



Web Services Security: Interop 1 Scenarios

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Abstract:

This document documents the three scenarios to be used in the first WSS Interoperability Event.

Status:

Committee members should send comments on this specification to the wss@lists.oasis-open.org list. Others should subscribe to and send comments to the wss-comment@lists.oasis-open.org list. To subscribe, send an email message to wss-comment-request@lists.oasis-open.org with the word "subscribe" as the body of the message.

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103 **Introduction**

104 This document describes the three message exchanges to be tested during the first
105 interoperability event of the WSS TC. All three use the Request/Response Message Exchange
106 Pattern (MEP) with no intermediaries. All three invoke the same simple application. The scenarios
107 build in complexity. Scenario #1 is the simplest and Scenario #3 is the most complex.

108 These scenarios are intended to test the interoperability of different implementations performing
109 common operations and to test the soundness of the various specifications and clarity and mutual
110 understanding of their meaning and proper application.

111 THESE SCENARIOS ARE NOT INTENDED TO REPRESENT REASONABLE OR USEFUL
112 PRACTICAL APPLICATIONS OF THE SPECIFICATIONS. THEY HAVE BEEN DESIGNED
113 PURELY FOR THE PURPOSES INDICATED ABOVE AND DO NOT NECESSARILY
114 REPRESENT EFFICIENT OR SECURE MEANS OF PERFORMING THE INDICATED
115 FUNCTIONS. IN PARTICULAR THESE SCENARIOS ARE KNOWN TO VIOLATE SECURITY
116 BEST PRACTICES IN SOME RESPECTS AND IN GENERAL HAVE NOT BEEN EXTENSIVELY
117 VETTED FOR ATTACKS.

118 **1.1 Terminology**

119 The key words *must*, *must not*, *required*, *shall*, *shall not*, *should*, *should not*, *recommended*, *may*,
120 and *optional* in this document are to be interpreted as described in [RFC2119].

121 **2 Test Application**

122 All three scenarios use the same, simple application.

123 The Requester sends a Ping element with a value of a string.

124 The Responder returns a PingResponse element with a value of the same string.

125 3 Scenario #1

126 The Request header contains a Username and Password. The response does not contain a
127 security header.

128 3.1 Agreements

129 This section describes the agreements that must be made, directly or indirectly between parties
130 who wish to interoperate.

131 USERNAME-PASSWORD-LIST is a list of value pairs of usernames and their associated
132 passwords.

133 3.2 Parameters

134 This section describes parameters that are required to correctly create or process messages, but
135 not a matter of mutual agreement.

136 No parameters are required.

137 3.3 General Message Flow

138 This section provides a general overview of the flow of messages.

139 This contract covers a request/response MEP over the http binding. SOAP 1.1 MUST be used.
140 As required by SOAP 1.1, the SOAPAction http header MUST be present. Any value, including a
141 null string may be used. The recipient SHOULD ignore the value.. The request contains a
142 plaintext password. The receiver checks the message and issues a Fault if any errors are found.
143 Otherwise it returns the response without any security mechanisms.

144 3.4 First Message - Request

145 3.4.1 Message Elements and Attributes

146 Items not listed in the following table MAY be present, but MUST NOT be marked with the
147 mustUnderstand="1" attribute. Items marked mandatory MUST be generated and processed.
148 Items marked optional MAY be generated and MUST be processed if present. Items MUST
149 appear in the order specified, except as noted.

150

Name	Mandatory?
Security	Mandatory
mustUnderstand="1"	Mandatory
UsernameToken	Mandatory
Username	Mandatory
Password	Mandatory
Body	Mandatory

151

152 **3.4.2 Message Creation**

153 **3.4.2.1 Security**

154 The Security element MUST contain the mustUnderstand="1" attribute.

155 **3.4.2.2 UsernameToken**

156 The Username and Password MUST match a username/password pair in the USERNAME-
157 PASSWORD-LIST.

158 **3.4.2.3 Body**

159 The body is not signed or encrypted in any way.

160 **3.4.3 Message Processing**

161 This section describes the processing performed by the receiver. If an error is detected, the
162 processing of this message stops and a Fault is issued.

163 **3.4.3.1 Security**

164 **3.4.3.2 UsernameToken**

165 The Username and Password MUST match one of the pairs in the USERNAME-PASSWORD-
166 LIST, otherwise it is an error.

167 **3.4.3.3 Body**

168 The body is passed to the application without modification.

169 **3.4.4 Example (Non-normative)**

170 Here is an example request.

```
171 <?xml version="1.0" encoding="utf-8" ?>
172 <soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"
173 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
174 xmlns:xsd="http://www.w3.org/2001/XMLSchema">
175   <soap:Header>
176     <wsse:Security soap:mustUnderstand="1"
177 xmlns:wsse="http://schemas.xmlsoap.org/ws/2003/06/secext">
178       <wsse:UsernameToken>
179         <wsse:Username>Chris</wsse:Username>
180         <wsse:Password
181           Type="wsse:PasswordText">sirhC</wsse:Password>
182       </wsse:UsernameToken>
183     </wsse:Security>
184   </soap:Header>
185   <soap:Body>
186     <Ping xmlns="http://xmlsoap.org/Ping">
187       <text>EchoString</text>
188     </Ping>
189   </soap:Body>
190 </soap:Envelope>
```

191 3.5 Second Message - Response

192 3.5.1 Message Elements and Attributes

193 Items not listed in the following table MUST NOT be created or processed. Items marked
194 mandatory MUST be generated and processed. Items marked optional MAY be generated and
195 MUST be processed if present. Items MUST appear in the order specified, except as noted.

196

Name	Mandatory?
Body	Mandatory

197

198 3.5.2 Message Creation

199 The response message must not contain a <wsse:Security> header. Any other header elements
200 MUST NOT be labeled with a mustUnderstand="1" attribute.

201 3.5.3 Message Processing

202 The body is passed to the application without modification.

203 3.5.4 Example (Non-normative)

204 Here is an example response.

```
205 <?xml version="1.0" encoding="utf-8" ?>  
206 <soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"  
207 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"  
208 xmlns:xsd="http://www.w3.org/2001/XMLSchema">  
209   <soap:Body>  
210     <PingResponse xmlns="http://xmlsoap.org/Ping">  
211       <text>EchoString</text>  
212     </PingResponse>  
213   </soap:Body>  
214 </soap:Envelope>
```

215 3.6 Other processing

216 This section describes processing that occurs outside of generating or processing a message.

217 3.6.1 Requester

218 No additional processing is required.

219 3.6.2 Responder

220 No additional processing is required.

221 3.7 Expected Security Properties

222 Use of the service is restricted to parties that know how to construct a correct password value.
223 There is no protection against interception or replay of the password or of interception or
224 modification of the message body.

225

226 **4 Scenario #2**

227 The Request header contains a Username and Password that have been encrypted using a
228 public key provided out-of-band. The response does not contain a security header

229 **4.1 Agreements**

230 This section describes the agreements that must be made, directly or indirectly between parties
231 who wish to interoperate.

232 **4.1.1 USERNAME-PASSWORD-LIST**

233 This is a list of value pairs of usernames and their associated passwords.

234 **4.1.2 CERT-VALUE**

235 This is an opaque identifier indicating the X.509 certificate to be used. The certificate in question
236 MUST be obtained by the Requester by unspecified means. The certificate SHOULD NOT have a
237 KeyUsage extension. If the KeyUsage extension is present, it SHOULD include the values of
238 keyEncipherment and dataEncipherment.

239 The Responder MUST have access to the Private key corresponding to the Public key in the
240 certificate.

241 **4.2 Parameters**

242 This section describes parameters that are required to correctly create or process messages, but
243 not a matter of mutual agreement.

244 **4.2.1 MAX-CLOCK-SKEW**

245 This has the value of the assumed maximum skew between the local times of any two systems.

246 **4.2.2 MAX-NONCE-AGE**

247 This has the value of the length of time a previously received Nonce value will be stored.

248 **4.3 General Message Flow**

249 This section provides a general overview of the flow of messages.

250 This contract covers a request/response MEP over the http binding. SOAP 1.1 MUST be used.
251 As required by SOAP 1.1, the SOAPAction http header MUST be present. Any value, including a
252 null string may be used. The recipient SHOULD ignore the value.. The request contains an
253 encrypted username token containing a plaintext password. The Responder decrypts the token
254 and checks the username and password. If no errors are detected it returns the response without
255 any security mechanisms.

256 **4.4 First Message - Request**

257 **4.4.1 Message Elements and Attributes**

258 Items not listed in the following table MAY be present, but MUST NOT be marked with the
259 mustUnderstand="1" attribute. Items marked mandatory MUST be generated and processed.

260 Items marked optional MAY be generated and MUST be processed if present. Items MUST
 261 appear in the order specified, except as noted.
 262

Name	Mandatory?
Security	Mandatory
mustUnderstand="1"	Mandatory
EncryptedKey	Mandatory
EncryptionMethod	Mandatory
KeyInfo	Mandatory
SecurityTokenReference	Mandatory
KeyIdentifier	Mandatory
CipherData	Mandatory
ReferenceList	Mandatory
EncryptedData	Mandatory
EncryptionMethod	Mandatory
Cipherdata	Mandatory
UsernameToken	Mandatory
Username	Mandatory
Password	Mandatory
Nonce	Mandatory
Created	Mandatory
Body	Mandatory

263

264 **4.4.2 Message Creation**

265 **4.4.2.1 Security**

266 The Security element MUST contain the mustUnderstand="1" attribute.

267 **4.4.2.2 EncryptedKey**

268 The EncryptionMethod MUST contain the Algorithm attribute. The algorithm MUST be RSA v1.5.

269 The KeyInfo MUST contain a SecurityTokenReference. The SecurityTokenReference MUST
 270 contain a KeyIdentifier with a ValueType attribute with a value of X509v3. The KeyIdentifier
 271 MUST have the value of CERT-VALUE.

272 The CipherData MUST contain the encrypted form of the random key, encrypted under the Public
 273 Key specified in the specified X.509 certificate, using the specified algorithm.

274 The ReferenceList MUST contain a DataReference which has the value of a relative URI that
 275 refers to the encrypted UsernameToken.

276 **4.4.2.3 EncryptedData**

277 The Type MUST have the value of #Element.

278 The EncryptionMethod MUST contain the Algorithm attribute. The algorithm MUST be triple DES
279 – CBC.

280 The CypherData MUST contain the encrypted form of the UsernameToken, encrypted under a
281 random key, using the specified algorithm.

282 **4.4.2.4 UsernameToken**

283 The Username and Password MUST match a username/password pair in the USERNAME-
284 PASSWORD-LIST. The Nonce MUST have a value that is unique for at least a 24-hour period,
285 coded in base 64. The Created MUST have the value of the local time when the message is
286 created.

287 **4.4.2.5 Body**

288 The body is not signed or encrypted in any way.

289 **4.4.3 Message Processing**

290 This section describes the processing performed by the Responder. If an error is detected, the
291 Responder MUST cease processing the message and issue a Fault with a value of
292 FailedAuthentication.

293 **4.4.3.1 Security**

294 **4.4.3.2 EncryptedKey**

295 The random key contained in the CipherData MUST be decrypted using the Private Key
296 corresponding to the certificate specified by the KeyIdentifier, using the specified algorithm.

297 **4.4.3.3 EncryptedData**

298 The UsernameToken contained in the EncryptedData, referenced by the ReferenceList MUST be
299 decrypted using the random key, using the specified algorithm.

300 **4.4.3.4 UsernameToken**

301 The Username and Password MUST match one of the pairs in the USERNAME-PASSWORD-
302 LIST, otherwise it is an error. If the Nonce value matches any stored Nonce value it is an error. If
303 the Created value is older than the current local time minus MAX-NONCE-AGE minus MAX-
304 CLOCK-SKEW, it is an error.

305 If there is no error, the Nonce and Created values from the message are stored.

306 **4.4.3.5 Body**

307 The body is passed to the application without modification.

308 **4.4.4 Example (Non-normative)**

309 Here is an example of the UsernameToken before encryption.

```
310 <wsse:UsernameToken>  
311   <wsse:Username>Chris</wsse:Username>  
312   <wsse:Password  
313     Type="wsse:PasswordText">sirhC</wsse:Password>  
314   <wsse:Nonce>ykEFh55E52hCeJk5vDdUBQ==</wsse:Nonce>
```

315 <wsu:Created>2003-03-18T19:50:33Z</wsu:Created>
316 </wsse:UsernameToken>

317 Here is an example of the request.

```
318 <soap:Envelope xmlns:wsse="http://schemas.xmlsoap.org/ws/2003/06/secext "  
319 xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"  
320 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"  
321 xmlns:xsd="http://www.w3.org/2001/XMLSchema">  
322 <soap:Header>  
323 <wsse:Security soap:mustUnderstand="1"  
324 xmlns:wsse="http://schemas.xmlsoap.org/ws/2003/06/secext">  
325 <xenc:EncryptedKey xmlns:xenc="http://www.w3.org/2001/04/xmlenc#">  
326 <xenc:EncryptionMethod Algorithm="http://www.w3.org/2001/04/xmlenc#rsa-1_5"/>  
327 <KeyInfo xmlns="http://www.w3.org/2000/09/xmldsig#">  
328 <wsse:SecurityTokenReference>  
329 <wsse:KeyIdentifier ValueType="wsse:X509v3">B39R...=</wsse:KeyIdentifier>  
330 </wsse:SecurityTokenReference>  
331 </KeyInfo>  
332 <xenc:CipherData>  
333 <xenc:CipherValue>pPzyO...XlM=</xenc:CipherValue>  
334 </xenc:CipherData>  
335 <xenc:ReferenceList>  
336 <xenc:DataReference URI="#enc-un" />  
337 </xenc:ReferenceList>  
338 </xenc:EncryptedKey>  
339 <xenc:EncryptedData Id="enc-un" Type="http://www.w3.org/2001/04/xmlenc#Element "  
340 xmlns:xenc="http://www.w3.org/2001/04/xmlenc#">  
341 <xenc:EncryptionMethod Algorithm="http://www.w3.org/2001/04/xmlenc#tripleDES-  
342 cbc" />  
343 <xenc:CipherData>  
344 <xenc:CipherValue>A/ufDw...chA==</xenc:CipherValue>  
345 </xenc:CipherData>  
346 </xenc:EncryptedData>  
347 </wsse:Security>  
348 </soap:Header>  
349 <soap:Body>  
350 <Ping xmlns="http://xmlsoap.org/Ping">  
351 <text>EchoString</text>  
352 </Ping>  
353 </soap:Body>  
354 </soap:Envelope>
```

355 4.5 Second Message - Response

356 4.5.1 Message Elements and Attributes

357 Items not listed in the following table MUST NOT be created or processed. Items marked
358 mandatory MUST be generated and processed. Items marked optional MAY be generated and
359 MUST be processed if present. Items MUST appear in the order specified, except as noted.

360

Name	Mandatory?
Body	Mandatory

361

362 4.5.2 Message Creation

363 The response message must not contain a <wsse:Security> header. Any other header elements
364 MUST NOT be labeled with a mustUnderstand="1" attribute.

365 4.5.3 Message Processing

366 The body is passed to the application without modification.

367 **4.5.4 Example (Non-normative)**

368 Here is an example response.

```
369 <?xml version="1.0" encoding="utf-8" ?>
370 <soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"
371 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
372 xmlns:xsd="http://www.w3.org/2001/XMLSchema">
373 <soap:Body>
374 <PingResponse xmlns="http://xmlsoap.org/Ping">
375 <text>EchoString</text>
376 </PingResponse>
377 </soap:Body>
378 </soap:Envelope>
```

379 **4.6 Other processing**

380 This section describes processing that occurs outside of generating or processing a message.

381 **4.6.1 Requester**

382 No additional processing is required.

383 **4.6.2 Responder**

384 Periodically, stored Nonce values which are older than the current local time minus MAX-
385 NONCE-AGE minus MAX-CLOCK-SKEW MAY be discarded.

386 **4.7 Expected Security Properties**

387 Use of the service is restricted to parties that know how to construct a correct username
388 password pair. The password is protected against interception and replay. The other headers and
389 body are not protected against interception or modification. Encrypting such a short and likely to
390 be known value creates the risk of a known plaintext attack.

391

392 **5 Scenario #3**

393 The Request Body contains data that has been signed and encrypted. The certificate used to
394 verify the signature is provided in the header. The certificate associated with the encryption is
395 provided out-of-band. The Response Body is also signed and encrypted, reversing the roles of
396 the key pairs identified by the certificates.

397 **5.1 Agreements**

398 This section describes the agreements that must be made, directly or indirectly between parties
399 who wish to interoperate.

400 **5.1.1 CERT-VALUE**

401 This is an opaque identifier indicating the X.509 certificate to be used. The certificate in question
402 MUST be obtained by the Requester by unspecified means. The certificate SHOULD NOT have a
403 KeyUsage extension. If it does contain a KeyUsage extension, it SHOULD include the values of
404 keyEncipherment, dataEncipherment and digitalSignature.

405 The Responder MUST have access to the Private key corresponding to the Public key in the
406 certificate.

407 **5.1.2 Signature Trust Root**

408 This refers generally to agreeing on at least one trusted key and any other certificates and
409 sources of revocation information sufficient to validate certificates sent for the purpose of
410 signature verification.

411 **5.2 Parameters**

412 This section describes parameters that are required to correctly create or process messages, but
413 not a matter of mutual agreement.

414 No parameters are required.

415 **5.3 General Message Flow**

416 This section provides a general overview of the flow of messages.

417 This contract covers a request/response MEP over the http binding. SOAP 1.1 MUST be used.
418 As required by SOAP 1.1, the SOAPAction http header MUST be present. Any value, including a
419 null string may be used. The recipient SHOULD ignore the value.. The request contains a body,
420 which is signed and then encrypted. The certificate for signing is included in the message. The
421 certificate for encryption is provided externally. The Responder decrypts the body and then
422 verifies the signature. If no errors are detected it returns the response signing and encrypting the
423 message body. The roles of the key pairs are reversed from that of the request, using the signing
424 key to encrypt and the encryption key to sign.

425 **5.4 First Message - Request**

426 **5.4.1 Message Elements and Attributes**

427 Items not listed in the following table MAY be present, but MUST NOT be marked with the
428 mustUnderstand="1" attribute. Items marked mandatory MUST be generated and processed.

429 Items marked optional MAY be generated and MUST be processed if present. Items MUST
 430 appear in the order specified, except as noted.
 431

Name	Mandatory?
Timestamp	Mandatory
Security	Mandatory
mustUnderstand="1"	Mandatory
EncryptedKey	Mandatory
EncryptionMethod	Mandatory
KeyInfo	Mandatory
SecurityTokenReference	Mandatory
KeyIdentifier	Mandatory
CipherData	Mandatory
ReferenceList	Mandatory
BinarySecurityToken	Mandatory
Signature	Mandatory
SignedInfo	Mandatory
CanonicalizationMethod	Mandatory
SignatureMethod	Mandatory
Reference	Mandatory
SignatureValue	Mandatory
KeyInfo	Mandatory
Body	Mandatory
EncryptedData	Mandatory
EncryptionMethod	Mandatory
Cipherdata	Mandatory

432

433 **5.4.2 Message Creation**

434 **5.4.2.1 Timestamp**

435 The Created element within the Timestamp SHOULD contain the current local time at the sender.

436 **5.4.2.2 Security**

437 The Security element MUST contain the mustUnderstand="1" attribute.

438 **5.4.2.3 EncryptedKey**

439 The EncryptionMethod MUST contain the Algorithm attribute. The algorithm MUST be RSA v1.5.
440 The KeyInfo MUST contain a SecurityTokenReference. The SecurityTokenReference MUST
441 contain a KeyIdentifier with a ValueType attribute with a value of X509v3. The KeyIdentifier
442 MUST have the value of CERT-VALUE.

443 The CipherData MUST contain the encrypted form of the random key, encrypted under the Public
444 Key specified in the specified X.509 certificate, using the specified algorithm.

445 The ReferenceList MUST contain a DataReference which has the value of a relative URI that
446 refers to the encrypted body of the message.

447 **5.4.2.4 BinarySecurityToken**

448 The ValueType MUST be X.509 v3. The EncodingType MUST be Base 64. The token MUST be
449 labeled with an Id so it can be referenced by the signature. The value MUST be a PK certificate
450 suitable for verifying the signature and encrypting the response. The certificate SHOULD NOT
451 have a KeyUsage extension. If it does contain a KeyUsage extension, it SHOULD include the
452 values of keyEncipherment, dataEncipherment and digitalSignature. The Requester must have
453 access to the private key corresponding to the public key in the certificate.

454 **5.4.2.5 Signature**

455 The signature is over the entire SOAP body.

456 **5.4.2.5.1 SignedInfo**

457 The CanonicalizationMethod MUST be Exclusive Canonicalization. The SignatureMethod MUST
458 be RSA-SHA1. The Reference MUST specify a relative URI that refers to the SOAP Body
459 element. The only Transform specified MUST be Exclusive Canonicalization. The DigestMethod
460 MUST be SHA1.

461 **5.4.2.5.2 SignatureValue**

462 The SignatureValue MUST be calculated as specified by the specification, using the private key
463 corresponding to the public key specified in the certificate in the BinarySecurityToken.

464 **5.4.2.5.3 KeyInfo**

465 The KeyInfo MUST contain a SecurityTokenReference with a reference to a relative URI which
466 indicates the BinarySecurityToken containing the certificate which will be used for signature
467 verification.

468 **5.4.2.6 Body**

469 The body element MUST be first signed and then its contents encrypted.

470 **5.4.2.7 EncryptedData**

471 The EncryptedData MUST be labeled with an Id referenced in the ReferenceList of the
472 EncryptedKey.

473 The Type MUST have the value of #Content.

474 The EncryptionMethod MUST contain the Algorithm attribute. The algorithm MUST be triple DES
475 – CBC.

476 The CypherData MUST contain the encrypted form of the Body, encrypted under a random key,
477 using the specified algorithm.

478 **5.4.3 Message Processing**

479 This section describes the processing performed by the Responder. If an error is detected, the
480 Responder MUST cease processing the message and issue a Fault with a value of
481 FailedAuthentication.

482 **5.4.3.1 Timestamp**

483 The Timestamp element MUST be ignored.

484 **5.4.3.2 Security**

485 **5.4.3.3 EncryptedKey**

486 The random key contained in the CipherData MUST be decrypted using the private key
487 corresponding to the certificate specified by the KeyIdentifier, using the specified algorithm.

488 **5.4.3.4 Body**

489 The contents of the body MUST first be decrypted and then the signature verified. If no errors are
490 detected, the body MUST be passed to the application.

491 **5.4.3.5 EncryptedData**

492 The message body contents contained in the EncryptedData, referenced by the ReferenceList
493 MUST be decrypted using the random key, using the specified algorithm.

494 **5.4.3.6 BinarySecurityToken**

495 The certificate in the token MUST be validated. The Subject of the certificate MUST be an
496 authorized entity. The public key in the certificate MUST be retained for verification of the
497 signature.

498 **5.4.3.7 Signature**

499 The body after decryption, MUST be verified against the signature using the specified algorithms
500 and transforms and the retained public key.

501 **5.4.4 Example (Non-normative)**

502 Here is an example request.

```
503 <?xml version="1.0" encoding="utf-8" ?>
504 <soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"
505 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
506 xmlns:xsd="http://www.w3.org/2001/XMLSchema">
507 <soap:Header>
508 <wsu:Timestamp xmlns:wsu="http://schemas.xmlsoap.org/ws/2003/06/utility">
509 <wsu:Created>2003-03-18T19:53:13Z</wsu:Created>
510 </wsu:Timestamp>
511 <wsse:Security soap:mustUnderstand="1"
512 xmlns:wsse="http://schemas.xmlsoap.org/ws/2003/06/secext">
513 <xenc:EncryptedKey xmlns:xenc="http://www.w3.org/2001/04/xmlenc#">
514 <xenc:EncryptionMethod Algorithm="http://www.w3.org/2001/04/xmlenc#rsa-1_5"
515 />
516 <KeyInfo xmlns="http://www.w3.org/2000/09/xmldsig#">
517 <wsse:SecurityTokenReference>
518 <wsse:KeyIdentifier
519 Value="wsse:X509v3">B39R...mY=</wsse:KeyIdentifier>
520 </wsse:SecurityTokenReference>
521 </KeyInfo>
522 <xenc:CipherData>
```

```

523     <xenc:CipherValue>dNYS...fQ=</xenc:CipherValue>
524 </xenc:CipherData>
525 <xenc:ReferenceList>
526   <xenc:DataReference URI="#enc" />
527 </xenc:ReferenceList>
528 </xenc:EncryptedKey>
529 <wsse:BinarySecurityToken ValueType="wsse:X509v3"
530 EncodingType="wsse:Base64Binary"
531 xmlns:wsu="http://schemas.xmlsoap.org/ws/2003/06/utility"
532 wsu:Id="myCert">MII...hk</wsse:BinarySecurityToken>
533 <Signature xmlns="http://www.w3.org/2000/09/xmldsig#">
534 <SignedInfo>
535   <CanonicalizationMethod Algorithm="http://www.w3.org/2001/10/xml-exc-c14n#"
536 />
537   <SignatureMethod Algorithm="http://www.w3.org/2000/09/xmldsig#rsa-sha1"/>
538   <Reference URI="#body">
539     <Transforms>
540       <Transform Algorithm="http://www.w3.org/2001/10/xml-exc-c14n#" />
541     </Transforms>
542     <DigestMethod Algorithm="http://www.w3.org/2000/09/xmldsig#sha1"/>
543     <DigestValue>QTV...dw=</DigestValue>
544   </Reference>
545 </SignedInfo>
546 <SignatureValue>H+x0...gUw=</SignatureValue>
547 <KeyInfo>
548   <wsse:SecurityTokenReference>
549     <wsse:Reference URI="#myCert" />
550   </wsse:SecurityTokenReference>
551 </KeyInfo>
552 </Signature>
553 </wsse:Security>
554 </soap:Header>
555 <soap:Body wsu:Id="body"
556 xmlns:wsu="http://schemas.xmlsoap.org/ws/2003/06/utility">
557   <xenc:EncryptedData Id="enc" Type="http://www.w3.org/2001/04/xmlenc#Content"
558   xmlns:xenc="http://www.w3.org/2001/04/xmlenc#">
559     <xenc:EncryptionMethod Algorithm="http://www.w3.org/2001/04/xmlenc#tripleDES-
560 cbc" />
561     <xenc:CipherData>
562       <xenc:CipherValue>AYb...Y8=</xenc:CipherValue>
563     </xenc:CipherData>
564   </xenc:EncryptedData>
565 </soap:Body>
566 </soap:Envelope>

```

567

568 5.5 Second Message - Response

569 5.5.1 Message Elements and Attributes

570 Items not listed in the following table MUST NOT be created or processed. Items marked
571 mandatory MUST be generated and processed. Items marked optional MAY be generated and
572 MUST be processed if present. Items MUST appear in the order specified, except as noted.

573

Name	Mandatory?
Timestamp	Mandatory
Security	Mandatory
mustUnderstand="1"	Mandatory
BinarySecurityToken	Mandatory

EncryptedKey	Mandatory
EncryptionMethod	Mandatory
KeyInfo	Mandatory
SecurityTokenReference	Mandatory
KeyIdentifier	Mandatory
CipherData	Mandatory
ReferenceList	Mandatory
Signature	Mandatory
SignedInfo	Mandatory
CanonicalizationMethod	Mandatory
SignatureMethod	Mandatory
Reference	Mandatory
SignatureValue	Mandatory
KeyInfo	Mandatory
Body	Mandatory
EncryptedData	Mandatory
EncryptionMethod	Mandatory
Cipherdata	Mandatory

574

575 **5.5.2 Message Creation**

576 **5.5.2.1 Timestamp**

577 The Created element within the Timestamp SHOULD contain the current local time at the sender.

578 **5.5.2.2 Security**

579 The Security element MUST contain the mustUnderstand="1" attribute. Any other header
580 elements MUST NOT be labeled with a mustUnderstand="1" attribute.

581 **5.5.2.3 BinarySecurityToken**

582 The ValueType MUST be X.509 v3. The EncodingType MUST be Base 64. The token MUST be
583 labeled with an Id so it can be referenced by the encryption. The certificate must be the one sent
584 in the request.

585 **5.5.2.4 EncryptedKey**

586 The EncryptionMethod MUST contain the Algorithm attribute. The algorithm MUST be RSA v1.5.

587 The KeyInfo MUST contain a SecurityTokenReference with a reference to a relative URI which
588 indicates the BinarySecurityToken containing the certificate which will be used for signature
589 verification.

590 The CipherData MUST contain the encrypted form of the random key, encrypted under the Public
591 Key specified in the specified X.509 certificate, using the specified algorithm.

592 The ReferenceList MUST contain a DataReference which has the value of a relative URI that
593 refers to the encrypted body of the message.

594 **5.5.2.5 Signature**

595 The signature is over the entire SOAP body.

596 **5.5.2.5.1 SignedInfo**

597 The CanonicalizationMethod MUST be Exclusive Canonicalization. The SignatureMethod MUST
598 be RSA-SHA1. The Reference MUST specify a relative URI that refers to the SOAP Body
599 element. The only Transform specified MUST be Exclusive Canonicalization. The DigestMethod
600 MUST be SHA1.

601 **5.5.2.5.2 SignatureValue**

602 The SignatureValue MUST be calculated as specified by the specification, using the private key
603 corresponding to the public key specified in the certificate in the BinarySecurityToken.

604 **5.5.2.5.3 KeyInfo**

605 The KeyInfo MUST contain a SecurityTokenReference. The SecurityTokenReference MUST
606 contain a KeyIdentifier with a ValueType attribute with a value of X509v3. The KeyIdentifier
607 MUST have the value of CERT-VALUE.

608 **5.5.2.6 Body**

609 The body element MUST be first signed and then its contents encrypted.

610 **5.5.2.7 EncryptedData**

611 The EncryptedData MUST be labeled with an Id referenced in the ReferenceList of the
612 EncryptedKey.

613 The Type MUST have the value of #Content.

614 The EncryptionMethod MUST contain the Algorithm attribute. The algorithm MUST be triple DES
615 – CBC.

616 The CypherData MUST contain the encrypted form of the Body, encrypted under a random key,
617 using the specified algorithm.

618 **5.5.3 Message Processing**

619 This section describes the processing performed by the Responder. If an error is detected, the
620 Responder MUST cease processing the message and report the fault locally with a value of
621 FailedAuthentication.

622 **5.5.3.1 Timestamp**

623 The Timestamp element MUST be ignored.

624 5.5.3.2 Security

625 5.5.3.3 BinarySecurityToken

626 The certificate in the token MUST be validated. The Subject of the certificate MUST be an
627 authorized entity. The certificate is used to identify the private key to be used for decryption.

628 5.5.3.4 EncryptedKey

629 The random key contained in the CipherData MUST be decrypted using the private key
630 corresponding to the certificate specified by the Reference, using the specified algorithm.

631 5.5.3.5 Body

632 The contents of the body MUST first be decrypted and then the signature verified.

633 5.5.3.6 EncryptedData

634 The message body contents contained in the EncryptedData, referenced by the ReferenceList
635 MUST be decrypted using the random key, using the specified algorithm.

636 5.5.3.7 Signature

637 The body after decryption, MUST be verified against the signature using the specified algorithms
638 and transforms and the indicated public key.

639 5.5.4 Example (Non-normative)

640 Here is an example response.

```
641 <?xml version="1.0" encoding="utf-8" ?>
642 <soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"
643 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
644 xmlns:xsd="http://www.w3.org/2001/XMLSchema">
645 <soap:Header>
646 <wsu:Timestamp xmlns:wsu="http://schemas.xmlsoap.org/ws/2003/06/utility">
647 <wsu:Created>2003-03-18T19:53:13Z</wsu:Created>
648 </wsu:Timestamp>
649 <wsse:Security soap:mustUnderstand="1"
650 xmlns:wsse="http://schemas.xmlsoap.org/ws/2003/06/secext">
651 <wsse:BinarySecurityToken ValueType="wsse:X509v3"
652 EncodingType="wsse:Base64Binary"
653 xmlns:wsu="http://schemas.xmlsoap.org/ws/2003/06/utility"
654 wsu:Id="myCert">MII...hk</wsse:BinarySecurityToken>
655 <xenc:EncryptedKey xmlns:xenc="http://www.w3.org/2001/04/xmlenc#">
656 <xenc:EncryptionMethod Algorithm="http://www.w3.org/2001/04/xmlenc#rsa-1_5"
657 />
658 <KeyInfo xmlns="http://www.w3.org/2000/09/xmldsig#">
659 <wsse:SecurityTokenReference>
660 <wsse:Reference URI="#myCert" />
661 </wsse:SecurityTokenReference>
662 </KeyInfo>
663 <xenc:CipherData>
664 <xenc:CipherValue>dNYS...fQ=</xenc:CipherValue>
665 </xenc:CipherData>
666 <xenc:ReferenceList>
667 <xenc:DataReference URI="#enc" />
668 </xenc:ReferenceList>
669 </xenc:EncryptedKey>
670 <Signature xmlns="http://www.w3.org/2000/09/xmldsig#">
671 <SignedInfo>
672 <CanonicalizationMethod Algorithm="http://www.w3.org/2001/10/xml-exc-c14n#"
673 />
674 <SignatureMethod Algorithm="http://www.w3.org/2000/09/xmldsig#rsa-sha1" />
675 <Reference URI="#body">
```

```

676     <Transforms>
677       <Transform Algorithm="http://www.w3.org/2001/10/xml-exc-c14n#" />
678     </Transforms>
679     <DigestMethod Algorithm="http://www.w3.org/2000/09/xmldsig#sha1" />
680     <DigestValue>KxW...5B=</DigestValue>
681   </Reference>
682 </SignedInfo>
683 <SignatureValue>8Hkd...al7=</SignatureValue>
684 <KeyInfo>
685   <wsse:SecurityTokenReference>
686     <wsse:KeyIdentifier
687 Value="wsse:X509v3">B39R...mY=</wsse:KeyIdentifier>
688   </wsse:SecurityTokenReference>
689 </KeyInfo>
690 </Signature>
691 </wsse:Security>
692 </soap:Header>
693 <soap:Body wsu:Id="body"
694 xmlns:wsu="http://schemas.xmlsoap.org/ws/2003/06/utility">
695   <xenc:EncryptedData Id="enc" Type="http://www.w3.org/2001/04/xmlenc#Content"
696     xmlns:xenc="http://www.w3.org/2001/04/xmlenc#">
697     <xenc:EncryptionMethod Algorithm="http://www.w3.org/2001/04/xmlenc#tripleDES-
698 cbc" />
699     <xenc:CipherData>
700       <xenc:CipherValue>d2s...GQ=</xenc:CipherValue>
701     </xenc:CipherData>
702   </xenc:EncryptedData>
703 </soap:Body>
704 </soap:Envelope>

```

705

706 5.6 Other processing

707 This section describes processing that occurs outside of generating or processing a message.

708 5.6.1 Requester

709 No additional processing is required.

710 5.6.2 Responder

711 No additional processing is required.

712 5.7 Expected Security Properties

713 Use of the service is restricted to authorized parties that sign the Body of the request. The Body
714 of the request is protected against modification and interception. The response is Authenticated
715 and protected against modification and interception.

716 Encrypting such a short and likely to be known value creates the risk of a known plaintext attack.
717 The cleartext SignatureValue may also assist a known plaintext attack. The Responder must not
718 draw any inferences about what party encrypted the message, it particular it should not be
719 assumed it was the same party who signed it.

720 **6 References**

721 **6.1 Normative**

722 [RFC2119] S. Bradner, *Key words for use in RFCs to Indicate Requirement Levels*,
723 <http://www.ietf.org/rfc/rfc2119.txt>, IETF RFC 2119, March 1997.

Appendix A. Ping Application WSDL File

```

725 <definitions xmlns:tns="http://xmlsoap.org/Ping"
726 xmlns="http://schemas.xmlsoap.org/wsdl/"
727 xmlns:xsd="http://www.w3.org/2001/XMLSchema"
728 xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
729 targetNamespace="http://xmlsoap.org/Ping" name="Ping">
730   <types>
731     <schema targetNamespace="http://xmlsoap.org/Ping"
732     xmlns="http://www.w3.org/2001/XMLSchema">
733       <complexType name="ping">
734         <sequence>
735           <element name="text" type="xsd:string"
736 nillable="true"/>
737         </sequence>
738       </complexType>
739       <complexType name="pingResponse">
740         <sequence>
741           <element name="text" type="xsd:string"
742 nillable="true"/>
743         </sequence>
744       </complexType>
745       <element name="Ping" type="tns:ping"/>
746       <element name="PingResponse" type="tns:pingResponse"/>
747     </schema>
748   </types>
749   <message name="PingRequest">
750     <part name="ping" element="tns:Ping"/>
751   </message>
752   <message name="PingResponse">
753     <part name="pingResponse" element="tns:PingResponse"/>
754   </message>
755   <portType name="PingPort">
756     <operation name="Ping">
757       <input message="tns:PingRequest"/>
758       <output message="tns:PingResponse"/>
759     </operation>
760   </portType>
761   <binding name="PingBinding" type="tns:PingPort">
762     <soap:binding style="document"
763 transport="http://schemas.xmlsoap.org/soap/http"/>
764     <operation name="Ping">
765       <soap:operation/>
766       <input>
767         <soap:body use="literal"/>
768       </input>
769       <output>
770         <soap:body use="literal"/>
771       </output>
772     </operation>
773   </binding>
774   <service name="PingService">
775     <port name="PingPort" binding="tns:PingBinding">
776       <soap:address
777 location="http://localhost:8080/pingejb/Ping"/>
778     </port>
779   </service>
780 </definitions>

```


782

Appendix B. Revision History

783

Rev	Date	By Whom	What
wss-01	2003-04-17	Hal Lockhart	Initial version
wss-02	2003-04-29	Hal Lockhart	Minor changes based on comments
wss-03	2003-05-19	Hal Lockhart	More minor changes
wss-04	2003-05-23	Hal Lockhart	Fix errors in description of Scenario 3
wss-05	2003-05-30	Hal Lockhart	Fix errors related to signatures and encryption, add new Appendix containing Ping WSDL
wss-06	2003-06-06	Hal Lockhart	Correct SOAPAction, namespace for Id

784

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