



SAML V2.0 Metadata Profile for Algorithm Support Version 1.0

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Technical Committee:

OASIS Security Services TC

Chair:

Thomas Hardjono, M.I.T.
Nate Kingenstein, Internet2

Editor:

Scott Cantor, Internet2

Related Work:

This specification defines an extension for use with SAML V2.0 Metadata [SAML2Meta].

Declared XML Namespace(s):

urn:oasis:names:tc:SAML:metadata:alsupport

Abstract:

The SAML V2.0 Metadata specification [SAML2Meta] includes an element allowing entities to describe the XML Encryption [XMLEnc] algorithms they support. This specification defines metadata extension elements to enable entities to describe the XML Signature [XMLSig] algorithms they support, and a profile for using both elements to enable better algorithm agility for profiles that rely on metadata.

36 **Status**

37 This document was last revised or approved by the SSTC on the above date. The level of
38 approval is also listed above. Check the current location noted above for possible later revisions
39 of this document. This document is updated periodically on no particular schedule.

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43 For information on whether any patents have been disclosed that may be essential to
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47 [open.org/committees/security](http://www.oasis-open.org/committees/security).

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1 Introduction

The SAML V2.0 Metadata specification [SAML2Meta] includes an `<md:EncryptionMethod>` element intended to communicate the XML Encryption [XMLEnc] algorithms supported for use with the key described by a containing `<md:KeyDescriptor>` element. The use of this element is not completely defined by the original specification, and there is no comparable support for communicating the XML Signature [XMLSig] algorithms supported by an entity. This profile addresses both considerations to improve algorithm agility and interoperability for deployments that make use of metadata.

There are more general standards for the description of security requirements of communicating endpoints, such as [WS-SecPol]. This specification is not intended as a replacement for such mechanisms, but is directed at systems with fewer requirements that are already designed around SAML V2.0 Metadata.

1.1 Notation

This specification uses normative text.

The keywords "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this specification are to be interpreted as described in [RFC2119]:

...they MUST only be used where it is actually required for interoperation or to limit behavior which has potential for causing harm (e.g., limiting retransmissions)...

These keywords are thus capitalized when used to unambiguously specify requirements over protocol and application features and behavior that affect the interoperability and security of implementations. When these words are not capitalized, they are meant in their natural-language sense.

Listings of XML schemas appear like this.

Example code listings appear like this.

Conventional XML namespace prefixes are used throughout the listings in this specification to stand for their respective namespaces as follows, whether or not a namespace declaration is present in the example:

| Prefix | XML Namespace | Comments |
|--------|---|--|
| saml: | urn:oasis:names:tc:SAML:2.0:assertion | This is the SAML V2.0 assertion namespace [SAML2Core]. |
| samlp: | urn:oasis:names:tc:SAML:2.0:protocol | This is the SAML V2.0 protocol namespace [SAML2Core]. |
| md: | urn:oasis:names:tc:SAML:2.0:metadata | This is the SAML V2.0 metadata namespace [SAML2Meta]. |
| alg: | urn:oasis:names:tc:SAML:metadata:algsupport | This is the SAML V2.0 metadata extension namespace defined by this document and its accompanying schema [AlgSup-XSD]. |
| xenc: | http://www.w3.org/2001/04/xmlenc# | This is the XML Encryption namespace [XMLEnc]. |
| xsd: | http://www.w3.org/2001/XMLSchema | This namespace is defined in the W3C XML Schema specification [Schema1]. In schema listings, this is the default namespace and no prefix is shown. |

139 This specification uses the following typographical conventions in text: <SAML*Element*>,
140 <ns:ForeignElement>, Attribute, **Datatype**, OtherCode.

141 1.2 Normative References

- 142 **[AlgSup-XSD]** OASIS Working Draft, *Metadata Extension Schema for SAML V2.0 Metadata*
143 *Profile for Algorithm Support Version 1.0*, June 2010. [http://docs.oasis-](http://docs.oasis-open.org/security/saml/Post2.0/sstc-saml-metadata-algsupport.xsd)
144 [open.org/security/saml/Post2.0/sstc-saml-metadata-algsupport.xsd](http://docs.oasis-open.org/security/saml/Post2.0/sstc-saml-metadata-algsupport.xsd)
- 145 **[RFC2119]** S. Bradner. *Key words for use in RFCs to Indicate Requirement Levels*. IETF
146 RFC 2119, March 1997. <http://www.ietf.org/rfc/rfc2119.txt>
- 147 **[SAML2Core]** OASIS Standard, *Assertions and Protocols for the OASIS Security Assertion*
148 *Markup Language (SAML) V2.0*, March 2005. [http://docs.oasis-](http://docs.oasis-open.org/security/saml/v2.0/saml-core-2.0-os.pdf)
149 [open.org/security/saml/v2.0/saml-core-2.0-os.pdf](http://docs.oasis-open.org/security/saml/v2.0/saml-core-2.0-os.pdf)
- 150 **[SAML2Errata]** OASIS Approved Errata, *SAML V2.0 Errata*, October 2009. [http://docs.oasis-](http://docs.oasis-open.org/security/saml/v2.0/sstc-saml-approved-errata-2.0.pdf)
151 [open.org/security/saml/v2.0/sstc-saml-approved-errata-2.0.pdf](http://docs.oasis-open.org/security/saml/v2.0/sstc-saml-approved-errata-2.0.pdf)
- 152 **[SAML2Meta]** OASIS Standard, *Metadata for the OASIS Security Assertion Markup Language*
153 *(SAML) V2.0*, March 2005. [http://docs.oasis-open.org/security/saml/v2.0/saml-](http://docs.oasis-open.org/security/saml/v2.0/saml-metadata-2.0-os.pdf)
154 [metadata-2.0-os.pdf](http://docs.oasis-open.org/security/saml/v2.0/saml-metadata-2.0-os.pdf)
- 155 **[XMLEnc]** D. Eastlake et al. *XML Encryption Syntax and Processing*. World Wide Web
156 Consortium Recommendation. [http://www.w3.org/TR/2002/REC-xmlenc-core-](http://www.w3.org/TR/2002/REC-xmlenc-core-20021210/)
157 [20021210/](http://www.w3.org/TR/2002/REC-xmlenc-core-20021210/)
- 158 **[Schema1]** H. S. Thompson et al. *XML Schema Part 1: Structures*. World Wide Web
159 Consortium Recommendation, May 2001. [http://www.w3.org/TR/2001/REC-](http://www.w3.org/TR/2001/REC-xmlschema-1-20010502/)
160 [xmlschema-1-20010502/](http://www.w3.org/TR/2001/REC-xmlschema-1-20010502/)
- 161 **[Schema2]** Paul V. Biron, Ashok Malhotra. *XML Schema Part 2: Datatypes*. World Wide Web
162 Consortium Recommendation, May 2001. [http://www.w3.org/TR/2001/REC-](http://www.w3.org/TR/2001/REC-xmlschema-2-20010502/)
163 [xmlschema-2-20010502/](http://www.w3.org/TR/2001/REC-xmlschema-2-20010502/)
- 164 **[XMLSig]** D. Eastlake et al. *XML-Signature Syntax and Processing, Second Edition*. World
165 Wide Web Consortium Recommendation, June 2008.
166 <http://www.w3.org/TR/xmlsig-core/>

167 1.3 Non-Normative References

- 168 **[RFC4051]** IETF RFC 4051, *Additional XML Security Uniform Resource Identifiers*, April
169 2005. <http://www.ietf.org/rfc/rfc4051.txt>
- 170 **[WS-SecPol]** OASIS Standard, *WS-SecurityPolicy 1.3*, February 2009. [http://docs.oasis-](http://docs.oasis-open.org/ws-sx/ws-securitypolicy/v1.3/os/ws-securitypolicy-1.3-spec-os.pdf)
171 [open.org/ws-sx/ws-securitypolicy/v1.3/os/ws-securitypolicy-1.3-spec-os.pdf](http://docs.oasis-open.org/ws-sx/ws-securitypolicy/v1.3/os/ws-securitypolicy-1.3-spec-os.pdf)

172

173 2 SAML V2.0 Metadata Profile for Algorithm Support

174 2.1 Required Information

175 **Identification:** urn:oasis:names:tc:SAML:metadata:algsupport

176 **Contact information:** security-services-comment@lists.oasis-open.org

177 **Description:** Given below.

178 **Updates:** None.

179 2.2 Profile Description

180 One of the interoperability challenges in large-scale, and long-term, SAML deployments is the selection of
181 XML Signature [XMLSig] and XML Encryption [XMLEnc] algorithms at runtime when communicating with
182 peer entities. In particular, accounting for software limitations that prevent support of newer algorithms,
183 while supporting those algorithms where possible to gradually strengthen systems, is difficult to manage
184 without knowledge of a peer's capabilities. This profile makes use of SAML metadata to enable
185 deployments to document their algorithm capabilities and preferences. It also allows for future expansion
186 to address the interoperability requirements of more complex algorithms.

187 This profile provides guidance on the use of the `<md:EncryptionMethod>` element defined in the
188 SAML V2.0 Metadata specification [SAML2Meta], and defines extension elements,
189 `<alg:SigningMethod>` and `<alg:DigestMethod>`, to address comparable requirements related to
190 XML Signature usage.

191 2.3 Expression of Encryption Capabilities

192 The SAML V2.0 Metadata specification [SAML2Meta] permits zero or more `<md:EncryptionMethod>`
193 elements to appear inside a `<md:KeyDescriptor>` element. This profile provides guidance for the use
194 of this element only in enclosing elements whose `use` attribute is omitted or set to "encryption".

195 In the common case that a `<md:KeyDescriptor>` element contains an asymmetric encryption key, an
196 `<md:EncryptionMethod>` element SHOULD be present for each of a Block or Stream Encryption, and
197 a Key Transport or Key Agreement algorithm. The Key Transport or Key Agreement algorithm(s) listed
198 MUST be compatible with the associated encryption key.

199 If the `<md:KeyDescriptor>` element contains or identifies by reference a symmetric key (e.g., a name
200 referring to a shared master secret or password), then an `<md:EncryptionMethod>` element SHOULD
201 be present for a Block or Stream Encryption algorithm, and MAY be present for other algorithm types
202 such as Symmetric Key Wrap or Key Derivation.

203 Per [XMLEnc], the `<md:EncryptionMethod>` element MUST contain an `Algorithm` attribute
204 containing the identifier for the algorithm defined for use with the specification. If the algorithm permits
205 varying key sizes, the element MAY contain an `<xenc:KeySize>` element defining a key size for the
206 algorithm that the entity will accept. If the algorithm definition includes the specification of additional public
207 content that the party performing encryption needs, that content MAY also be present.

208 If multiple `<md:EncryptionMethod>` elements identifying algorithms of the same general type are
209 present, they MUST be listed in order of preference by the entity.

210 2.4 Expression of Signature Capabilities

211 This profile defines a pair of extension elements for the expression of an entity's capability to verify
212 digests and signatures with particular algorithms. While not strictly meant as an expression of policy, it is
213 a natural assumption that a peer stating support for particular algorithms requires their use.

214 An entity SHOULD include one or more `<alg:DigestMethod>` and `<alg:SigningMethod>` elements
215 in its metadata by means of the `<md:Extensions>` element in its `<md:EntityDescriptor>` element,
216 and/or in its roles (elements whose type is based on `md:RoleDescriptorType`).

217 If a signature algorithm permits varying key sizes, the `<alg:SigningMethod>` element MAY contain
218 `MinKeySize` and/or `MaxKeySize` attributes bounding the key size for the algorithm that the entity
219 supports. If the algorithm definition includes the specification of additional public content that the party
220 creating a signature or digest needs, that content MAY also be present.

221 If multiple elements of the same type are present, they MUST be listed in order of preference by the
222 entity.

223 2.4.1 Element `<alg:DigestMethod>`

224 The `<alg:DigestMethod>` element describes a Message Digest algorithm. It contains the following
225 attribute:

226 `Algorithm` [Required]

227 Identifies the algorithm by means of the URL defined for its use with the XML Signature specification
228 [XMLSig].

229 This element also permits the use of arbitrary elements defined in any namespace.

230 The schema for the `<alg:DigestMethod>` element, and its corresponding `alg:DigestMethodType`
231 complex type, is as follows:

```
232 <element name="DigestMethod" type="alg:DigestMethodType"/>  
233 <complexType name="DigestMethodType">  
234   <sequence>  
235     <any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>  
236   </sequence>  
237   <attribute name="Algorithm" type="anyURI" use="required"/>  
238 </complexType>
```

239 2.4.2 Element `<alg:SigningMethod>`

240 The `<alg:SigningMethod>` element describes a Signature or Message Authentication Code algorithm.
241 It contains the following attributes:

242 `Algorithm` [Required]

243 Identifies the algorithm by means of the URL defined for its use with the XML Signature specification
244 [XMLSig].

245 `MinKeySize` [Optional]

246 The smallest key size, in bits, that the entity supports in conjunction with the algorithm. If omitted, no
247 minimum is implied.

248 `MaxKeySize` [Optional]

249 The largest key size, in bits, that the entity supports in conjunction with the algorithm. If omitted, no
250 maximum is implied.

251 This element also permits the use of arbitrary elements defined in any namespace.

252 The schema for the `<alg:SigningMethod>` element, and its corresponding **alg:SigningMethodType**
253 complex type, is as follows:

```
254 <element name="SigningMethod" type="alg:SigningMethodType"/>  
255 <complexType name="SigningMethodType">  
256   <sequence>  
257     <any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>  
258   </sequence>  
259   <attribute name="Algorithm" type="anyURI" use="required"/>  
260   <attribute name="MinKeySize" type="positiveInteger"/>  
261   <attribute name="MaxKeySize" type="positiveInteger"/>  
262 </complexType>
```

263 2.5 Metadata Consumers

264 A consumer of metadata that wishes to perform XML Signature or XML Encryption operations with
265 knowledge of the peer entity (this is not always true of signatures) **MUST** consult the peer's metadata to
266 determine the intersection of the algorithms, key sizes, and other parameters as defined by particular
267 algorithms that it supports and that the peer entity supports.

268 The elements describing this support in metadata **SHOULD** be consulted in order, and the metadata
269 consumer **SHOULD** select the first algorithm encountered that it supports for use with a particular entity
270 (subject to local policy).

271 With respect to use of XML Signature, the presence of any `<alg:DigestMethod>` and
272 `<alg:SigningMethod>` elements at the level of a role element **MUST** take precedence over any such
273 elements at the level of an `<md:EntityDescriptor>` element, and the two sets are not combined if
274 both are present.

275 In the absence of an element describing support for a particular algorithm type (e.g., no
276 `<alg:DigestMethod>` elements), the metadata consumer is free to select any algorithm that it
277 supports. The absence of metadata therefore implies no information, rather than lack of support.

278 2.6 Security Considerations

279 The use of metadata as a means of "negotiating" the algorithms to use exposes both parties to attacks
280 traditionally associated with such mechanisms, such as step-down attacks in which the metadata is
281 compromised to influence the selection of a weaker algorithm than the parties might otherwise support.

282 The exchange and verification of metadata should always be subject to appropriate security controls to
283 mitigate this threat, and entities should always be prepared to reject the use of algorithms that they deem
284 insufficiently secure.

285 2.7 Example

286 The example presented shows a partial metadata instance for a service provider that supports (as a
287 relying party) a number of newer/stronger signature and digest algorithms defined in [RFC4051]. It also
288 specifies support for encryption via two AES variants using an RSA key as a transport.

```
289 <EntityDescriptor xmlns="urn:oasis:names:tc:SAML:2.0:metadata"  
290   xmlns:ds="http://www.w3.org/2000/09/xmldsig#"  
291   xmlns:alg="urn:oasis:names:tc:SAML:metadata:algsupport"  
292   entityID="https://serviceprovider.example.com/SAML">  
293   <Extensions>  
294     <alg:DigestMethod  
295       Algorithm="http://www.w3.org/2001/04/xmldsig-more#sha384"/>  
296     <alg:DigestMethod  
297       Algorithm="http://www.w3.org/2001/04/xmldsig-more#sha256"/>  
298     <alg:SignatureMethod MinKeySize="256" MaxKeySize="511"  
299       Algorithm="http://www.w3.org/2001/04/xmldsig-more#ecdsa-sha256"/>  
300     <alg:SignatureMethod MinKeySize="2048" MaxKeySize="4096"  
301       Algorithm="http://www.w3.org/2001/04/xmldsig-more#rsa-sha256"/>  
302   </Extensions>  
303   <SPSSODescriptor  
304     protocolSupportEnumeration="urn:oasis:names:tc:SAML:2.0:protocol">  
305     <KeyDescriptor>  
306       <ds:KeyInfo>...RSA key elided...</ds:KeyInfo>  
307       <EncryptionMethod  
308         Algorithm="http://www.w3.org/2001/04/xmlenc#aes128-cbc"/>  
309       <EncryptionMethod  
310         Algorithm="http://www.w3.org/2001/04/xmlenc#aes256-cbc"/>  
311       <EncryptionMethod  
312         Algorithm="http://www.w3.org/2001/04/xmlenc#rsa-oaep-mgf1p"/>  
313     </KeyDescriptor>  
314     ...  
315   </SPSSODescriptor>  
316   ...  
317 </EntityDescriptor>
```

318 **3 Conformance**

319 **3.1 SAML V2.0 Metadata Profile for Algorithm Support Version 1.0**

320 A metadata producer conforms to this profile if it has the ability to produce metadata in accordance with
321 sections 2.3 and 2.4.

322 A metadata consumer conforms to this profile if it can consume extended metadata produced in
323 accordance with sections 2.3 and 2.4 and conforms to the normative statements in section 2.5.

324 **Appendix A. Acknowledgements**

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- 336 • Hal Lockhart, Oracle Corporation
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- 338 • Anil Saldhana, Red Hat
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340 **Appendix B. Revision History**

- 341 ● Draft 01, first working draft.
- 342 ● Committee Draft 01, CD edits.