model fairly static relationships and should not change if a SERVICE
693	becomes temporarily unavailable. As in the general case, any CLIENT attempting to contact such a
694	SERVICE will need to deal with an Endpoint Unavailable Fault [WS-Addressing] connection refusal or
695	other network indication that the SERVICE is unavailable
696	4.3 WSDL
co7 [	P2004 Ke UOSTED SEDVICE autocos Natilizations, its nextTime MUST include Natilizations at the
097 609	K2004. II a TOSTED SERVICE exposes Inotifications, its port Type MOST include Inotification and/or Solicit Personance Operations describing these Netifications
090	Solidit-Response Operations describing those Notifications.
699	R2004 relaxes R2303 in [BP 1.1, Section 4].

 R2019: A HOSTED SERVICE MUST at least include a document-literal Binding for SOAP 1.2 over HTTP for each portType in its WSDL. Because the document-literal SOAP Binding is more general than an rpc-literal SOAP Binding, there is no requirement to use anything other than the document-literal Binding.
 *R2028: A HOSTED SERVICE is not required to include any WSDL bindings for SOAP 1.1 in its WSDL.*

Since this profile brings SOAP 1.2 into scope, it is sufficient to bind to that version of SOAP. There is no requirement to bind to other SOAP versions and thus R2028 updates R2401 in [BP 1.1, Section 4] to SOAP 1.2.

Addressing information for a HOSTED SERVICE is included in relationship metadata. For the mandatory SOAP 1.2 binding (R2019), there is no requirement to re-express this information in a WSDL Service and Port, since the endpoint reference used in the relationship metadata refers to this binding by default. The use of WSDL Services and Ports may still be necessary for other bindings not covered by this profile.

 R2023: If a HOSTED SERVICE receives a MESSAGE that is inconsistent with its WSDL description, the HOSTED SERVICE SHOULD generate a SOAP Fault with a Code Value of "Sender", unless a

"MustUnderstand" or "VersionMismatch" Fault is generated.

- R2024: If a HOSTED SERVICE receives a MESSAGE that is inconsistent with its WSDL description, the HOSTED SERVICE MUST check for "VersionMismatch", "MustUnderstand", and "Sender" fault conditions in that order.
- 718 Statements R2023 and R2024 update R2724 and R2725 [BP 1.1, Section 4] to SOAP 1.2.
- R2031: A HOSTED SERVICE MUST have at least one Metadata Section with Dialect="http://schemas.xmlsoap.org/wsdl/".
- For clarity, separation of levels of abstraction, and/or reuse of standardized components, WSDL may be authored in a style that separates different elements of a Service Definition into separate documents which may be imported or included as needed. Each separate document may be available at the URL in the xs:include/@schemaLocation, xs:import/@schemaLocation, or wsdl:import/@location or may be
- included in a separate XML Schema or WSDL Metadata Section.
- GetMetadata [WS-MetadataExchange] is the interoperable means for a CLIENT to retrieve metadata for
   a HOSTED SERVICE which includes the WSDL for a HOSTED SERVICE. A HOSTED SERVICE MAY
   provide other means for a CLIENT to retrieve its WSDL.

There is no requirement for a HOSTED SERVICE to store its WSDL and include it in-line in a Get Response SOAP ENVELOPE. The WSDL may be stored at a different location, and the HOSTED

731 SERVICE may include a reference to it in a Get Response SOAP ENVELOPE.

### 732 CORRECT:

714

733 <soap:Envelope 734 xmlns:soap="http://www.w3.org/2003/05/soap-envelope" 735 xmlns:wsx="http://schemas.xmlsoap.org/ws/2004/09/mex" 736 xmlns:wsa="http://www.w3.org/2005/08/addressing" > 737 <soap:Header> 738 <wsa:Action> 739 http://schemas.xmlsoap.org/ws/2004/09/mex/GetMetadata/Response 740 </wsa:Action> 741 <wsa:RelatesTo> 742 urn:uuid:82204a83-52f6-475c-9708-174fa27659ec 743 </wsa:RelatesTo> 744 <wsa:To> 745 http://www.w3.org/2005/08/addressing/anonymous 746 </wsa:To> 747 </soap:Header> 748 <soap:Body> 749 <wsx:Metadata> 750 <wsx:MetadataSection 751 Dialect="http://schemas.xmlsoap.org/wsdl" > 752 <wsx:MetadataReference> 753 <wsa:Address>http://172.30.184.244/print</wsa:Address>

754	<wsa:referenceparameters></wsa:referenceparameters>
755	<pre><x:acme xmlns:x="urn:acme.com:webservices"></x:acme></pre>
756	WSDL
757	
758	
759	
760	
762	<pre><!-- Other Metadata Sections omitted for brewity--></pre>
763	C. Other Metadata Sections on iteration brevity. /
764	
765	
766	
767	4.4 WS-Policy
768 769	To indicate that a SERVICE is compliant with this profile, this profile defines the following WS-Policy [WS-Policy] assertion:
770	<dpws:profile ?="" wsp:optional="true"></dpws:profile>
771	The following describes additional, normative constraints on the outline above:
772	dpws:Profile
773 774 775 776 777	Assertion indicating compliance with this profile is required. This assertion has Endpoint Policy Subject [WS-PolicyAttachment]: a policy expression containing this assertion MAY be attached to a wsdl:port, SHOULD be attached to a wsdl:binding, but MUST NOT be attached to a wsdl:portType; the latter is prohibited because the assertion specifies a concrete behavior whereas the wsdl:portType is an abstract construct.
778	dpws:Profile/@wsp:Optional="true"
779 780 781	Per WS-Policy [WS-Policy], this is compact notation for two policy alternatives, one with and one without the assertion. The intuition is that the behavior indicated by the assertion is optional, or in this case, that the SERVICE supports but does not require compliance with this profile.
782	CORRECT:
783 784 785 786 787	<wsp:policy< td=""></wsp:policy<>
788	R2037: A SERVICE MUST include the dpws:Profile assertion in its policy.
789 790 791 792	This assertion has Endpoint Policy Subject: a policy expression containing this assertion MAY be attached to a wsdl:port, SHOULD be attached to a wsdl:binding, but MUST NOT be attached to a wsdl:portType; the latter is prohibited because this assertion specifies concrete behavior whereas the wsdl:portType is an abstract construct.
793 794 795	R2041: If a SERVICE uses wsp:PolicyReference/@URI to attach a policy identified by an absolute IRI, the SERVICE MUST have a Metadata Section with Dialect equal to "http://www.w3.org/ns/ws- policy" and Identifier equal to that IRI.
796 797 798	R2025: If a SERVICE uses wsp:PolicyReference/@URI to attach a policy identified by an absolute IRI, then in a Get Response SOAP ENVELOPE, the SERVICE MUST include the Metadata Section with Dialect equal to "http://www.w3.org/ns/ws-policy" and Identifier equal to that IRI.
799 800 801	R2035: If a SERVICE uses wsp:PolicyReference/@URI to attach a policy identified by a relative IRI, the SERVICE MUST embed that policy as a child of wsdl:definitions, and the policy MUST have a @wsu:Id containing that IRI.
802	R2036: A SERVICE MUST NOT use @wsp:PolicyURIs to attach policy.

- Because all components in WSDL are extensible via elements [BP 1.1, Section 4], attachment using
   wsp:PolicyReference/@URI is sufficient.
- 805 Get [WS-Transfer] is the interoperable means for a CLIENT to retrieve attached policy.

806 CORRECT:

807	<soap:envelope< th=""></soap:envelope<>
808	<pre>xmlns:soap="http://www.w3.org/2003/05/soap-envelope"</pre>
809	<pre>xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"</pre>
810	<pre>xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01"</pre>
811	<pre>xmlns:wsp="http://www.w3.org/ns/ws-policy"</pre>
812	<pre>xmlns:wsx="http://schemas.xmlsoap.org/ws/2004/09/mex"</pre>
813	<pre>xmlns:wsa="http://www.w3.org/2005/08/addressing" &gt;</pre>
814	<soap:header></soap:header>
815	<wsa:action></wsa:action>
816	http://schemas.xmlsoap.org/ws/2004/09/transfer/GetResponse
817	
818	<wsa:relatesto></wsa:relatesto>
819	urn:uuid:82204a83-52f6-475c-9708-174fa27659ec
820	
821	<wsa:to></wsa:to>
822	http://www.w3.org/2005/08/addressing/anonymous
823	
824	
825	<soap:body></soap:body>
826	<wsx:metadata></wsx:metadata>
827	<wsx:metadatasection< th=""></wsx:metadatasection<>
828	<pre>Dialect="http://schemas.xmlsoap.org/wsdl/" &gt;</pre>
829	<wsdl:definitions< th=""></wsdl:definitions<>
830	<pre>targetNamespace="http://acme.example.com/colorbeam"</pre>
831	<pre>xmlns:image="http://printer.example.org/imaging" &gt;</pre>
832	<wsp:policy wsu:id="DpPolicy"></wsp:policy>
833	<pre><dpws:profile></dpws:profile></pre>
834	
835	
836	Other WSDL components omitted for brevity
837	
838	<wsdl:binding <="" name="PrintBinding" th="" type="image:PrintPortType"></wsdl:binding>
039	<pre><wsp:policyreference <="" th="" uri="#DpPolicy"></wsp:policyreference></pre>
040	wsal:required="true" />
041 842	<pre><!-- Other WSDL Components Omitted for previty--> </pre>
042	
043 8 <i>11</i>	
044 8/5	
846	(1 Other Metadata Sections emitted for browity>
847	<pre>&lt;: Other Metadata Sections onittled for previty&gt;</pre>
848	
849	
850	
000	<pre></pre>

>

# 851 **5 Eventing**

The scope of this section is the following set of Web services specifications. All of the requirements in these specifications are included by reference except where superseded by normative statements herein:

• [WS-Eventing]

# 855 **5.1 Subscription**

856 857	R3009: A HOSTED SERVICE MUST at least support Push Delivery Mode indicated by "http://schemas.xmlsoap.org/ws/2004/08/eventing/DeliveryModes/Push".
858 859	The Push Delivery Mode [WS-Eventing] is the default Delivery Mode and indicates the Event Source (HOSTED SERVICE) will push Notifications to the Event Sink (CLIENT).
860 861 862	R3017: If a HOSTED SERVICE does not understand the [address] of the Notify To of a Subscribe SOAP ENVELOPE, the HOSTED SERVICE MUST generate a wsa:DestinationUnreachable SOAP Fault in place of a SubscribeResponse message.
863 864 865	R3018: If a HOSTED SERVICE does not understand the [address] of the End To of a Subscribe SOAP ENVELOPE, the HOSTED SERVICE MUST generate a wsa:DestinationUnreachable SOAP Fault in place of a SubscribeResponse message.
866 867 868	R3017 and R3018 do not ensure that a HOSTED SERVICE can contact an event sink, but they do provide a mechanism for the event source to fault on unsupported URI schemes or addresses it knows it cannot contact.
869 870 871	R5003: If a HOSTED SERVICE generates a wsa:DestinationUnreachable SOAP Fault under R3017 or R3018, the SOAP Fault Detail MUST be the EndTo or NotifyTo Endpoint Reference Address that the HOSTED SERVICE did not understand.
872 873 874	R5003 allows a client to distinguish between a SOAP Fault generated due to an unreachable [destination] information header in the Subscribe message, and a SOAP Fault generated due to an unreachable NotifyTo or EndTo address.
875 876	R3019: If a HOSTED SERVICE cannot deliver a Notification SOAP ENVELOPE to an Event Sink, the HOSTED SERVICE MAY terminate the corresponding Subscription.
877 878 879	R5004: If a HOSTED SERVICE terminates a subscription (per R3019), the HOSTED SERVICE SHOULD send a Subscription End SOAP ENVELOPE with a Status of "http://schemas.xmlsoap.org/ws/2004/08/eventing/DeliveryFailure".

# 880 **5.1.1 Filtering**

- To enable subscribing to one or more Notifications exposed by a HOSTED SERVICE, this profile defines a Filter Dialect designated "http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/Action".
- A Filter in this Dialect contains a white space-delimited list of URIs that indicate the [action]
   property of desired Notifications.
- The content of a Filter in this Dialect is defined as xs:list/@itemType="xs:anyURI" [XML Schema Part 2].
- A Filter in this Dialect evaluates to true for an Output Message of a Notification or Solicit-Response operation if and only if a URI in the Filter matches the [action] property of the Message using the "http://docs.oasis-open.org/ws-dd/ns/discovery/2009/01/rfc3986" matching rule [WS-Discovery].
- A Filter in this Dialect with no URIs specified will always evaluate to false for all messages.
- The Action Dialect uses the RFC 3986 prefix matching rule so CLIENTs can subscribe to a related set of Notifications by including the common prefix of the [action] property of those Notifications. Typically, the

CORRECT: <soap:envelope xmlns:soap="http://www.w3.org/2003/05/soap-envelope" xmlns:wsa="http://www.w3.org/2005/08/addressing" xmlns:wse="http://schemas.xmlsoap.org/ws/2004/08/eventing" &gt; <soap:header> <wsa:action> http://schemas.xmlsoap.org/ws/2004/08/eventing/Subscribe </wsa:action> <wsa:action> <wsa:messageid> unr:uui314bea3b-03af-47a1-8284-f495497f1e33 </wsa:messageid> <wsa:replyto> <wsa:replyto> <wsa:address> </wsa:address> </wsa:replyto> <wsa:to>http://uww.w3.org/2005/08/addressing/anonymous  </wsa:to>http://172.30.184.244/print  <wse:subscribe> <wse:notifyto> </wse:notifyto>   PTIOM <wse:filter Dialect="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/Action" &gt; http://printer.example.org/imaging/PrintBasicPortType/JobEndState http://printer.example.org/imaging/PrintBasicPortType/PrinterState </wse:filter </wse:subscribe></wsa:replyto></wsa:action></soap:header></soap:envelope 	ł	R3008: A HOSTED SERVICE MUST at least support Filtering by the Dialect "http://docs.oasis- open.org/ws-dd/ns/dpws/2009/01/Action".
<pre><soap:envelope xmlns:soap="http://www.w3.org/2003/05/soap-envelope" xmlns:ws="http://www.w3.org/2005/08/addressing" xmlns:ws="http://schemas.xmlsoap.org/ws/2004/08/eventing" &gt; <soap:header> <wsa:action> http://schemas.xmlsoap.org/ws/2004/08/eventing/Subscribe </wsa:action> <wsa:messageid> urn:uuid:314bea3b-03af-47a1-8284-f495497fle33  <wsa:replyto> <wsa:replyto> <wsa:address> http://www.w3.org/2005/08/addressing/anonymous </wsa:address> http://172.30.184.244/print  <wse:subscribe> <wse:subscribe> <wse:subscribe>  urn:uuid:3726983d-02de-4d41-8207-d028ae92ce3d  PT10M <wse:filter Dialect="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/Action" &gt; http://printer.example.org/imaging/PrintBasicPortType/JobEndState http://printer.example.org/imaging/PrintBasicPortType/PrinterState </wse:filter </wse:subscribe> </wse:subscribe></wse:subscribe></wsa:replyto></wsa:replyto></wsa:messageid></soap:header></soap:envelope </pre>	(	CORRECT:
<pre>xmlns:soap="http://www.w3.org/2003/05/soap-envelope" xmlns:wsa="http://www.w3.org/2005/08/addressing" xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/08/eventing" &gt; <soap:header> <wsa:action> http://schemas.xmlsoap.org/ws/2004/08/eventing/Subscribe </wsa:action> <wsa:messageid> urn:uuid:314bea3b-03af-47a1-8284-f495497fle33  <wsa:replyto> <wsa:replyto> <wsa:address> http://www.w3.org/2005/08/addressing/anonymous </wsa:address></wsa:replyto> <wsa:to>http://172.30.184.244/print</wsa:to> </wsa:replyto></wsa:messageid></soap:header> <soap:body> <wse:subscribe> <wse:subscribe> <wse:subscribe>      <wse:expires>PT10M</wse:expires> <wse:filter Dialect="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/Action" &gt; http://printer.example.org/imaging/PrintBasicPortType/JobEndState http://printer.example.org/imaging/PrintBasicPortType/PrinterState </wse:filter </wse:subscribe></wse:subscribe></wse:subscribe></soap:body></pre>	<	(soap:Envelope
<pre>xmlns:wsa="http://www.w3.org/2005/08/addressing" xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/08/eventing" &gt; <soap:header> <wsa:action> http://schemas.xmlsoap.org/ws/2004/08/eventing/Subscribe </wsa:action> <wsa:action> <wsa:messageid> urn:uuid:314bea3b-03af-47a1-8284-f495497f1e33 </wsa:messageid> <wsa:messageid> <wsa:replyto> <wsa:address> http://www.w3.org/2005/08/addressing/anonymous </wsa:address> </wsa:replyto> <wsa:replyto> <wsa:to>http://172.30.184.244/print</wsa:to> </wsa:replyto></wsa:messageid></wsa:action></soap:header> <soap:body> <wse:subscribe> <wse:subscribe> <wse:notifyto> </wse:notifyto>   PT10M <wse:filter Dialect="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/Action" &gt; http://printer.example.org/imaging/PrintBasicPortType/JobEndState http://printer.example.org/imaging/PrintBasicPortType/PrinterState </wse:filter </wse:subscribe></wse:subscribe></soap:body></pre>		<pre>xmlns:soap="http://www.w3.org/2003/05/soap-envelope"</pre>
<pre>xmlns:wse="http://schemas.xmlsoap.org/ws/2004/08/eventing" &gt; <soap:header> <wsa:action> http://schemas.xmlsoap.org/ws/2004/08/eventing/Subscribe </wsa:action> wsa:Action&gt; <wsa:action> <wsa:action> <wsa:messageid> unr:uuid:314bea3b-03af-47a1-8284-f495497f1e33  <wsa:replyto> <wsa:address> http://www.w3.org/2005/08/addressing/anonymous </wsa:address> </wsa:replyto> <wsa:replyto> <wsa:replyto> <wsa:replyto> <wsa:to>http://172.30.184.244/print</wsa:to>  <wse:subscribe> <wsa:address> unr:uuid:3726983d-02de-4d41-8207-d028ae92ce3d  PT10M <wse:filter dialect="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/Action"> </wse:filter></wsa:address></wse:subscribe> </wsa:replyto></wsa:replyto></wsa:replyto></wsa:messageid></wsa:action></wsa:action></soap:header></pre>		<pre>xmlns:wsa="http://www.w3.org/2005/08/addressing"</pre>
<pre><soap:header> <wsa:action> http://schemas.xmlsoap.org/ws/2004/08/eventing/Subscribe </wsa:action> <wsa:messageid> urn:uuid:314bea3b-03af-47a1-8284-f495497f1e33  <wsa:replyto> <wsa:address> http://www.w3.org/2005/08/addressing/anonymous </wsa:address> http://172.30.184.244/print </wsa:replyto></wsa:messageid></soap:header> <soap:body> <wse:subscribe> <wse:notifyto> <wsa:address> urn:uuid:3726983d-02de-4d41-8207-d028ae92ce3d  </wsa:address></wse:notifyto>  <wse:eplivery> <wse:eplivery> <wse:eplivery>  http://printer.example.org/imaging/PrintBasicPortType/JobEndState http://printer.example.org/imaging/PrintBasicPortType/PrinterState </wse:eplivery></wse:eplivery></wse:eplivery></wse:subscribe>    </soap:body></pre>		<pre>xmlns:wse="http://schemas.xmlsoap.org/ws/2004/08/eventing" &gt;</pre>
<pre><ws:action> http://schemas.xmlsoap.org/ws/2004/08/eventing/Subscribe </ws:action>  urn:uuid:314bea3b-03af-47a1-8284-f495497fle33  <ws:messageid> <ws:address> </ws:address>  http://nvw.w3.org/2005/08/addressing/anonymous   <wsa:address> http://172.30.184.244/print  <wse:subscribe> <wse:delivery> <wse:subscribe>    PT10M <wse:filter dialect="http://dcs.oasis-open.org/ws-dd/ns/dpws/2009/01/Action"> http://printer.example.org/imaging/PrintBasicPortType/PrinterState </wse:filter></wse:subscribe> </wse:delivery></wse:subscribe>  </wsa:address></ws:messageid></pre>		<soap:header></soap:header>
<pre>http://schemas.xmlsoap.org/ws/2004/08/eventing/Subscribe  <wsa:action> <wsa:messageid> <wsa:messageid> <wsa:replyto> <wsa:address> http://www.w3.org/2005/08/addressing/anonymous </wsa:address> </wsa:replyto> <wsa:to>http://172.30.184.244/print</wsa:to>  <soap:body> <wse:subscribe> <wse:subscribe> <wse:subscribe> <wse:notifyto> <wsa:address> urn:uuid:3726983d-02de-4d41-8207-d028ae92ce3d </wsa:address> PT10M <wse:eplivery> <wse:eplivery> <wse:eplivery> </wse:eplivery> </wse:eplivery> </wse:eplivery> Dialect="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/Action" &gt; http://printer.example.org/imaging/PrintBasicPortType/JobEndState http://printer.example.org/imaging/PrintBasicPortType/PrinterState </wse:notifyto></wse:subscribe></wse:subscribe></wse:subscribe></soap:body></wsa:messageid></wsa:messageid></wsa:action></pre>		<wsa:action></wsa:action>
 <wsa:messageid> urn:uuid:314bea3b-03af-47a1-8284-f495497f1e33  <wsa:replyto> <wsa:address> http://www.w3.org/2005/08/addressing/anonymous </wsa:address>  </wsa:replyto> <wsa:to>http://172.30.184.244/print</wsa:to>  <soap:bedy> <wse:subscribe> <wse:subscribe> <wse:subscribe> <wse:subscribe> <wse:subscribe> <wse:subscribe> <wse:notifyto> <wsa:address> urn:uuid:3726983d-02de-4d41-8207-d028ae92ce3d </wsa:address></wse:notifyto>  <wse:expires>PT10M</wse:expires> <wse:filter Dialect="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/Action" &gt; nttp://printer.example.org/imaging/PrintBasicPortType/JobEndState nttp://printer.example.org/imaging/PrintBasicPortType/PrinterState  </wse:filter </wse:subscribe></wse:subscribe></wse:subscribe></wse:subscribe></wse:subscribe></wse:subscribe></soap:bedy></wsa:messageid>		http://schemas.xmlsoap.org/ws/2004/08/eventing/Subscribe
<pre><wsa:messageid>     urn:uuid:314bea3b-03af-47a1-8284-f495497f1e33      <wsa:replyto>     <wsa:address>         http://www.w3.org/2005/08/addressing/anonymous         </wsa:address>         /ttp://uww.w3.org/2005/08/addressing/anonymous         </wsa:replyto>         <wsa:address>         /ttp://172.30.184.244/print          <soap:body>         <wse:to>http://172.30.184.244/print          <soap:body>         <wse:subscribe>         <wse:subscribe>         <wse:subscribe>         <wse:subscribe>         <wse:address>         urn:uuid:3726983d-02de-4d41-8207-d028ae92ce3d          <wse:notifyto>         </wse:notifyto>         PT10M         <wse:filter dialect="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/Action">         http://printer.example.org/imaging/PrintBasicPortType/JobEndState         thtp://printer.example.org/imaging/PrintBasicPortType/PrinterState         </wse:filter></wse:address></wse:subscribe>         </wse:subscribe>         </wse:subscribe>         </wse:subscribe>   </soap:body></wse:to></soap:body></wsa:address></wsa:messageid></pre>		
<pre>urn:uuid:314bea3b-03af-47a1-8284-f495497f1e33  <wsa:replyto> <wsa:address> http://www.w3.org/2005/08/addressing/anonymous </wsa:address>  </wsa:replyto> <wsa:to>http://172.30.184.244/print</wsa:to>  <soap:body> <wse:subscribe> <wse:subscribe>  <wse:notifyto> </wse:notifyto>    PTIOM <wse:filter dialect="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/Action"> http://printer.example.org/imaging/PrintBasicPortType/JobEndState http://printer.example.org/imaging/PrintBasicPortType/PrinterState </wse:filter></wse:subscribe> </wse:subscribe></soap:body></pre>		<wsa:messageid></wsa:messageid>
 <wsa:replyto> <wsa:address> http://www.w3.org/2005/08/addressing/anonymous </wsa:address>  </wsa:replyto> <wsa:to>http://172.30.184.244/print</wsa:to>    <wse:subscribe> <wse:subscribe> <wse:notifyto> </wse:notifyto>  urn:uuid:3726983d-02de-4d41-8207-d028ae92ce3d  urn:uuid:3726983d-02de-4d41-8207-d028ae92ce3d     <wse:expires>PT10M</wse:expires> <wse:filter Dialect="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/Action" &gt; http://printer.example.org/imaging/PrintBasicPortType/JobEndState http://printer.example.org/imaging/PrintBasicPortType/PrinterState  </wse:filter </wse:subscribe></wse:subscribe>		urn:uuid:314bea3b-03af-47a1-8284-f495497f1e33
<pre><wsa:replyto> <wsa:address> http://www.w3.org/2005/08/addressing/anonymous </wsa:address> </wsa:replyto> <wsa:replyto> <wsa:to>http://172.30.184.244/print</wsa:to>  <soap:header> <soap:body> <wse:subscribe> <wse:delivery> <wse:subscribe> <wse:notifyto> </wse:notifyto>    PT10M <wse:filter dialect="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/Action"> http://printer.example.org/imaging/PrintBasicPortType/JobEndState http://printer.example.org/imaging/PrintBasicPortType/PrinterState </wse:filter> </wse:subscribe> </wse:delivery></wse:subscribe></soap:body></soap:header></wsa:replyto></pre>		
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<pre><wsa:to>http://172.30.184.244/print</wsa:to>  <soap:body> <wse:subscribe> <wse:subscribe> <wse:notifyto> <wsa:address> urn:uuid:3726983d-02de-4d41-8207-d028ae92ce3d </wsa:address>  </wse:notifyto>   <wse:expires>PT10M</wse:expires> <wse:filter dialect="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/Action"> http://printer.example.org/imaging/PrintBasicPortType/JobEndState http://printer.example.org/imaging/PrintBasicPortType/PrinterState </wse:filter> </wse:subscribe></wse:subscribe></soap:body></pre>		
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<pre><wse:notifyto>     <wsa:address>         urn:uuid:3726983d-02de-4d41-8207-d028ae92ce3d         </wsa:address>         </wse:notifyto>          <wse:delivery>         <wse:expires>PT10M</wse:expires>          http://printer.example.org/imaging/PrintBasicPortType/JobEndState         http://printer.example.org/imaging/PrintBasicPortType/PrinterState          </wse:delivery></pre>		<wse:delivery></wse:delivery>
<pre><wsa:address>     urn:uuid:3726983d-02de-4d41-8207-d028ae92ce3d     </wsa:address>       <wse:expires>PT10M</wse:expires>     <wse:filter dialect="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/Action">     http://printer.example.org/imaging/PrintBasicPortType/JobEndState     http://printer.example.org/imaging/PrintBasicPortType/PrinterState     </wse:filter>     </pre>		<wse:notifyto></wse:notifyto>
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<pre> PT10M  http://printer.example.org/imaging/PrintBasicPortType/JobEndState http://printer.example.org/imaging/PrintBasicPortType/PrinterState  </pre>		
<pre><wse:explices <br="" files=""><wse:filter Dialect="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/Action" &gt; http://printer.example.org/imaging/PrintBasicPortType/JobEndState http://printer.example.org/imaging/PrintBasicPortType/PrinterState  </wse:filter </wse:explices></pre>		<pre>PT10M//wse.Fynires&gt;</pre>
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<pre>&gt; &gt; &gt; &gt; http://printer.example.org/imaging/PrintBasicPortType/JobEndState http://printer.example.org/imaging/PrintBasicPortType/PrinterState  </pre>		)ialect="http://docs.oasis-open.org/ws-dd/ns/dnws/2009/01/Action"
<pre>nttp://printer.example.org/imaging/PrintBasicPortType/JobEndState nttp://printer.example.org/imaging/PrintBasicPortType/PrinterState</pre>		>
<pre>http://printer.example.org/imaging/PrintBasicPortType/PrinterState</pre>		ttp://printer.example.org/imaging/PrintBasicPortType/JobEndState
		<pre>ittp://printer.example.org/imaging/PrintBasicPortType/PrinterState</pre>
	~	<pre>/soap:Envelope&gt;</pre>

940 SOAP Fault is not appropriate.

941 To indicate that a HOSTED SERVICE does not expose any Notifications that would match the contents of942 a Filter with the Action Dialect, this profile defines the following SOAP Fault:

[action]	http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01/fault
[Code]	Soap:Sender
[Subcode]	dpws:FilterActionNotSupported

[Reason]	E.g., "no notifications match the supplied filter"
[Detail]	(None defined.)
R3020: If none of th Subscribe S dd/ns/dpws/ dpws:Filter/	e Notifications exposed by a HOSTED SERVICE match the [action] values in a COAP ENVELOPE Filter whose Dialect is "http://docs.oasis-open.org/ws- /2009/01/Action", the HOSTED SERVICE SHOULD generate a ActionNotSupported SOAP Fault.

# **5.2 Subscription Duration and Renewal**

948 949	R3016: A HOSTED SERVICE MUST NOT generate a wse:UnsupportedExpirationType SOAP Fault in response to a Subscribe or Renew SOAP ENVELOPE with an Expiration type of xs:duration.
950 951	R3013: A HOSTED SERVICE MAY generate a wse:UnsupportedExpirationType SOAP Fault in response to a Subscribe or Renew SOAP ENVELOPE with an Expiration of type xs:dateTime.
952 953 954 955 956	Event Sources are required to have an internal clock, but there is no requirement that the clock be synchronized with clients or other HOSTED SERVICEs. Event Sources are only required to support Expirations expressed in duration, but they should attempt to match the type of the Subscription Expiration when possible. If the value or type of the Expiration is unacceptable, the Event Source MAY select an appropriate Expiration and return it in the Subscribe Response or Renew Response.
957 958	R3015: A HOSTED SERVICE MAY generate a wsa:ActionNotSupported SOAP Fault in response to a Get Status SOAP ENVELOPE.
050	

959 Event Sources are not required to support retrieving subscription status.

# 960 6 Security

961 This section defines a RECOMMENDED baseline for interoperable security between a DEVICE and a

- 962 CLIENT. A DEVICE (or CLIENT) is free to support other security mechanisms, and alternate profiles may
   963 be developed to accommodate different deployment requirements. The use of alternate profiles may be
   964 indicated by WSDL [WSDL 1.1], policies [WS-Policy], or by other means.
- 965 In the absence of an explicit indication stating that a different security mechanism is to be used, the
- default security mechanism is determined by the transport addresses of the DEVICE: HTTP transport
   addresses (URLs) indicate the device supports no security, and HTTPS transport addresses indicate the
- 968 device supports the security profile defined in this section.
- A DEVICE may support more than one security profile, but security technologies do not always compose in a way that results in interoperability. Implementers of multiple security profiles should take care to
- 970 in a way that results in interoperability. Implementers of multiple971 preserve interoperability with each profile individually.
- 972 All requirements and recommendations in this section are conditional on the SERVICE or CLIENT
- implementing this security profile. If a SERVICE or CLIENT does not implement the profile defined in this
   section, it is not obligated to follow any of the requirements defined herein.
- 975 This scope of this section is the following set of Web services specifications. All of the requirements in 976 these specifications are included by reference except where superseded by normative statements herein:
- 977 [AES/TLS]
- 978 [HTTP Authentication]
- 979 [SHA]
- 980 [TLS]
- 981 [RFC 4122]
- 982 [X.509.v3]
- 983 [WS-Discovery]

### 984 6.1 Terminology

#### 985 Compact Signature

A WS-Discovery Compact Signature [WS-Discovery] is evidence of authenticity of the
 unencrypted contents of a WS-Discovery message. The Compact Signature is included inside
 the unencrypted message.

#### 989 Secure Channel

A Secure Channel is a point-to-point transport-level TLS/SSL connection established between a
 CLIENT and a SERVICE. Messages transmitted through a Secure Channel receive some
 security protection, but that protection does not extend beyond the CLIENT and SERVICE that
 established the channel.

#### 994 Certificate

An x.509.v3 Certificate [x.509.v3] is a cryptographic credential that a SERVICE or a CLIENT use
 for authentication. When a SERVICE or a CLIENT receives a Certificate from another entity, it
 may inspect the contents to ensure they are valid credentials.

### 998 6.2 Model

999 The security profile defined in this section has two parts: optional message-level signatures for UDP WS-

1000 Discovery traffic, and transport-level encryption. Transport-level encryption is mandatory for metadata 1001 and is optional for control traffic.

- 1002 WS-Discovery Compact Signatures allow a CLIENT to verify the integrity of multicast or unicast WS-
- 1003 Discovery messages, and to identify WS-Discovery traffic that was signed by a DEVICE with a specific 1004 cryptographic credential.
- 1005 TLS/SSL is used to establish a point-to-point Secure Channel between a CLIENT and a DEVICE, and
- 1006 provides a mechanism for each participant to authenticate the identity of the other, and to verify the
- integrity of the exchanged messages. It also provides confidentiality for all messages sent in the SecureChannel established between the CLIENT and the DEVICE.
- 1009 A DEVICE uses an x.509.v3 certificate as its credential, and it uses this credential to sign WS-Discovery
- 1010 messages and to establish TLS/SSL connections. A DEVICE may require CLIENT authentication in the 1011 form of x.509.v3 certificates negotiated in the TLS/SSL connection, or username/password credentials
- 1012 communicated through HTTP Authentication after the TLS/SSL connection is established.
- 1013 A DEVICE uses TLS/SSL to secure its HTTP traffic, and HOSTED SERVICES may also use TLS/SSL to
- 1014 secure their HTTP traffic. A DEVICE may use a physical HTTPS address, or a logical address and
- 1015 HTTPS xAddrs. If a DEVICE and its HOSTED SERVICEs are all reachable at the same address and
- 1016 port, a CLIENT and DEVICE may reuse a TLS/SSL connection for multiple operations.
- 1017



- 1018
- 1019 Figure 2: Communication mechanisms for authentication information and for encrypted messages
- 1020 The organization of CLIENT and DEVICE credentials, mechanism for provisioning them, and criteria for 1021 distinguishing valid and invalid credentials is out of scope of this profile.

# 1022 6.3 Endpoint Reference and xAddrs

1023 R5009: If a DEVICE uses a physical transport address for the [address] property of its Endpoint 1024 Reference, it MUST be an HTTPS scheme IRI. R5012: A DEVICE MUST NOT advertise HTTP scheme addresses the xAddrs fields of WS-Discovery 1025 1026 messages. 1027 A DEVICE is prohibited from advertising non-secure HTTP transport addresses. It may advertise a 1028 logical Endpoint Reference Address and HTTPS xAddrs, or a physical HTTPS transport address for its 1029 Enpoint Reference Address. R5010: A SERVICE MAY use an HTTP scheme IRI for the [address] property of its Endpoint Reference. 1030 1031 A DEVICE may have secure HOSTED SERVICEs, non-secure HOSTED SERVICEs, neither, or both. 1032 Secure HOSTED SERVICEs must comply with the requirements for secure SERVICEs in this section.

# 1033 6.4 Credentials

- 1034 R4043: Each DEVICE SHOULD have its own, unique Certificate.
- 1035 Restrictions in further subsections require that a DEVICE have an x.509.v3 certificate. R4043
   1036 recommends that this certificate is unique.

1037	R4045: The format of the certificate MUST follow the common standard x.509.v3.
1038 1039	The Certificate contains information pertinent to the specific device including its public key. Typically, certificates are issued by a trusted authority or a delegate (2nd tier) or a delegate of the delegate.
1040	See Appendix D for an example x.509.v3 certificate.
1041 1042	Provisioning of credentials, definition of valid credentials, and certificate management are out of the scope of this profile.
1043 1044	R4008: A SERVICE MAY use additional mechanisms to verify the authenticity of the SENDER of any received MESSAGE by analyzing information provided by the lower networking layers.
1045	For example, a SERVICE may only allow CLIENTs whose IP address exists in a preconfigured list.
1046	6.5 Discovery
1047 1048 1049	R4032: A DEVICE MUST NOT send a Probe Match SOAP ENVELOPE if the DEVICE is outside the local subnet of the CLIENT, and the Probe SOAP ENVELOPE was sent using the multicast binding as defined in WS-Discovery section 3.1.1.
4050	
1050	R4065: A CLIENT MUST discard a Probe Match SOAP ENVELOPE if it is received MATCH_TIMEOUT seconds or more later than the last corresponding Probe SOAP ENVELOPE was sent.

 1055
 R4066: A CLIENT MUST discard a Resolve Match SOAP ENVELOPE if it is received MATCH\_TIMEOUT

 1056
 seconds or more later than the last corresponding Resolve SOAP ENVELOPE was sent.

### 1057 6.5.1 WS-Discovery Compact Signatures

1058 R5011: A DEVICE SHOULD sign its UDP discovery traffic using WS-Discovery Compact Signatures [WS-Discovery] to provide CLIENTs with a mechanism to verify the integrity of the messages, and to authenticate the DEVICE as the signor of the messages.

- 1061 WS-Discovery Compact Signatures use WS-Security [WS-Security] to generate a cryptographic signature 1062 that can be used by a CLIENT to verify the validity of the unencrypted message.
- In cases where CLIENTs persist enough information about the credentials and presence of security on a
   DEVICE to protect against impersonation, the DEVICE may not sign its discovery messages.
- 1065 R4017: A CLIENT MAY ignore MESSAGEs received during discovery that have no signature or a nonverifiable signature.
- Messages signed with WS-Discovery Compact Signatures must also meet the requirements in sections
   6.7 Authentication and 6.8 Integrity.

# 1069 6.6 Secure Channel

- 1070 A TLS/SSL Secure Channel at the transport level is used to secure traffic between CLIENT and1071 SERVICE.
- 1072 R4057: All secure communication for Description, Control, and Eventing between the CLIENT and SERVICE MUST use a Secure Channel.
   1074 R4072: A DEVICE MUST support receiving and responding to a Probe SOAP ENVELOPE over HTTP using a Secure Channel.
   1076 P4072: A DEVICE MAX import a Probe SOAP ENVELOPE over HTTP
- 1076 R4073: A DEVICE MAY ignore a Probe SOAP ENVELOPE sent over HTTP that does not use a Secure
   1077 Channel.
- 1078 As described in R1015, a CLIENT MAY send a Probe over HTTP; this Probe and ProbeMatches are sent 1079 using the Secure Channel.

1080 1081	R5013: A CLIENT MAY use a Secure Channel to contact multiple SERVICEs if they can be reached at the same address and port.
1082 1083	R4042: Following the establishment of a TLS/SSL Secure Channel, subsequent MESSAGE exchanges over HTTP SHOULD use the existing TLS/SSL session.
1084	Secure Channels must also meet the minimum requirements in sections 6.7 Authentication, 6.8 Integrity,

1085 and 6.9 Confidentiality.

# 1086 6.6.1 TLS/SSL Ciphersuites

1087 1088	R4059: It is the responsibility of the sender to convert the embedded URL to use HTTPS as different transport security mechanisms can be negotiated.				
1089	R4060: A SERVICE MUST support the following TLS Ciphersuite: TLS_RSA_WITH_RC4_128_SHA.				
1090 1091	R4061: It is recommended that a SERVICE also support the following TLS Ciphersuite: TLS_RSA_WITH_AES_128_CBC_SHA.				
1092	R4062: Additional Ciphersuites MAY be supported. They are negotiated during the TLS/SSL handshake.				
1093 1094	Where appropriate, DEVICEs are encouraged to support additional Ciphersuites that rely on more robust security technology, such as the SHA-2 [SHA] family of hashing standards.				
1095 1096 1097	R5014: A SERVICE SHOULD NOT negotiate any of the following TLS/SSL Ciphersuites: (a) TLS_RSA_WITH_NULL_SHA, (b) SSL_RSA_WITH_NULL_SHA, (c) any Ciphersuite with DH_anon in their symbolic name, (d) any Ciphersuites with MD5 in their symbolic name.				

# 1098 **6.6.2 SERVICE Authentication in a Secure Channel**

1099	X.509.v3 certificates are the only mechanism for a CLIENT to authenticate a DEVICE or a HOSTED
1100	SERVICE (if TLS/SSL is supported on that HOSTED SERVICE).

#### 1101 *R4039: A CLIENT MUST initiate authentication with the DEVICE by setting up a TLS/SSL session.*

1102 R5017: If a SERVICE uses TLS/SSL, it MUST authenticate itself to a CLIENT by supplying an X.509v3
 1103 certificate during the TLS/SSL handshake.

# 1104 **6.6.3 CLIENT Authentication in a Secure Channel**

1105	R4014: A DEVICE MAY require authentication of a CLIENT.
1106 1107	A DEVICE may authenticate a CLIENT by negotiating and x.509.v3 certificate, or by requesting a username and password communicated over HTTP Authentication inside the Secure Channel.
1108	X.509.v3 certificates are the preferred mechanism for authenticating a CLIENT.
1109	R4018: A DEVICE SHOULD cache authentication information for a CLIENT as valid as long as the

1110 DEVICE is connected to the CLIENT.

# 1111 6.6.3.1 CLIENT Authentication with x.509.v3 certificates

1112 R4071: If the CLIENT and the SERVICE exchanged certificates during the TLS/SSL handshake, and the
 1113 SERVICE as well as the CLIENT were able to verify the certificates, the CLIENT and SERVICE
 1114 are mutually authenticated, and no further steps SHALL be required.

# 1115 **6.6.3.2 CLIENT Authentication with HTTP Authentication**

1116 In cases where x.509.v3 client certificates are unavailable or where validation is infeasible, the DEVICE

1117 may use HTTP Authentication [HTTP/1.1] to request client credentials.

1118 1119 1120	HTTP authentication requires credentials in the form of username and password. It is assumed that how the CLIENT and SERVICE share knowledge of the username and password is out-of-band and beyond the scope of this profile.				
1121 1122 1123	Because the authentication is performed over the Secure Channel established during TLS/SSL handshake and after the CLIENT has authenticated the SERVICE, HTTP Basic authentication may be used safely.				
1124 1125 1126	R4046: A SERVICE MAY require HTTP Authentication step after the TLS/SSL handshake, if the SERVICE was not able to verify the certificate, or if the CLIENT did not provide a certificate during the TLS/SSL handshake.				
1127 1128 1129	R4048: If the HTTP authentication is successful, and the CLIENT presents a certificate to the SERVICE, the SERVICE SHOULD cache the certificate in its local certificate store of trusted certificates for future authentication of the CLIENT.				
1130	R4048 avoids the need for HTTP authentication for subsequent connections.				
1131 1132	R4050: If a SERVICE requires HTTP authentication, the SERVICE SHALL challenge the CLIENT using the HTTP 401 response code.				
1133	R4051: A CLIENT MUST authenticate using one of the options listed in the HTTP-Authenticate header.				
1134 1135	R4052: HTTP Authentication MUST use the following parameters for username and password of the HTTP Request: username, PIN / password.				
1136 1137 1138	The username is supplied to the SERVICE during HTTP authentication and MAY be used for establishing multiple access control classes, such as administrators, users, and guests. The naming and use of username is implementation-dependent and out of the scope of this profile.				
1139	R4053: If no username is provided, "admin" SHALL be used as the default username.				
1140 1141	The purpose of the PIN / password is to authenticate the CLIENT to the DEVICE during the HTTP authentication.				
1142 1143	R4054: The RECOMMENDED size of a PIN / password is at least 8 characters using at least a 32 character alphabet.				
1144 1145	R4055: The PIN / password that is unique to the SERVICE SHALL be conveyed to the CLIENT out-of- band. The methods of conveying the PIN out-of-band are out of the scope of this profile.				
1146 1147 1148	R4056: To reduce the attack surface, the SERVICE and CLIENT MAY limit the number of failed authentication attempts as well as the time interval successive attempts are made for one TLS/SSL session.				

#### **6.7 Authentication** 1149

1150 Authentication is the process by which the identity of the sender is determined by the recipient. 1151 Authentication MUST adhere to the following requirements:

1152 1153	R4004: A SENDER MUST authenticate itself to a RECEIVER using credentials acceptable to the RECEIVER.
1154 1155	In this profile, authentication is done using certificates or a combination of certificates and HTTP authentication. If multicast messages are secured, the following additional requirements apply:
1156 1157	R4005: On multicast MESSAGEs, a CLIENT MUST use an authentication credential that is suitable for all DEVICEs that could legitimately process the multicast MESSAGE.
1158 1159	R5023: If a SERVICE uses TLS/SSL, it MUST provide Authentication (as defined in this section) for any TLS/SSL connections.

1160 Credentials MAY be cached on the DEVICE and/or CLIENT to simplify subsequent authentications.

# 1161 **6.8 Integrity**

1162 Integrity is the process that protects MESSAGEs against tampering while in transit. Integrity MUST1163 adhere to the following requirements:

1164 1165	R5015: If a SERVICE uses TLS/SSL or WS-Discovery Compact Signatures, it MUST provide Integrity (as defined in this section) for any TLS/SSL connections or signatures, respectively.
1166 1167 1168 1169 1170 1171	R4000: A SERVICE MUST not send a SOAP ENVELOPE without protecting the integrity of any Message Information Header blocks matching the following XPath expressions: (a) /soap:Envelope/soap:Header/wsa:Action, (b) /soap:Envelope/soap:Header/wsa:MessageID, (c) /soap:Envelope/soap:Header/wsa:To, (d) /soap:Envelope/soap:Header/wsa:ReplyTo, (e) /soap:Envelope/soap:Header/wsa:RelatesTo, and (f) /soap:Envelope/soap:Header/*[@isReferenceParameter='true'].
1172 1173	R4063: A SERVICE MAY reject a SOAP ENVELOPE that has unprotected Message Information Header blocks.
1174 1175 1176	R4001: A SERVICE MUST not send a SOAP ENVELOPE (including SOAP Faults) without protecting the integrity of the SOAP ENVELOPE Body in conjunction with any Message Information Block(s) from R4000.
1177 1178	R4064: A SERVICE MAY reject a SOAP ENVELOPE that does not protect the integrity of the SOAP ENVELOPE Body.
1179 1180	In this profile, the integrity of UDP discovery SOAP ENVELOPEs is protected using message-level signatures, while the integrity of other MESSAGEs is protected using a Secure Channel.

# 1181 6.9 Confidentiality

1182 Confidentiality is the process by which sensitive information is protected against unauthorized disclosure 1183 while in transit. Confidentiality MUST adhere to the following requirements:

1184 1185	R5016: If a SERVICE uses TLS/SSL, it MUST provide Confidentiality (as defined in this section) for any TLS/SSL connections.
1186 1187	R4002: A SERVICE MUST NOT send a SOAP ENVELOPE without encrypting the SOAP ENVELOPE Body.
1188	R4067: A SERVICE MAY reject a SOAP ENVELOPE that does not encrypt the SOAP ENVELOPE Body.
1189 1190	In this profile, UDP WS-Discovery MESSAGEs are not treated as confidential. Confidential MESSAGEs are encrypted using a Secure Channel.

# 1191 7 Conformance

- 1192 An endpoint is expected to implement at least one of the roles defined herein (DEVICE, CLIENT, or
- HOSTED SERVICE) and MAY implement more than one of the roles. An endpoint is not compliant with
   this specification if it fails to satisfy one or more of the MUST or REQUIRED level requirements defined
   herein for the roles it implements.
- 1196 Normative text within this specification takes precedence over normative outlines, which in turn take
- 1197 precedence over the XML Schema [XML Schema Part 1, Part 2] descriptions, which in turn take
- 1198 precedence over examples.

# 1199 Appendix A. Acknowledgements

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# 1263 Appendix B. Constants

1264 The following constants are used throughout this profile. The values listed below supersede other values1265 defined in other specifications listed below.

Constant	Value	Specification
APP_MAX_DELAY	2,500 milliseconds	[WS-Discovery]
DISCOVERY_PORT	3702	[WS-Discovery]
MATCH_TIMEOUT	10 seconds	[WS-Discovery]
MAX_ENVELOPE_SIZE	32,767 octets	This profile
MAX_UDP_ENVELOPE_SIZE	4,096 octets	This profile
MAX_FIELD_SIZE	256 Unicode characters	This profile
MAX_URI_SIZE	2,048 octets	This profile
MULTICAST_UDP_REPEAT	1	[SOAP-over-UDP]
UDP_MAX_DELAY	250 milliseconds	[SOAP-over-UDP]
UDP_MIN_DELAY	50 milliseconds	[SOAP-over-UDP]
UDP_UPPER_DELAY	450 milliseconds	[SOAP-over-UDP]
UNICAST_UDP_REPEAT	1	[SOAP-over-UDP]

# 1266 Appendix C. Declaring Discovery Types in WSDL

Solutions built on DPWS often define portTypes implemented by Hosted Services, and a discovery-layer 1267 1268 portType implemented by the Host Service so the presence of these functional services can be 1269 determined at the discovery layer. The binding between a service-layer type and its discovery-layer type 1270 can be defined purely in descriptive text, but this appendix provides an optional mechanism to declare a discovery-layer type inside WSDL that can be consumed and understood by tools. 1271 1272 This appendix defines an @dpws:DiscoveryType attribute to annotate the WSDL 1.1 portType [WSDL 1273 1.1] for the service-layer type. The normative outline for @dpws:DiscoveryType is: 1274 <wsdl:definitions ...> 1275 [<wsdl:portType [dpws:DiscoveryType="xs:QName"]? > 1276 1277 </wsdl:portType>]\* 1278 </wsdl:definitions> 1279 The following describes additional, normative constraints to the outline listed above: 1280 /wsdl:definitions/wsdl:portType/@dpws:DiscoveryType 1281 The name of the portType to be advertised by the Host Service to indicate that this device 1282 supports the annotated Hosted Service portType. 1283 If omitted, no implied value 1284 This mechanism is only suitable in cases where a functional service type is bound to a single discovery-1285 layer type, and authors of more complex type topologies may express the relationship between service 1286 and discovery types through normative text or through other means. 1287 Example usage follows. PrintDeviceType is the discovery-layer type for PrintPortType. 1288 <wsdl:definitions 1289 xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/" 1290 xmlns:dpws="http://docs.oasis-open.org/ws-dd/ns/dpws/2009/01" 1291 targetNamespace="http://printer.example.com/imaging" 1292 xmlns:tns="http://printer.example.com/imaging"> 1293 1294 <wsdl:portType name="PrintPortType" 1295 dpws:DiscoveryType="tns:PrintDeviceType"> 1296 1297 <!-- Contents omitted for brevity --> 1298 1299 </wsdl:portType> 1300 1301 <!-- Define PrintDeviceType to be empty --> 1302 <wsdl:portType name="PrintDeviceType" /> 1303 1304 </wsdl:definitions>

# 1305 Appendix D. Example x.509.v3 Certificate

1306 An example of a self-signed X.509 certificate is shown below. In this case, the Subject field contains the 1307 UUID in string representation format (i.e., not represented numerically).

Туре	Element	Usage	Example
Basic Elements	Version	TLS	3
	Certificate Serial Number		1234567
	Certificate Algorithm Identifier		RSA
	Issuer		a7731471-4b54-4a64-942c-7d481dcb9614
	Validity Period		11/09/2001 - 01/07/2015
	Subject		a7731471-4b54-4a64-942c-7d481dcb9614
	Subject Public Key Information		rsaEncryption 1024 10888232e76740bd873462ea2c64ca1d a6f9112656a34b949d32cede0e476547 84ba0f7e62e143429d3217ee45ce5304 308e65a6eee6474cb4d9a3c0295c8267 761661ccba7546a09d5f03a8ea3b1160 dac9fb6e6ba94e54b6c8ee892e492f4c e3a96bbd9d7b4c4bb98b7c052ff361ba cee01718122c4f0d826efc123bb1b03d
Extensions	Extended Key Usage	Server Authentication	1.3.6.1.5.5.7.3.1
		Client Authentication	1.3.6.1.5.5.7.3.2
Signature	Certificate Authority's Digital Signature		5938f9908916cca32321916a184a6e75 2becb14fb99c4f33a03b03c3c752117c 91b8fb163d3541fca78bca235908ba69 1f7e36004a2d499a8e23951bd8af961d 36be05307ec34467a7c66fbb7fb5e49c 25e8dbdae4084ca9ba244b5bc1a377e5 262b9ef543ce47ad8a6b1d28c9138d0a dc8f5e3b469e42a5842221f9cf0a50d1

# 1309 Appendix E. Revision History

1310 [optional; should not be included in OASIS Standards]

Revision	Date	Editor	Changes Made
wd-01	09/16/2008	Dan Driscoll	Converted input specification to OASIS template.
wd-02	10/08/2008	Dan Driscoll	<ul> <li>Resolved the following issues:</li> <li>001: Clarify R4032 and R4036 w.r.t. other multicast bindings</li> <li>002: Define matching for empty Action filter</li> <li>003: Fault Action should use lowercase 'f'</li> <li>004: Faulting to non-anonymous endpoints</li> <li>005: SOAP Binding should apply to clients</li> <li>013: Restrict encoding of SOAP messages to UTF-8</li> <li>016: Edit R0042</li> <li>028: Review constants</li> <li>045: EndpointReference subelement</li> <li>061: Assign an OASIS namespace for the specifications</li> </ul>
wd-02	10/14/2008	Dan Driscoll	<ul> <li>Changed document format from doc to docx</li> <li>Fixed "authoritative reference"</li> </ul>
wd-02	10/14/2008	Dan Driscoll	<ul><li>Changed version number to 1.1</li><li>Removed "related work" section</li></ul>
wd-02	10/14/2008	Dan Driscoll	Changed copyrights from 2007 to 2008
wd-03	12/12/2008	Dan Driscoll	<ul> <li>Changed draft from cd-01 to wd-03</li> <li>Updated dates to 2008/12/12</li> <li>Updated namespace to 2009/01</li> <li>Issue 098: Update namespace</li> <li>Editorial: Changed 'wsdp' prefix to 'dpws'</li> </ul>
wd-03	12/12/2008	Dan Driscoll Antoine Mensch	<ul> <li>011: Fix SERVICE terminology</li> <li>015: Remove R0007</li> <li>024: Fix Directed Discovery</li> </ul>

			<ul> <li>029: Fix SERVICE/DEVICE for WS- Policy</li> </ul>
			038: Contents of Host EPR
			039: Recursive hosting
			055: WS-Addressing 1.0
			<ul> <li>070: HTTP content negotiation for PresentationUrl</li> </ul>
			• 071: Update to WS-Policy 1.5
			073: Clarify "stable" identifier
			• 074: Clarify R0036/R0037
			075: Clarify "Target Service"
			077: Remove R3010 as redundant
			080: Secure all WS-A headers
			084: Faulting behavior on Subscribe
			085: Get/GetMetadata
			• 092: Split R3019
			• 093: Remove R3012
			<ul> <li>094: Clean up expiration type/value switching</li> </ul>
			095: Clarify expiration value switching
			109: Update references
wd-03	1/2/2009	Dan Driscoll	032: Describe security composability
			051: Generalize security
			112: Remove WS-Security reference
			113: Cleanup Network Model
			• 114: Remove security negotiation
			<ul> <li>115: Replace R4070 with switches on HTTPS ID/xAddrs</li> </ul>
			<ul> <li>138: Create introduction and concrete description of security profile</li> </ul>
			139: Remove protocol negotiation
			• 140: Clean up HTTP Authentication
wd-03	1/21/2009	Antoine Mensch	Issue 012
			Issue 040
			Issue 046
			Issue 117
			Issue 127
			Issue 128
			Issue 135
			Issue 143
cd-02	1/21/2009	Dan Driscoll	Changed draft from wd-03 to cd-02

Candidate			Updated date, copyrights
			<ul> <li>Updated WS-Discovery and SOAP- over-UDP references to CD-02</li> </ul>
			072: Fix HOSTEDSERVICE
			083: Fix R0031 and wsa:ReplyTo
			<ul> <li>130: Make FilterActionNotSupported recommended, not mandatory</li> </ul>
			• 132: Define relative PresentationUrl
			<ul> <li>134: Make Types/Scopes mandatory in directed ProbeMatches</li> </ul>
			• 137: Add Appendix C
			More security edits (see Section 7)
cd-02	1/26/2009	Dan Driscoll	Fixed WS-DD committee site links
Candidate			<ul> <li>Added TC participants to Appendix A; remove company names to meet OASIS rules</li> </ul>
			Removed "Last Approved Version"
cd-02	1/27/2009	Dan Driscoll	Updated to reflect CD-02 status
pr-01	1/30/2009	Dan Driscoll	Updated to reflect PR-01 status
wd-04	2/10/2009	Dan Driscoll	Changed draft from PR-01 to WD-04
			<ul> <li>Updated references to WS-Discovery and SOAP-over-UDP</li> </ul>
wd-04	2/11/2009	Dan Driscoll	150: Add pointer to RDDL and XSD
			151: Reorder terminology section
			Reformat references section
			Reformat appendix headers
			Add missed internal hyperlinks
wd-04	2/20/2009	Dan Driscoll	147: Add URL for Directed Probe
			• 154: Fix R0031
			• 155: Update XML schema references
wd-05	2/25/2009	Dan Driscoll	148: Reorganize security section
wd-06	4/9/2009	Dan Driscoll	Updated draft from WD-05 to WD-06
			Update list of TC participants
			<ul> <li>Pr007.1: review non-normative RFC2119 keywords</li> </ul>
			Pr007.2: cross-reference roles to terms/definitions
			Pr007.4: Update conformance section
cd-03	4/14/2009	Dan Driscoll	Updated to reflect CD-03 status
cd-04	4/28/2009	Dan Driscoll	Updated to reflect CD-04 status