



Web Services Security X.509 Certificate Token Profile Version 1.1.1

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Specification URIs

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(Authoritative)

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Additional artifacts:

This prose specification is one component of a multi-part Work Product which includes:

- *Web Services Security Kerberos Token Profile Version 1.1.1.* <http://docs.oasis-open.org/wss-m/wss/v1.1.1/os/wss-KerberosTokenProfile-v1.1.1-os.html>.
- *Web Services Security Rights Expression Language (REL) Token Profile Version 1.1.1.* <http://docs.oasis-open.org/wss-m/wss/v1.1.1/os/wss-rel-token-profile-v1.1.1-os.html>.
- *Web Services Security SAML Token Profile Version 1.1.1.* <http://docs.oasis-open.org/wss-m/wss/v1.1.1/os/wss-SAMLTOKENProfile-v1.1.1-os.html>.
- *Web Services Security: SOAP Message Security Version 1.1.1.* <http://docs.oasis-open.org/wss-m/wss/v1.1.1/os/wss-SOAPMessageSecurity-v1.1.1-os.html>.
- *Web Services Security SOAP Message with Attachments (SwA) Profile Version 1.1.1.* <http://docs.oasis-open.org/wss-m/wss/v1.1.1/os/wss-SwAProfile-v1.1.1-os.html>.
- *Web Services Security Username Token Profile Version 1.1.1.* <http://docs.oasis-open.org/wss-m/wss/v1.1.1/os/wss-UsernameTokenProfile-v1.1.1-os.html>.

- *Web Services Security X.509 Certificate Token Profile Version 1.1.1*. <http://docs.oasis-open.org/wss-m/wss/v1.1.1/os/wss-x509TokenProfile-v1.1.1-os.html>. (this document)
- XML schemas: <http://docs.oasis-open.org/wss-m/wss/v1.1.1/os/xsd/>

Related work:

This specification supersedes:

- *Web Services Security X.509 Certificate Token Profile 1.1*. 01 November 2006. OASIS Standard incorporating Approved Errata. <http://docs.oasis-open.org/wss/v1.1/wss-v1.1-spec-errata-os-x509TokenProfile.htm>
- *Web Services Security X.509 Certificate Token Profile 1.1*. 01 November 2006. OASIS Approved Errata. <http://docs.oasis-open.org/wss/v1.1/wss-v1.1-errata-os-x509TokenProfile.htm>

Abstract:

This document describes how to use X.509 Certificates with the Web Services Security: SOAP Message Security [WS-Security] specification.

This document integrates specific error corrections or editorial changes to the preceding specification, within the scope of the Web Services Security and this TC.

This document introduces a third digit in the numbering convention where the third digit represents a consolidation of error corrections, bug fixes or editorial formatting changes (e.g., 1.1.1); it does not add any new features beyond those of the base specifications (e.g., 1.1).

Status:

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1 Introduction (Non-Normative)

2 This specification describes the use of the X.509 authentication framework with the Web Services
3 Security: SOAP Message Security specification [[WS-Security](#)].

4
5 An X.509 certificate specifies a binding between a public key and a set of attributes that includes (at least)
6 a subject name, issuer name, serial number and validity interval. This binding may be subject to
7 subsequent revocation advertised by mechanisms that include issuance of CRLs, OCSP tokens or
8 mechanisms that are outside the X.509 framework, such as XKMS.

9
10 An X.509 certificate may be used to validate a public key that may be used to authenticate a SOAP
11 message or to identify the public key with a SOAP message that has been encrypted.

12
13 Note that Sections 2.1, 2.2, all of 3, and indicated parts of 5 are normative. All other sections are non-
14 normative.

2 Notations and Terminology (Normative)

This section specifies the notations, namespaces and terminology used in this specification.

2.1 Notational Conventions

The keywords "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119.

When describing abstract data models, this specification uses the notational convention used by the XML Infoset. Specifically, abstract property names always appear in square brackets (e.g., [some property]).

When describing concrete XML schemas, this specification uses a convention where each member of an element's [children] or [attributes] property is described using an XPath-like notation (e.g., /x:MyHeader/x:SomeProperty/@value1). The use of {any} indicates the presence of an element wildcard (<xs:any/>). The use of @{any} indicates the presence of an attribute wildcard (<xs:anyAttribute/>).

2.2 Namespaces

Namespace URIs (of the general form "some-URI") represents some application-dependent or context-dependent URI as defined in RFC 3986 [URI]. This specification is designed to work with the general SOAP [SOAP11, SOAP12] message structure and message processing model, and should be applicable to any version of SOAP. The current SOAP 1.1 namespace URI is used herein to provide detailed examples, but there is no intention to limit the applicability of this specification to a single version of SOAP.

The namespaces used in this document are shown in the following table (note that for brevity, the examples use the prefixes listed below but do not include the URIs – those listed below are assumed).

```
http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd
http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd
http://docs.oasis-open.org/wss/oasis-wss-wssecurity-secext-1.1.xsd
```

The following namespace prefixes are used in this document:

Prefix	Namespace
S11	http://schemas.xmlsoap.org/soap/envelope/
S12	http://www.w3.org/2003/05/soap-envelope
ds	http://www.w3.org/2000/09/xmldsig#
xenc	http://www.w3.org/2001/04/xmenc#
wsse	http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd

wsse11	http://docs.oasis-open.org/wss/oasis-wss-wssecurity-secext-1.1.xsd
wsu	http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd

46 *Table 1- Namespace prefixes*

47 URI fragments defined in this specification are relative to the following base URI unless otherwise stated:

48

49 [http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-](http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-1.0)
50 1.0

51

52 The following table lists the full URI for each URI fragment referred to in this specification.

URI Fragment	Full URI
#Base64Binary	http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-soap-message-security-1.0#Base64Binary
#STR-Transform	http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-soap-message-security-1.0#STR-Transform
#PKCS7	http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-1.0#PKCS7
#X509v3	http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-1.0#X509v3
#X509SubjectKeyIdentifier	http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-1.0#X509SubjectKeyIdentifier

53

54 **2.3 Terminology**

55 This specification adopts the terminology defined in Web Services Security: SOAP Message Security
56 specification [\[WS-Security\]](#).

57

58 Readers are presumed to be familiar with the definitions of terms in the Internet Security Glossary
59 [\[Glossary\]](#).

60

61 3 Usage (Normative)

62 This specification describes the syntax and processing rules for the use of the X.509 authentication
63 framework with the Web Services Security: SOAP Message Security specification [WS-Security]. For the
64 purposes of determining the order of preference of reference types, the use of IssuerSerial within
65 X509Data should be considered to be a form of Key Identifier

66 3.1 Token types

67 This profile defines the syntax of, and processing rules for, three types of binary security token using the
68 URI values specified in Table 2.

69
70 If the `ValueType` attribute is missing, the receiver may interpret it either based on a prior agreement or
71 by parsing the content.

72

Token	ValueType URI	Description
Single certificate	#X509v3	An X.509 v3 certificate capable of signature-verification at a minimum
Certificate Path	#X509PKIPathv1	An ordered list of X.509 certificates packaged in a PKIPath
Set of certificates and CRLs	#PKCS7	A list of X.509 certificates and (optionally) CRLs packaged in a PKCS#7 wrapper

73 *Table 2 – Token types*

74 3.1.1 X509v3 Token Type

75 The type of the end-entity that is authenticated by a certificate used in this manner is a matter of policy
76 that is outside the scope of this specification.

77 3.1.2 X509PKIPathv1 Token Type

78 The `X509PKIPathv1` token type MAY be used to represent a certificate path.

79 3.1.3 PKCS7 Token Type

80 The `PKCS7` token type MAY be used to represent a certificate path. It is RECOMMENDED that
81 applications use the PKIPath object for this purpose instead.

82

83 The order of the certificates in a PKCS#7 data structure is not significant. If an ordered certificate path is
84 converted to PKCS#7 encoded bytes and then converted back, the order of the certificates may not be
85 preserved. Processors SHALL NOT assume any significance to the order of the certificates in the data
86 structure. See [PKCS7] for more information.

87 3.2 Token References

88 In order to ensure a consistent processing model across all the token types supported by WSS: SOAP
89 Message Security, the `<wsse:SecurityTokenReference>` element SHALL be used to specify all
90 references to X.509 token types in signature or encryption elements that comply with this profile.

91
92 A `<wsse:SecurityTokenReference>` element MAY reference an X.509 token type by one of the
93 following means:

- 94
95 • Reference to a Subject Key Identifier
96 The `<wsse:SecurityTokenReference>` element contains a `<wsse:KeyIdentifier>`
97 element that specifies the token data by means of a X.509 SubjectKeyIdentifier reference. A
98 subject key identifier MAY only be used to reference an X.509v3 certificate.”
99
- 100 • Reference to a Binary Security Token
101 The `<wsse:SecurityTokenReference>` element contains a `wsse:Reference>`
102 element that references a local `<wsse:BinarySecurityToken>` element or a remote data
103 source that contains the token data itself.
104
- 105 • Reference to an Issuer and Serial Number
106 The `<wsse:SecurityTokenReference>` element contains a `<ds:X509Data>` element
107 that contains a `<ds:X509IssuerSerial>` element that uniquely identifies an end entity
108 certificate by its X.509 Issuer and Serial Number.

109 3.2.1 Reference to an X.509 Subject Key Identifier

110 The `<wsse:KeyIdentifier>` element is used to specify a reference to an X.509v3 certificate by
111 means of a reference to its X.509 SubjectKeyIdentifier attribute. This profile defines the syntax of, and
112 processing rules for referencing a Subject Key Identifier using the URI values specified in Table 3 (note
113 that URI fragments are relative to `http://docs.oasis-open.org/wss/2004/01/oasis-200401-`
114 `wss-x509-token-profile-1.0`).

115

Subject Key Identifier	ValueType URI	Description
Certificate Key Identifier	#X509SubjectKeyIdentifier	Value of the certificate's X.509 SubjectKeyIdentifier

116 *Table 3 – Subject Key Identifier*

117 The `<wsse:SecurityTokenReference>` element from which the reference is made contains the
118 `<wsse:KeyIdentifier>` element. The `<wsse:KeyIdentifier>` element MUST have a `ValueType`
119 attribute with the value `#X509SubjectKeyIdentifier` and its contents MUST be the value of the
120 certificate's X.509v3 SubjectKeyIdentifier extension, encoded as per the `<wsse:KeyIdentifier>`
121 element's `EncodingType` attribute. For the purposes of this specification, the value of the
122 SubjectKeyIdentifier extension is the contents of the KeyIdentifier octet string, excluding the encoding of
123 the octet string prefix.

124 3.2.2 Reference to a Security Token

125 The `<wsse:Reference>` element is used to reference an X.509 security token value by means of a URI
126 reference.

127

128 The URI reference MAY be internal in which case the URI reference SHOULD be a bare name XPointer
129 reference to a <wsse:BinarySecurityToken> element contained in a preceding message header that
130 contains the binary X.509 security token data.

131 3.2.3 Reference to an Issuer and Serial Number

132 The <ds:X509IssuerSerial> element is used to specify a reference to an X.509 security token by
133 means of the certificate issuer name and serial number.

134

135 The <ds:X509IssuerSerial> element is a direct child of the <ds:X509Data> element that is in turn a
136 direct child of the <wsse:SecurityTokenReference> element in which the reference is made

137 3.3 Signature

138 Signed data MAY specify the certificate associated with the signature using any of the X.509 security
139 token types and references defined in this specification.

140

141 An X.509 certificate specifies a binding between a public key and a set of attributes that includes (at least)
142 a subject name, issuer name, serial number and validity interval. Other attributes may specify constraints
143 on the use of the certificate or affect the recourse that may be open to a relying party that depends on the
144 certificate. A given public key may be specified in more than one X.509 certificate; consequently a given
145 public key may be bound to two or more distinct sets of attributes.

146

147 It is therefore necessary to ensure that a signature created under an X.509 certificate token uniquely and
148 irrefutably specifies the certificate under which the signature was created.

149

150 Implementations SHOULD protect against a certificate substitution attack by including either the
151 certificate itself or an immutable and unambiguous reference to the certificate within the scope of the
152 signature according to the method used to reference the certificate as described in the following sections.

153 3.3.1 Key Identifier

154 The <wsse:KeyIdentifier> element does not guarantee an immutable and unambiguous reference
155 to the certificate referenced. Consequently implementations that use this form of reference within a
156 signature SHOULD employ the STR Dereferencing Transform within a reference to the signature key
157 information in order to ensure that the referenced certificate is signed, and not just the ambiguous
158 reference. The form of the reference is a bare name reference as defined by the XPointer specification
159 [XPointer].

160

161 The following example shows a certificate referenced by means of a KeyIdentifier. The scope of the
162 signature is the <ds:SignedInfo> element which includes both the message body (#body) and the
163 signing certificate by means of a reference to the <ds:KeyInfo> element which references it
164 (#keyinfo). Since the <ds:KeyInfo> element only contains a mutable reference to the certificate rather
165 than the certificate itself, a transformation is specified which replaces the reference to the certificate with
166 the certificate. The <ds:KeyInfo> element specifies the signing key by means of a
167 <wsse:SecurityTokenReference> element which contains a <wsse:KeyIdentifier> element
168 which specifies the X.509 subject key identifier of the signing certificate.

169

```
170 <S11:Envelope xmlns:S11="...">  
171   <S11:Header>  
172     <wsse:Security  
173       xmlns:wsse="..."  
174       xmlns:wsu="...">
```

```

175     <ds:Signature
176         xmlns:ds="http://www.w3.org/2000/09/xmldsig#">
177         <ds:SignedInfo>...
178         <ds:Reference URI="#body">...</ds:Reference>
179         <ds:Reference URI="#keyinfo">
180             <ds:Transforms>
181                 <ds:Transform Algorithm="...#STR-Transform">
182                     <wsse:TransformationParameters>
183                         <ds:CanonicalizationMethod Algorithm="..."/>
184                     </wsse:TransformationParameters>
185                 </ds:Transform>
186             </ds:Transforms>...
187         </ds:Reference>
188     </ds:SignedInfo>
189     <ds:SignatureValue>HFLP...</ds:SignatureValue>
190     <ds:KeyInfo Id="keyinfo">
191         <wsse:SecurityTokenReference>
192             <wsse:KeyIdentifier EncodingType="...#Base64Binary"
193                 ValueType="...#X509SubjectKeyIdentifier">
194                 MIGfMa0GCSq...
195             </wsse:KeyIdentifier>
196         </wsse:SecurityTokenReference>
197     </ds:KeyInfo>
198 </ds:Signature>
199 </wsse:Security>
200 </S11:Header>
201 <S11:Body wsu:Id="body"
202     xmlns:wsu=".../">
203     ...
204 </S11:Body>
205 </S11:Envelope>

```

206 3.3.2 Reference to a Binary Security Token

207 The signed data SHOULD contain a core bare name reference (as defined by the XPointer specification
208 [\[XPointer\]](#)) to the <wsse:BinarySecurityToken> element that contains the security token referenced,
209 or a core reference to the external data source containing the security token.

210
211 The following example shows a certificate embedded in a <wsse:BinarySecurityToken> element
212 and referenced by URI within a signature. The certificate is included in the <wsse:Security> header
213 as a <wsse:BinarySecurityToken> element with identifier binarytoken. The scope of the
214 signature defined by a <ds:Reference> element within the <ds:SignedInfo> element includes the
215 signing certificate which is referenced by means of the URI bare name pointer #binarytoken. The
216 <ds:KeyInfo> element specifies the signing key by means of a <wsse:SecurityTokenReference>
217 element which contains a <wsse:Reference> element which references the certificate by means of the
218 URI bare name pointer #binarytoken.

```

219  

220 <S11:Envelope xmlns:S11="...">
221   <S11:Header>
222     <wsse:Security
223       xmlns:wsse="..."
224       xmlns:wsu="...">
225       <wsse:BinarySecurityToken
226         wsu:Id="binarytoken"
227         ValueType="...#X509v3"
228         EncodingType="...#Base64Binary">
229         MIEZzCCA9CgAwIBAgIQEmtJZc0...
230       </wsse:BinarySecurityToken>
231     <ds:Signature

```

```

232         xmlns:ds="http://www.w3.org/2000/09/xmldsig#">
233         <ds:SignedInfo>...
234         <ds:Reference URI="#body">...</ds:Reference>
235         <ds:Reference URI="#binarytoken">...</ds:Reference>
236         </ds:SignedInfo>
237         <ds:SignatureValue>HFLP...</ds:SignatureValue>
238         <ds:KeyInfo>
239             <wsse:SecurityTokenReference>
240                 <wsse:Reference URI="#binarytoken" />
241             </wsse:SecurityTokenReference>
242         </ds:KeyInfo>
243     </ds:Signature>
244 </wsse:Security>
245 </S11:Header>
246 <S11:Body wsu:Id="body"
247     xmlns:wsu="...">
248     ...
249 </S11:Body>
250 </S11:Envelope>

```

251 3.3.3 Reference to an Issuer and Serial Number

252 The signed data SHOULD contain a core bare name reference (as defined by the XPointer specification
253 [\[XPointer\]](#)) to the <ds:KeyInfo> element that contains the security token reference.

254

255 The following example shows a certificate referenced by means of its issuer name and serial number. In
256 this example the certificate is not included in the message. The scope of the signature defined by the
257 <ds:SignedInfo> element includes both the message body (#body) and the key information element
258 (#keyInfo). The <ds:KeyInfo> element contains a <wsse:SecurityTokenReference> element
259 which specifies the issuer and serial number of the specified certificate by means of the
260 <ds:X509IssuerSerial> element.

261

```

262 <S11:Envelope xmlns:S11="...">
263   <S11:Header>
264     <wsse:Security
265       xmlns:wsse="..."
266       xmlns:wsu="...">
267       <ds:Signature
268         xmlns:ds="...">
269         <ds:SignedInfo>...
270         <ds:Reference URI="#body">...</ds:Reference>
271         <ds:Reference URI="#keyinfo">...</ds:Reference>
272       </ds:SignedInfo>
273       <ds:SignatureValue>HFLP...</ds:SignatureValue>
274       <ds:KeyInfo Id="keyinfo">
275         <wsse:SecurityTokenReference>
276           <ds:X509Data>
277             <ds:X509IssuerSerial>
278               <ds:X509IssuerName>
279                 DC=ACMECorp, DC=com
280               </ds:X509IssuerName>
281               <ds:X509SerialNumber>12345678</ds:X509SerialNumber>
282             </ds:X509IssuerSerial>
283           </ds:X509Data>
284         </wsse:SecurityTokenReference>
285       </ds:KeyInfo>
286     </ds:Signature>
287   </wsse:Security>
288 </S11:Header>
289 <S11:Body wsu:Id="body"

```

```
290         xmlns:wsu="...">
291         ...
292         </S11:Body>
293     </S11:Envelope>
```

294 3.4 Encryption

295 Encrypted keys or data MAY identify a key required for decryption by identifying the corresponding key
296 used for encryption by means of any of the X.509 security token types or references specified herein.

297
298 Since the sole purpose is to identify the decryption key it is not necessary to specify either a trust path or
299 the specific contents of the certificate itself.

300
301 The following example shows a decryption key referenced by means of the issuer name and serial
302 number of an associated certificate. In this example the certificate is not included in the message. The
303 <ds:KeyInfo> element contains a <wsse:SecurityTokenReference> element which specifies the
304 issuer and serial number of the specified certificate by means of the <ds:X509IssuerSerial>
305 element.

```
306  
307 <S11:Envelope
308     xmlns:S11="..."
309     xmlns:ds="..."
310     xmlns:wsse="..."
311     xmlns:xenc="...">
312     <S11:Header>
313         <wsse:Security>
314             <xenc:EncryptedKey>
315                 <xenc:EncryptionMethod Algorithm="..."/>
316                 <ds:KeyInfo>
317                     <wsse:SecurityTokenReference>
318                         <ds:X509Data>
319                             <ds:X509IssuerSerial>
320                                 <ds:X509IssuerName>
321                                     DC=ACMECorp, DC=com
322                                 </ds:X509IssuerName>
323                                 <ds:X509SerialNumber>12345678</ds:X509SerialNumber>
324                             </ds:X509IssuerSerial>
325                         </ds:X509Data>
326                     </wsse:SecurityTokenReference>
327                 </ds:KeyInfo>
328                 <xenc:CipherData>
329                     <xenc:CipherValue>...</xenc:CipherValue>
330                 </xenc:CipherData>
331                 <xenc:ReferenceList>
332                     <xenc:DataReference URI="#encrypted"/>
333                 </xenc:ReferenceList>
334             </xenc:EncryptedKey>
335         </wsse:Security>
336     </S11:Header>
337     <S11:Body>
338         <xenc:EncryptedData Id="encrypted" Type="...">
339             <xenc:CipherData>
340                 <xenc:CipherValue>...</xenc:CipherValue>
341             </xenc:CipherData>
342         </xenc:EncryptedData>
343     </S11:Body>
344 </S11:Envelope>
```

345

346 The following example shows a decryption key referenced by means of the Thumbprint of an associated
347 certificate. In this example the certificate is not included in the message. The <ds:KeyInfo> element
348 contains a <wsse:SecurityTokenReference> element which specifies the Thumbprint of the
349 specified certificate by means of the http://docs.oasis-open.org/wss/oasis-wss-soap-
350 message-security-1.1#ThumbprintSHA1 attribute of the <wsse:KeyIdentifier> element.

```
351 <S11:Envelope  
352   xmlns:S11="..."  
353   xmlns:ds="..."  
354   xmlns:wsse="..."  
355   xmlns:xenc="...">  
356   <S11:Header>  
357     <wsse:Security>  
358       <xenc:EncryptedKey>  
359         <xenc:EncryptionMethod Algorithm="..."/>  
360         <ds:KeyInfo>  
361           <wsse:SecurityTokenReference>  
362             <wsse:KeyIdentifier  
363               ValueType="http://docs.oasis-open.org/wss/oasis-wss-  
364 soap-message-security-1.1#ThumbprintSHA1" >LKiQ/CmFrJDJqCLFcfjIsmZ/+0=  
365               </wsse:KeyIdentifier>  
366             </wsse:SecurityTokenReference>  
367           </ds:KeyInfo>  
368           <xenc:CipherData>  
369             <xenc:CipherValue>...</xenc:CipherValue>  
370           </xenc:CipherData>  
371           <xenc:ReferenceList>  
372             <xenc:DataReference URI="#encrypted"/>  
373           </xenc:ReferenceList>  
374         </xenc:EncryptedKey>  
375       </wsse:Security>  
376     </S11:Header>  
377     <S11:Body>  
378       <xenc:EncryptedData Id="encrypted" Type="...">  
379         <xenc:CipherData>  
380           <xenc:CipherValue>...</xenc:CipherValue>  
381         </xenc:CipherData>  
382       </xenc:EncryptedData>  
383     </S11:Body>  
384   </S11:Envelope>
```

385

386 3.5 Error Codes

387 When using X.509 certificates, the error codes defined in the WSS: SOAP Message Security specification
388 [\[WS-Security\]](#) MUST be used.

389

390 If an implementation requires the use of a custom error it is recommended that a sub-code be defined as
391 an extension of one of the codes defined in the WSS: SOAP Message Security specification [\[WS-
392 Security\]](#)

393 **4 Threat Model and Countermeasures (Non-**
394 **Normative)**

395 The use of X.509 certificate token introduces no new threats beyond those identified in WSS: SOAP
396 Message Security specification [\[WS-Security\]](#).

397
398 Message alteration and eavesdropping can be addressed by using the integrity and confidentiality
399 mechanisms described in WSS: SOAP Message Security [\[WS-Security\]](#). Replay attacks can be
400 addressed by using message timestamps and caching, as well as other application-specific tracking
401 mechanisms. For X.509 certificates, identity is authenticated by use of keys, man-in-the-middle attacks
402 are generally mitigated.

403
404 It is strongly RECOMMENDED that all relevant and immutable message data be signed.

405
406 It should be noted that a transport-level security protocol such as SSL or TLS [\[RFC2246\]](#) MAY be used to
407 protect the message and the security token as an alternative to or in conjunction with WSS: SOAP
408 Message Security specification [\[WS-Security\]](#).

5 References

409

410 The following are normative references

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440

441 **6 Conformance**

442 An implementation conforms to this specification if it meets the requirements in Sections 2.1, 2.2 and 3.

443 **A. Acknowledgements**

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449

450

B. Revision History

451

Revision	Date	Editor	Changes Made
WD01	17-January-2011	Carlo Milono	Corrected/added hyperlinks where missing; added Status section
WD02	8-February-2011	Carlo Milono	Added Related Work to reflect v1.1.1 of the specs; changed References for SOAP Message Security to reflect v1.1.1; Changed WD# to 2; Added Date; Moved Current Members to Previous and added new Current Members; saved document under wd02; entered the Revision History Merged Old Current Contributors with Old Previous, created a New Current Contributors.
WD03	16-March-2011	David Turner	Corrected and updated links.
CSD01	2-May-2011	TC Admin	Generated from WD03
CSD02-draft	16-May-11	David Turner	Added conformance statement and corrected a few formatting issues.

452