



Web Services Security Kerberos Token Profile Version 1.1.1

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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 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](#)
[Web Services Security X.509 Certificate Token Profile Version 1.1.1](#)
[Web Services Security SAML Token Profile Version 1.1.1](#)
Schemas: <http://docs.oasis-open.org/wss-m/wss/v1.1.1/csd02/xsd/>

This specification supersedes:

- [Web Services Security Kerberos Token Profile 1.1](#). 01 November 2006. OASIS Standard incorporating Approved Errata.

- [Web Services Security Kerberos Token Profile 1.1](#). 01 November 2006. OASIS Approved Errata.

Abstract:

This document describes how to use Kerberos [Kerb] tickets (specifically the AP-REQ packet) with the Web Services Security: SOAP Message Security 1.1.1.

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).

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1 Introduction

2 This specification describes the use of Kerberos [RFC1510] tokens with respect to the WSS: SOAP
3 Message Security specification [WSS].

4 Specifically, this document defines how to encode Kerberos tickets and attach them to SOAP messages.
5 As well, it specifies how to add signatures and encryption to the SOAP message, in accordance with
6 WSS: SOAP Message Security, which uses and references the Kerberos tokens.

7 For interoperability concerns, and for some security concerns, the specification is limited to using the AP-
8 REQ packet (service ticket and authenticator) defined by Kerberos as the Kerberos token. This allows a
9 service to authenticate the ticket and interoperate with existing Kerberos implementations.

10 It should be noted that how the AP-REQ is obtained is out of scope of this specification as are scenarios
11 involving other ticket types and user-to-user interactions.

12 Note that Sections 2.1, 2.2, all of 3, and indicated parts of 6 are normative. All other sections are non-
13 normative.

14 2 Notations and Terminology

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

16 2.1 Notational Conventions

17 The keywords "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD
18 NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described
19 in RFC2119 [2119].

20
21 Namespace URIs (of the general form "some-URI") represent some application-dependent or context-
22 dependent URI as defined in RFC2396 [URI].

23
24 This specification is designed to work with the general SOAP [S11, S12] message structure and message
25 processing model, and should be applicable to any version of SOAP. The current SOAP 1.2 namespace
26 URI is used herein to provide detailed examples, but there is no intention to limit the applicability of this
27 specification to a single version of SOAP.

28 2.2 Namespaces

29 The XML namespace [XML-ns] URIs that MUST be used by implementations of this specification are as
30 follows (note that different elements in this specification are from different namespaces):

31
32 [http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-
33 1.0.xsd](http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd)
34 [http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-
35 1.0.xsd](http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd)
36 <http://docs.oasis-open.org/wss/oasis-wss-wssecurity-secext-1.1.xsd>

37 Note that this specification does not introduce new schema elements.

38 The following namespaces are used in this document:

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

39

40 The URLs provided for the `wsse` and `wsu` namespaces can be used to obtain the schema files. URI
41 fragments defined in this specification are relative to the following base URI unless otherwise specified:

42 <http://docs.oasis-open.org/wss/oasis-wss-kerberos-token-profile-1.1>

43 **2.3 Terminology**

44 Readers are presumed to be familiar with the terms in the Internet Security Glossary [ISG].

45

46 This specification employs the terminology defined in the WSS: SOAP Message Security Core
47 Specification [WSS].

48

49 The following (non-normative) table defines additional acronyms and abbreviations for this document.

Term	Definition
SHA	Secure Hash Algorithm
SOAP	Simple Object Access Protocol
URI	Uniform Resource Identifier
XML	Extensible Markup Language

50

51 3 Usage

52 This section describes the profile (specific mechanisms and procedures) for the Kerberos binding of
53 WSS: SOAP Message Security.

54 **Identification:** [http://docs.oasis-open.org/wss/oasis-wss-kerberos-token-profile-](http://docs.oasis-open.org/wss/oasis-wss-kerberos-token-profile-1.1)
55 1.1

56 3.1 Processing Model

57 The processing model for WSS: SOAP Message Security with Kerberos tokens is no different from that of
58 WSS: SOAP Message Security with other token formats as described in WSS: SOAP Message Security.

59 3.2 Attaching Security Tokens

60 Kerberos tokens are attached to SOAP messages using WSS: SOAP Message Security by using the
61 `<wsse:BinarySecurityToken>` described in WSS: SOAP Message Security. When using this
62 element, the `@ValueType` attribute MUST be specified. This specification defines six values for this
63 attribute as defined in the table below:

URI	Description
http://docs.oasis-open.org/wss/oasis-wss-kerberos-token-profile-1.1#Kerberosv5_AP_REQ	Kerberos v5 AP-REQ as defined in the Kerberos specification [Kerb]. This <code>ValueType</code> is used when the ticket is an AP Request.
http://docs.oasis-open.org/wss/oasis-wss-kerberos-token-profile-1.1#GSS_Kerberosv5_AP_REQ	A GSS-API Kerberos V5 mechanism token containing an KRB_AP_REQ message as defined in RFC-1964 [1964], Sec. 1.1 and its successor RFC-4121 [4121], Sec. 4.1. This <code>ValueType</code> is used when the ticket is an AP Request (ST + Authenticator).
http://docs.oasis-open.org/wss/oasis-wss-kerberos-token-profile-1.1#Kerberosv5_AP_REQ1510	Kerberos v5 AP-REQ as defined in RFC1510. This <code>ValueType</code> is used when the ticket is an AP Request per RFC1510.
http://docs.oasis-open.org/wss/oasis-wss-kerberos-token-profile-1.1#GSS_Kerberosv5_AP_REQ1510	A GSS-API Kerberos V5 mechanism token containing an KRB_AP_REQ message as defined in RFC-1964, Sec. 1.1 and its successor RFC-4121, Sec. 4.1. This <code>ValueType</code> is used when the ticket is an AP Request (ST + Authenticator) per RFC1510.
http://docs.oasis-open.org/wss/oasis-wss-kerberos-token-profile-1.1#Kerberosv5_AP_REQ4120	Kerberos v5 AP-REQ as defined in RFC4120. This <code>ValueType</code> is used when the ticket is an AP Request per

	RFC4120
http://docs.oasis-open.org/wss/oasis-wss-kerberos-token-profile-1.1#GSS_Kerberosv5_AP_REQ4120	A GSS-API Kerberos V5 mechanism token containing an KRB_AP_REQ message as defined in RFC-1964, Sec. 1.1 and its successor RFC-4121, Sec. 4.1. This ValueType is used when the ticket is an AP Request (ST + Authenticator) per RFC4120.

64 It should be noted that the URIs in the table above also serve as the official URIs identifying the Kerberos
65 tokens defined in this specification.

66

67 All token types defined in this section use the type 0x8003 defined in RFC1964 for the checksum field of
68 the authenticator inside the AP_REQ.

69

70 The octet sequence of either the GSS-API framed KRB_AP_REQ token or an unwrapped AP_REQ is
71 encoded using the indicated encoding (e.g. base 64) and the result is placed inside of the
72 <wsse:BinarySecurityToken> element.

73 The following example illustrates a SOAP message with a Kerberos token.

```

74 <S11:Envelope xmlns:S11="..." xmlns:wssu="...">
75   <S11:Header>
76     <wsse:Security xmlns:wsse="...">
77       <wsse:BinarySecurityToken EncodingType="http://docs.oasis-
78 open.org/wss/2004/01/oasis-200401-wss-soap-message-security-1.0#Base64Binary"
79 ValueType="http://docs.oasis-open.org/wss/oasis-wss-kerberos-token-profile-
80 1.1#Kerberosv5_AP_REQ" wssu:Id="MyToken">boIBxDCCAcCgAwIBBaEDAgEOogcD...
81     </wsse:BinarySecurityToken>
82     ...
83   </wsse:Security>
84 </S11:Header>
85 <S11:Body>
86   ...
87 </S11:Body>
88 </S11:Envelope>

```

89

90 3.3 Identifying and Referencing Kerberos Tokens

91 A Kerberos Token is referenced by means of the <wsse:SecurityTokenReference> element. This
92 mechanism, defined in WSS: SOAP Message Security, provides different referencing mechanisms. The
93 following list identifies the supported and unsupported mechanisms:

94 The wssu:Id MAY be specified on the <wsse:BinarySecurityToken> element allowing the token to
95 be directly referenced.

96 A <wsse:KeyIdentifier> element MAY be used which specifies the identifier for the Kerberos ticket.
97 This value is computed as the SHA1 of the pre-encoded octets that were used to form the contents of the
98 <wsse:BinarySecurityToken> element. The <wsse:KeyIdentifier> element contains the
99 encoded form of the KeyIdentifier which is defined as the base64 encoding of the SHA1 result.

100 Key Name references MUST NOT be used.

101 When a Kerberos Token is referenced using <wsse:SecurityTokenReference> the
102 @wsse11:TokenType attribute SHOULD be specified. If the @wsse11:TokenType is specified its value
103 MUST be the URI that identifies the Kerberos token type as defined for a corresponding

104 BinarySecurityToken/@ValueType attribute. The Reference/@ValueType attribute is not
 105 required. If specified, its value MUST be equivalent to that of the @wsse11:TokenType attribute..
 106 The <wsse:SecurityTokenReference> element from which the reference is made contains the
 107 <wsse:KeyIdentifier> element. The <wsse:KeyIdentifier> element MUST have a ValueType
 108 attribute on the <wsse:KeyIdentifier> element with the value #Kerberosv5APREQSHA1 and its
 109 contents MUST be the SHA1 of GSS-API framed KRB_AP_REQ token or unwrapped AP-REQ, as
 110 appropriate, encoded as per the <wsse:KeyIdentifier> element's EncodingType attribute.
 111

Reference Identifier	ValueType URI	Description
Kerberos v5 AP-REQ	http://docs.oasis-open.org/wss/oasis-wss-kerberos-token-profile-1.1#Kerberosv5APREQSHA1	SHA1 of the v5 AP-REQ octets, either GSS-API framed KRB_AP_REQ token or just the Kerberos AP-REQ.

112
 113 The following example illustrates using ID references to a Kerberos token:
 114

```

115 <S11:Envelope xmlns:S11="..." xmlns:wsse="..." xmlns:wsu="...">
116   <S11:Header>
117     <wsse:Security>
118       <wsse:BinarySecurityToken EncodingType="http://docs.oasis-
119 open.org/wss/2004/01/oasis-200401-wss-soap-message-security-1.0#Base64Binary"
120 ValueType="http://docs.oasis-open.org/wss/oasis-wss-kerberos-token-profile-
121 1.1#Kerberosv5_AP_REQ" wsu:Id="MyToken">
122         boIBxDCCAcCgAwIBBaEDAgEOogcD...
123       </wsse:BinarySecurityToken>
124       ...
125       <wsse:SecurityTokenReference TokenType="http://docs.oasis-
126 open.org/wss/oasis-wss-kerberos-token-profile-1.1#Kerberosv5_AP_REQ">
127         <wsse:Reference URI="#MyToken"
128 ValueType="http://docs.oasis-open.org/wss/oasis-wss-kerberos-token-profile-
129 1.1#Kerberosv5_AP_REQ">
130           </wsse:Reference>
131         </wsse:SecurityTokenReference>
132         ...
133       </wsse:Security>
134     </S11:Header>
135     <S11:Body>
136       ...
137     </S11:Body>
138   </S11:Envelope>
139
```

140
 141 The AP-REQ packet is included in the initial message to the service, but need not be attached to
 142 subsequent messages exchanged between the involved parties. Consequently, the KeyIdentifier
 143 reference mechanism SHOULD be used on subsequent exchanges as illustrated in the example below:
 144

```

145 <S11:Envelope xmlns:S11="..." xmlns:wsse="..." xmlns:wsu="...">
146   <S11:Header>
147     <wsse:Security>
148       ...
149       <wsse:SecurityTokenReference
150 wsse11:TokenType=http://docs.oasis-open.org/wss/oasis-wss-kerberos-token-
151 profile-1.1#Kerberosv5_AP_REQ>

```

```
152         <wsse:KeyIdentifier ValueType="http://docs.oasis-  
153 open.org/wss/oasis-wss-kerberos-token-profile-1.1#Kerberosv5APREQSHA1">  
154             GbsDt+WmD9XlnUUWbY/nhBveW8I=  
155         </wsse:KeyIdentifier>  
156     </wsse:SecurityTokenReference>  
157         ...  
158     </wsse:Security>  
159 </S11:Header>  
160 <S11:Body>  
161     ...  
162 </S11:Body>  
163 </S11:Envelope>  
164
```

165 **3.4 Authentication**

166 When a Kerberos ticket is referenced as a signature key, the signature algorithm [DSIG] MUST be a
167 hashed message authentication code.

168
169 When a Kerberos ticket is referenced as an encryption key, the encryption algorithm MUST be a
170 symmetric encryption algorithm.

171
172 The value of the signature or encryption key is constructed from the value of the Kerberos sub-key when
173 it is present in the authenticator or a session key from the ticket if the sub-key is absent, either by using
174 the Kerberos sub-key or session key directly or using a key derived from that key using a mechanism
175 agreed to by the communicating parties.

176 **3.5 Encryption**

177 When a Kerberos ticket is referenced as an encryption key, the encryption algorithm MUST be a
178 symmetric encryption algorithm.

179
180 The value of the signature or encryption key is constructed from the value of the Kerberos sub-key when
181 it is present in the authenticator or a session key from the ticket if the sub-key is absent, either by using
182 the Kerberos sub-key or session key directly or using a key derived from that key using a mechanism
183 agreed to by the communicating parties..

184 **3.6 Principal Name**

185 Kerberos principal name definition and mapping of non-Kerberos names to Kerberos V principal names
186 are out of scope of this document.

187 **3.7 Error Codes**

188 When using Kerberos tokens, it is RECOMMENDED to use the error codes defined in the WSS: SOAP
189 Message Security specification. However, implementations MAY use custom errors, defined in private
190 namespaces if they desire. Care should be taken not to introduce security vulnerabilities in the errors
191 returned.

192 4 Threat Model and Countermeasures

193 The use of Kerberos assertion tokens with WSS: SOAP Message Security introduces no new message-
194 level threats beyond those identified for Kerberos itself or by WSS: SOAP Message Security with other
195 types of security tokens.

196
197 One potential threat is that of key re-use. The mechanisms described in WSS: SOAP Message Security
198 can be used to prevent replay of the message; however, it is possible that for some service scopes, there
199 are host security concerns of key hijacking within a Kerberos infrastructure. The use of the AP-REQ and
200 its associated authenticator and sequencer mitigate this threat.

201
202 Message alteration and eavesdropping can be addressed by using the integrity and confidentiality
203 mechanisms described in WSS: SOAP Message Security. Replay attacks can be addressed by using
204 message timestamps and caching, as well as other application-specific tracking mechanisms. For
205 Kerberos tokens ownership is verified by use of keys, so man-in-the-middle attacks are generally
206 mitigated.

207
208 It is strongly recommended that GSS wrapped AP-REQ be used or that unwrapped AP-REQ be
209 combined with timestamp be used to prevent replay attack.

210
211 It is strongly recommended that all relevant and immutable message data be signed to prevent replay
212 attacks.

213
214 It should be noted that transport-level security MAY be used to protect the message and the security
215 token in cases where neither a GSS-API framed KRB_AP_REQ token or an unwrapped AP-REQ
216 combined with timestamp and signature are being used.

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

219 5 References

220 The following are normative references

- 221 **[2119]** S. Bradner, "Key words for use in RFCs to Indicate Requirement Levels," [RFC](#)
222 2119, Harvard University, March 1997
- 223 **[Kerb]** J. Kohl and C. Neuman, "The Kerberos Network Authentication Service (V5),"
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- 225 **[KEYWORDS]** S. Bradner, "Key words for use in RFCs to Indicate Requirement Levels," [RFC](#)
226 2119, Harvard University, March 1997
- 227 **[S11]** W3C Note, "[SOAP: Simple Object Access Protocol 1.1](#)," 08 May 2000.
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229 June 2003.
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231 Generic Syntax," RFC 3986, MIT/LCS, Day Software, Adobe Systems, January
232 2005.
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234 [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)
235 [v1.1.1-csd01.pdf](http://docs.oasis-open.org/wss-m/wss/v1.1.1/csd01/wss-SOAPMessageSecurity-v1.1.1-csd01.pdf).
- 236 **[1964]** J. Linn , The Kerberos Version 5 GSS-API Mechanism, RFC 1964, June 1996.
- 237 **[4121]** L. Zhu, K. Jaganathan, S. Hartman, The Kerberos Version 5 Generic Security
238 Service Application Program Interface (GSS-API) Mechanism: Version 2, RFC
239 4121, July 2005.

240 The following are non-normative references

- 241 **[ISG]** Informational RFC 2828, "[Internet Security Glossary](#)," May 2000.
- 242 **[XML-ns]** W3C Recommendation, "[Namespaces in XML](#)," 14 January 1999.
- 243 **[DSIG]** D. Eastlake, J. R., D. Solo, M. Bartel, J. Boyer , B. Fox , E. Simon. *XML-*
244 *Signature Syntax and Processing*, W3C Recommendation, 12 February 2002.
245 <http://www.w3.org/TR/xmlsig-core/>.

246

6 Conformance

247

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

248

249

A. Acknowledgements

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

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B. Revision History

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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; Changed the Acknowledgements from Participants to reflect them as Current Contributors and Previous 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.

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