



# Web Services Security X.509 Certificate Token Profile Version 1.1.1

## Committee Specification Draft 01

23 March 2011

### Specification URIs:

#### This Version:

<http://docs.oasis-open.org/wss-m/wss/v1.1.1/csd01/wss-x509TokenProfile-v1.1.1-csd01.doc>  
(Authoritative)  
<http://docs.oasis-open.org/wss-m/wss/v1.1.1/csd01/wss-x509TokenProfile-v1.1.1-csd01.pdf>  
<http://docs.oasis-open.org/wss-m/wss/v1.1.1/csd01/wss-x509TokenProfile-v1.1.1-csd01.html>

#### Previous Version:

<http://docs.oasis-open.org/wss/v1.1/wss-v1.1-spec-errata-os-x509TokenProfile.doc>  
<http://docs.oasis-open.org/wss/v1.1/wss-v1.1-spec-errata-os-x509TokenProfile.pdf>  
<http://docs.oasis-open.org/wss/v1.1/wss-v1.1-spec-errata-os-x509TokenProfile.htm>

#### Latest Version:

<http://docs.oasis-open.org/wss-m/wss/v1.1.1/wss-x509TokenProfile-v1.1.1.doc> (Authoritative)  
<http://docs.oasis-open.org/wss-m/wss/v1.1.1/wss-x509TokenProfile-v1.1.1.pdf>  
<http://docs.oasis-open.org/wss-m/wss/v1.1.1/wss-x509TokenProfile-v1.1.1.html>

### Technical Committee:

OASIS Web Services Security Maintenance (WSS-M) TC

### Chair(s):

David Turner, Microsoft

### Editor(s):

Anthony Nadalin, IBM  
Chris Kaler, Microsoft  
Ronald Monzillo, Sun  
Phillip Hallam-Baker, Verisign  
Carlo Milono, Tibco

### Related work:

This specification is one part of a multi-part Work Product. The other parts include:

[Web Services Security: SOAP Message Security Version 1.1.1](#)  
[Web Services Security SAML Token Profile Version 1.1.1](#)  
[Web Services Security Kerberos Token Profile Version 1.1.1](#)  
[Web Services Security Rights Expression Language \(REL\) Token Profile Version 1.1.1](#)  
[Web Services Security SOAP Messages with Attachments \(SwA\) Profile Version 1.1.1](#)  
[Web Services Security Username Token Profile Version 1.1.1](#)  
Schemas: <http://docs.oasis-open.org/wss-m/wss/v1.1.1/csd01/xsd/>

This specification supersedes:

- [Web Services Security X.509 Certificate Token Profile 1.1](#), OASIS Standard  
Incorporating Approved Errata, 1 November 2006

- [Web Services Security X.509 Certificate Token Profile 1.1](#), OASIS Approved Errata, 1 November 2006

**Abstract:**

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

**Status:**

This document was last revised or approved by the [OASIS Web Services Security Maintenance \(WSS-M\) TC](#) on the above date. The level of approval is also listed above. Check the “Latest Version” location noted above for possible later revisions of this document.

Technical Committee members should send comments on this specification to the Technical Committee’s email list. Others should send comments to the Technical Committee by using the “[Send A Comment](#)” button on the Technical Committee’s web page at <http://www.oasis-open.org/committees/wss-m/>.

For information on whether any patents have been disclosed that may be essential to implementing this specification, and any offers of patent licensing terms, please refer to the Intellectual Property Rights section of the Technical Committee web page (<http://www.oasis-open.org/committees/wss-m/ipr.php>).

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).

**Citation Format:**

**[WSS-X509-Certificate-Token-Profile-V1.1.1]**

*Web Services Security X.509 Certificate Token Profile Version 1.1.1*. 23 March 2011. OASIS Committee Specification Draft 01. <http://docs.oasis-open.org/wss-m/wss/v1.1.1/csd01/wss-x509TokenProfile-v1.1.1-csd01.doc>.

---

## Notices

Copyright © OASIS Open 2011. All Rights Reserved.

All capitalized terms in the following text have the meanings assigned to them in the OASIS Intellectual Property Rights Policy (the "OASIS IPR Policy"). The full [Policy](#) may be found at the OASIS website.

This document and translations of it may be copied and furnished to others, and derivative works that comment on or otherwise explain it or assist in its implementation may be prepared, copied, published, and distributed, in whole or in part, without restriction of any kind, provided that the above copyright notice and this section are included on all such copies and derivative works. However, this document itself may not be modified in any way, including by removing the copyright notice or references to OASIS, except as needed for the purpose of developing any document or deliverable produced by an OASIS Technical Committee (in which case the rules applicable to copyrights, as set forth in the OASIS IPR Policy, must be followed) or as required to translate it into languages other than English.

The limited permissions granted above are perpetual and will not be revoked by OASIS or its successors or assigns.

This document and the information contained herein is provided on an "AS IS" basis and OASIS DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY OWNERSHIP RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

OASIS requests that any OASIS Party or any other party that believes it has patent claims that would necessarily be infringed by implementations of this OASIS Committee Specification or OASIS Standard, to notify OASIS TC Administrator and provide an indication of its willingness to grant patent licenses to such patent claims in a manner consistent with the IPR Mode of the OASIS Technical Committee that produced this specification.

OASIS invites any party to contact the OASIS TC Administrator if it is aware of a claim of ownership of any patent claims that would necessarily be infringed by implementations of this specification by a patent holder that is not willing to provide a license to such patent claims in a manner consistent with the IPR Mode of the OASIS Technical Committee that produced this specification. OASIS may include such claims on its website, but disclaims any obligation to do so.

OASIS takes no position regarding the validity or scope of any intellectual property or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; neither does it represent that it has made any effort to identify any such rights. Information on OASIS' procedures with respect to rights in any document or deliverable produced by an OASIS Technical Committee can be found on the OASIS website. Copies of claims of rights made available for publication and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this OASIS Committee Specification or OASIS Standard, can be obtained from the OASIS TC Administrator. OASIS makes no representation that any information or list of intellectual property rights will at any time be complete, or that any claims in such list are, in fact, Essential Claims.

The name "OASIS" is a trademark of [OASIS](#), the owner and developer of this specification, and should be used only to refer to the organization and its official outputs. OASIS welcomes reference to, and implementation and use of, specifications, while reserving the right to enforce its marks against misleading uses. Please see <http://www.oasis-open.org/who/trademark.php> for above guidance.

---

# Table of Contents

1	Introduction (Non-Normative) .....	5
2	Notations and Terminology (Normative).....	6
2.1	Notational Conventions.....	6
2.2	Namespaces.....	6
2.3	Terminology .....	7
3	Usage (Normative) .....	8
3.1	Token types .....	8
3.1.1	X509v3 Token Type .....	8
3.1.2	X509PKIPathv1 Token Type .....	8
3.1.3	PKCS7 Token Type.....	8
3.2	Token References .....	9
3.2.1	Reference to an X.509 Subject Key Identifier .....	9
3.2.2	Reference to a Security Token.....	9
3.2.3	Reference to an Issuer and Serial Number.....	10
3.3	Signature.....	10
3.3.1	Key Identifier.....	10
3.3.2	Reference to a Binary Security Token .....	11
3.3.3	Reference to an Issuer and Serial Number.....	12
3.4	Encryption.....	13
3.5	Error Codes.....	14
4	Threat Model and Countermeasures (Non-Normative).....	16
5	References .....	17
#	Conformance.....	18
A.	Acknowledgements .....	19
B.	Revision History.....	23

---

# 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.

---

## 15 2 Notations and Terminology (Normative)

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

### 17 2.1 Notational Conventions

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

21  
22 When describing abstract data models, this specification uses the notational convention used by the XML  
23 Infoset. Specifically, abstract property names always appear in square brackets (e.g., [some property]).

24  
25 When describing concrete XML schemas, this specification uses a convention where each member of an  
26 element's [children] or [attributes] property is described using an XPath-like notation (e.g.,  
27 /x:MyHeader/x:SomeProperty/@value1). The use of {any} indicates the presence of an element wildcard  
28 (<xs:any/>). The use of @{any} indicates the presence of an attribute wildcard (<xs:anyAttribute/>).

### 29 2.2 Namespaces

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

36  
37 The namespaces used in this document are shown in the following table (note that for brevity, the  
38 examples use the prefixes listed below but do not include the URIs – those listed below are assumed).

39  
40 `http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-`  
41 `1.0.xsd`  
42 `http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-`  
43 `1.0.xsd`  
44 `http://docs.oasis-open.org/wss/oasis-wss-wssecurity-secext-1.1.xsd`

45 The following namespace prefixes are used in this document:

Prefix	Namespace
S11	<code>http://schemas.xmlsoap.org/soap/envelope/</code>
S12	<code>http://www.w3.org/2003/05/soap-envelope</code>
ds	<code>http://www.w3.org/2000/09/xmldsig#</code>
xenc	<code>http://www.w3.org/2001/04/xmlenc#</code>

wsse	<a href="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-secext-1.0.xsd</a>
wsse11	<a href="http://docs.oasis-open.org/wss/oasis-wss-wssecurity-secext-1.1.xsd">http://docs.oasis-open.org/wss/oasis-wss-wssecurity-secext-1.1.xsd</a>
wsu	<a href="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd">http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd</a>

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](http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-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	<a href="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-soap-message-security-1.0#Base64Binary">http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-soap-message-security-1.0#Base64Binary</a>
#STR-Transform	<a href="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-soap-message-security-1.0#STR-Transform">http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-soap-message-security-1.0#STR-Transform</a>
#PKCS7	<a href="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-1.0#PKCS7">http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-1.0#PKCS7</a>
#X509v3	<a href="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-1.0#X509v3">http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-1.0#X509v3</a>
#X509SubjectKeyIdentifier	<a href="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-1.0#X509SubjectKeyIdentifier">http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-1.0#X509SubjectKeyIdentifier</a>

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/CmFrJDJqCLFcjlhIsmZ/+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 [\[WS-Security\]](#).

---

## 409 5 References

410 The following are normative references

- 411     **[Glossary]**        Informational RFC 2828, *Internet Security Glossary*, May 2000.  
412                        <http://www.ietf.org/rfc/rfc2828.txt>
- 413     **[KEYWORDS]**        S. Bradner, *Key words for use in RFCs to Indicate Requirement Levels*, RFC  
414                        2119, Harvard University, March 1997, <http://www.ietf.org/rfc/rfc2119.txt>
- 415     **[RFC2246]**        T. Dierks, C. Allen., *The TLS Protocol Version, 1.0*. IETF RFC 2246 January  
416                        1999. <http://www.ietf.org/rfc/rfc2246.txt>
- 417     **[SOAP11]**         W3C Note, "[SOAP: Simple Object Access Protocol 1.1](#)," 08 May 2000.
- 418     **[SOAP12]**         W3C Recommendation, "SOAP Version 1.2 Part 1: Messaging Framework", 23  
419                        June 2003.
- 420     **[URI]**             T. Berners-Lee, R. Fielding, L. Masinter, "Uniform Resource Identifiers (URI):  
421                        Generic Syntax," RFC 3986, MIT/LCS, Day Software, Adobe Systems, January  
422                        2005.
- 423     **[WS-Security]**     A. Nadalin et al., *Web Services Security: SOAP Message Security 1.1.1*  
424                        [http://docs.oasis-open.org/wss-m/wss/v1.1.1-csd01/wss-SOAPMessageSecurity-](http://docs.oasis-open.org/wss-m/wss/v1.1.1-csd01/wss-SOAPMessageSecurity-v1.1.1-csd01.pdf)  
425                        [v1.1.1-csd01.pdf](http://docs.oasis-open.org/wss-m/wss/v1.1.1-csd01/wss-SOAPMessageSecurity-v1.1.1-csd01.pdf).
- 426     **[PKCS7]**            *PKCS #7: Cryptographic Message Syntax Standard* RSA Laboratories,  
427                        November 1, 1993. <http://www.rsasecurity.com/rsalabs/pkcs/pkcs-7/index.html>
- 428     **[PKIPATH]**         [http://www.itu.int/rec/recommendation.asp?type=items&lang=e&parent=T-REC-](http://www.itu.int/rec/recommendation.asp?type=items&lang=e&parent=T-REC-X.509-200110-S!Cor1)  
429                        [X.509-200110-S!Cor1](http://www.itu.int/rec/recommendation.asp?type=items&lang=e&parent=T-REC-X.509-200110-S!Cor1)
- 430     **[X509]**             ITU-T Recommendation X.509 (1997 E): *Information Technology - Open*  
431                        *Systems Interconnection - The Directory: Authentication Framework*, June 1997.  
432

433 The following are non-normative references

- 434     **[XML-ns]**            T. Bray, D. Hollander, A. Layman. *Namespaces in XML. W3C Recommendation*.  
435                        January 1999. <http://www.w3.org/TR/1999/REC-xml-names-19990114>
- 436     **[XML Encrypt]**     W3C Recommendation, "XML Encryption Syntax and Processing," 10 December  
437                        2002
- 438     **[XML Signature]**    D. Eastlake, J. R., D. Solo, M. Bartel, J. Boyer , B. Fox , E. Simon. *XML-*  
439                        *Signature Syntax and Processing*, W3C Recommendation, 12 February 2002.  
440

---

441 **# Conformance**

442 The last numbered section in the specification must be the Conformance section. Conformance  
443 Statements/Clauses go here.

444 **A. Acknowledgements**

445 The following individuals have participated in the creation of this specification and are gratefully  
 446 acknowledged:

447 **Participants:**

448 **Current Contributors:**

Tom	Rutt	Fujitsu Limited
Jacques	Durand	Fujitsu Limited
Calvin	Powers	IBM
Kelvin	Lawrence	IBM
Michael	McIntosh	Individual
Thomas	Hardjono	M.I.T.
David	Turner	Microsoft Corporation
Anthony	Nadalin	Microsoft Corporation
Monica	Martin	Microsoft Corporation
Marc	Goodner	Microsoft Corporation
Peter	Davis	Neustar
Hal	Lockhart	Oracle Corporation
Rich	Levinson	Oracle Corporation
Anil	Saldhana	Red Hat
Martin	Raepple	SAP AG
Federico	Rossini	Telecom Italia S.p.a.
Carlo	Milono	TIBCO Software Inc.
Don	Adams	TIBCO Software Inc.
Jerry	Smith	US Department of Defense (DoD)

449 **Previous Contributors:**

Michael	Hu	Actional
Maneesh	Sahu	Actional
Duane	Nickull	Adobe Systems
Gene	Thurston	AmberPoint
Frank	Siebenlist	Argonne National Laboratory
Peter	Dapkus	BEA
Hal	Lockhart	BEA Systems
Denis	Pilipchuk	BEA Systems
Corinna	Witt	BEA Systems
Steve	Anderson	BMC Software
Rich	Levinson	Computer Associates
Thomas	DeMartini	ContentGuard
Guillermo	Lao	ContentGuard
TJ	Pannu	ContentGuard

Xin	Wang	ContentGuard
Merlin	Hughes	Cybertrust
Dale	Moberg	Cyclone Commerce
Shawn	Sharp	Cyclone Commerce
Rich	Salz	Datapower
Ganesh	Vaideeswaran	Documentum
Sam	Wei	EMC
Tim	Moses	Entrust
Carolina	Canales-Valenzuela	Ericsson
Dana S.	Kaufman	Forum Systems
Toshihiro	Nishimura	Fujitsu
Tom	Rutt	Fujitsu
Kefeng	Chen	GeoTrust
Irving	Reid	Hewlett-Packard
Kojiro	Nakayama	Hitachi
Yutaka	Kudo	Hitachi
Jason	Rouault	HP
Paula	Austel	IBM
Derek	Fu	IBM
Maryann	Hondo	IBM
Kelvin	Lawrence	IBM
Michael	McIntosh	IBM
Anthony	Nadalin	IBM
Nataraj	Nagaratnam	IBM
Bruce	Rich	IBM
Ron	Williams	IBM
Bob	Blakley	IBM
Joel	Farrell	IBM
Satoshi	Hada	IBM
Hiroshi	Maruyama	IBM
David	Melgar	IBM
Kent	Tamura	IBM
Wayne	Vicknair	IBM
Don	Flinn	Individual
Phil	Griffin	Individual
Mark	Hayes	Individual
John	Hughes	Individual
Peter	Rostin	Individual
Davanum	Srinivas	Individual

Bob	Morgan	Individual/Internet2
Kate	Cherry	Lockheed Martin
Paul	Cotton	Microsoft
Vijay	Gajjala	Microsoft
Martin	Gudgin	Microsoft
Chris	Kaler	Microsoft
Bob	Atkinson	Microsoft
Keith	Ballinger	Microsoft
Allen	Brown	Microsoft
Giovanni	Della-Libera	Microsoft
Alan	Geller	Microsoft
Johannes	Klein	Microsoft
Scott	Konersmann	Microsoft
Chris	Kurt	Microsoft
Brian	LaMacchia	Microsoft
Paul	Leach	Microsoft
John	Manferdelli	Microsoft
John	Shewchuk	Microsoft
Dan	Simon	Microsoft
Hervey	Wilson	Microsoft
Jeff	Hodges	Neustar
Frederick	Hirsch	Nokia
Senthil	Sengodan	Nokia
Abbie	Barbir	Nortel
Lloyd	Burch	Novell
Ed	Reed	Novell
Charles	Knouse	Oblix
Prateek	Mishra	Oracle
Vamsi	Motukuru	Oracle
Ramana	Turlapi	Oracle
Vipin	Samar	Oracle
Jerry	Schwarz	Oracle
Eric	Gravengaard	Reactivity
Andrew	Nash	Reactivity
Stuart	King	Reed Elsevier
Ben	Hammond	RSA Security
Rob	Philpott	RSA Security
Martijn	de Boer	SAP
Blake	Dournaee	Sarvega
Sundeep	Peechu	Sarvega

Coumara	Radja	Sarvega
Pete	Wenzel	SeeBeyond
Jonathan	Tourzan	Sony
Yassir	Elley	Sun
Manveen	Kaur	Sun Microsystems
Ronald	Monzillo	Sun Microsystems
Jan	Alexander	Systinet
Michael	Nguyen	The IDA of Singapore
Don	Adams	TIBCO Software Inc.
Symon	Chang	TIBCO Software Inc.
John	Weiland	US Navy
Hans	Granqvist	VeriSign
Phillip	Hallam-Baker	VeriSign
Hemma	Prafullchandra	VeriSign
Morten	Jorgensen	Vordel

450

451

## B. Revision History

452

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.

453

454