



# XACML v3.0 XML Digital Signature Profile Version 1.0

## Committee Specification 01

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### Related work:

This specification replaces or supercedes:

- [XML Digital Signature Profile of XACML 2.0](#)

This specification is related to:

- [eXtensible Access Control Markup Language \(XACML\) Version 3.0, cd 03](#)

### Declared XML Namespace(s):

None

### Abstract:

This specification profiles use of the W3C XML-Signature Syntax and Processing Standard in providing authentication and integrity protection for XACML schema instances.

### Status:

This document was last revised or approved by the OASIS eXtensible Access Control Markup Language (XACML) TC on the above date. The level of approval is also listed above. Check the "Latest Version" or "Latest Approved Version" location noted above for possible later revisions of this document.

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# 1 Introduction

This document provides a profile for use of the W3C XML-Signature Syntax and Processing Standard in providing authentication and integrity protection for OASIS eXtensible Access Control Markup Language [XACML] schema instances. Sections 9.2.1 Authentication and 9.2.4 Policy integrity in [XACML] describe requirements and considerations for such authentication and integrity protection.

A digital signature is useful for authentication and integrity protection only if the signed information includes a specification of the identity of the signer and a specification of the period during which the signed **data object** is to be considered valid. XACML itself does not define the format for such information, as XACML is intended to use other standards for functions other than the actual specification and evaluation of access control policies, requests, and responses.

One appropriate format that has been defined elsewhere is [SAML]. A profile for the use of SAML with XACML schema instances is available in [XACML-SAML]. This profile therefore RECOMMENDS use of XACML schema instances in SAML Assertions, Requests, and Responses, which MAY then be digitally signed as specified in the SAML specification.

This profile also notes various canonicalization issues that must be resolved in order for signed documents to be verified by a relying party.

This profile specification assumes that the reader is familiar with the concept of a digital signature, with the W3C XML-Signature Syntax and Processing Standard, and with XACML.

## 1.1 Terminology

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as described in [RFC2119].

## 1.2 Glossary

### Data object

Used in this profile to refer to a digital object that is being signed. A **data object** could be an XACML PolicySet, Policy, Request context, Response context, or any associated schemas. A **data object** is referenced inside an [XMLDSIG] <Reference> element using a URI as defined by [RFC2396].

## 1.3 Normative References

- |            |   |
|------------|---|
| [ExcIC14N] | J. Boyer et al., <i>Exclusive Canonicalization Version 1.0</i> , 18 January 2002, World Wide Web Consortium, <a href="http://www.w3.org/TR/xml-exc-c14n/">http://www.w3.org/TR/xml-exc-c14n/</a> .  |
| [RFC2119]  | S. Bradner, <i>Key words for use in RFCs to Indicate Requirement Levels</i> , <a href="http://www.ietf.org/rfc/rfc2119.txt">http://www.ietf.org/rfc/rfc2119.txt</a> , IETF RFC 2119, March 1997.  |
| [RFC2253]  | M. Wahl, et al., <i>Lightweight Directory Access Protocol (v3): UTF-8 String Representation of Distinguished Names</i> , IETF RFC 2253, September 1997, <a href="http://www.ietf.org/rfc/rfc2253.txt">http://www.ietf.org/rfc/rfc2253.txt</a> .                                     |
| [RFC2396]  | T. Berners-Lee, et al., <i>Uniform Resource Identifiers (URI): Generic Syntax</i> , August 1998, <a href="http://www.ietf.org/rfc/rfc2396.txt">http://www.ietf.org/rfc/rfc2396.txt</a>  |
| [SAML]     | OASIS Standard, <i>Assertions and Protocols for the OASIS Security Assertion Markup Language (SAML) V2.0</i> , 15 March 2005, <a href="http://docs.oasis-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</a> . |
| [ScC14N]   | S. Aissi, M. Hondo, eds., <i>Schema Centric XML Canonicalization, Version 1.0</i> , 20 May 2003, <a href="http://uddi.org/pubs/SchemaCentricCanonicalization.htm">http://uddi.org/pubs/SchemaCentricCanonicalization.htm</a> .  |

45	<b>[XACML]</b>	OASIS Committee Specification 01, eXtensible access control markup language (XACML) Version 3.0. August 2010. <a href="http://docs.oasis-open.org/xacml/3.0/xacml-3.0-core-spec-cs-01-en.doc">http://docs.oasis-open.org/xacml/3.0/xacml-3.0-core-spec-cs-01-en.doc</a>
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47		
48	<b>[XACML-SAML]</b>	OASIS Committee Specification 01, SAML 2.0 profile of XACML, Version 2, August 2010, <a href="http://docs.oasis-open.org/xacml/3.0/xacml-profile-saml2.0-v2-spec-cs-01-en.odt">http://docs.oasis-open.org/xacml/3.0/xacml-profile-saml2.0-v2-spec-cs-01-en.odt</a>
49		
50		
51	<b>[XMLDSIG]</b>	D. Eastlake, et al., <i>W3C XML-Signature Syntax and Processing</i> , W3C Recommendation, 12 February 2002, <a href="http://www.w3.org/TR/xmlsig-core">http://www.w3.org/TR/xmlsig-core</a> .
52		
53	<b>[XPath2Filt]</b>	J. Boyer, M. Hughes, J. Reagle, editors, <i>XML-Signature XPath Filter 2.0</i> , 8 November 2002 <a href="http://www.w3.org/TR/xmlsig-filter2/">http://www.w3.org/TR/xmlsig-filter2/</a> .
54		
55	<b>[X.690]</b>	ITU-T Recommendation X.690 Information Technology – Open Systems Interconnection - Procedures for the operation of OSI Registration Authorities: General procedures, 1992.
56		
57		

## 58 **1.4 Non-Normative References**

59 **None**

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## 2 XML Digital Signature profile of XACML

### 2.1 Use of SAML

This Profile RECOMMENDS use of XACML schema instances embedded in SAML Assertions, Requests, and Responses as described in [XACML-SAML]. Such SAML objects SHALL be digitally signed as described in Section 5: SAML and XML Signature Syntax and Processing of [SAML].

### 2.2 Canonicalization

In order for a digital signature to be verified by a relying party, the byte stream that was signed MUST be identical to the byte stream that is verified. To ensure this, the XML document being signed MUST be canonicalized. Section 5: SAML and XML Signature Syntax and Processing of [SAML] specifies use of Exclusive Canonicalization [ExclC14N].

#### 2.2.1 Namespace elements in XACML data objects

Any XACML *data object* that is to be signed MUST specify all namespace elements used in the *data object*. If this is not done, then the *data object* will attract namespace definitions from ancestors of the *data object* that may differ from one envelope to another.

When [ExclC14N] is used as the canonicalization or transform method, then the namespace of XACML schemas used by elements in an XACML *data object* MUST be bound to prefixes and included in the InclusiveNamespacesPrefixList parameter to [ExclC14N].

#### 2.2.2 Additional canonicalization considerations

Additional transformations on the XACML *data object* must usually be performed in order to ensure that the *data object* signed will match the *data object* that is verified. Some of these transformations are listed here, but this Profile does not attempt to specify algorithms for performing these.

If an XACML *data object* includes data elements that may be represented in more than one form (such as (TRUE, FALSE), (1,0), (true,false)), then a Transform method MUST be defined and specified for normalizing those data elements.

This Profile RECOMMENDS applying the following canonicalizations to values of the corresponding datatypes, whether occurring in XML attribute values or in XACML Attributes.

1. Where a canonical representation for an XACML-defined datatype is defined in <http://www.w3.org/2001/XMLSchema>, then the value of the datatype MUST be put into the canonical form specified in <http://www.w3.org/2001/XMLSchema>. This includes boolean {"true", "false"}, double, dateTime, time, date, and hexBinary (upper-case).
2. <http://www.w3.org/2001/XMLSchema#anyURI> - use the canonical form defined in [RFC2396]
3. <http://www.w3.org/2001/XMLSchema#base64Binary> - remove all line breaks and white space. Remove all characters following the first sequence of "=" characters. The Base64 Transform (identifier: <http://www.w3.org/TR/xmlsig-core/#sec-Base-64>) MAY be useful in performing this canonicalization.
4. urn:oasis:names:tc:xacml:1.0:data-type:x500Name - first normalize according to [RFC2253]. If any RDN contains multiple attributeTypeAndValue pairs, re-order the AttributeValuePairs in that RDN in ascending order when compared as octet strings (described in Section 11.6 "Set-of components" of [X.690]).
5. urn:oasis:names:tc:xacml:1.0:data-type:rfc822Name - normalize the domain-part of the name to lower case.
6. XPath expression – apply [XPath2Filt] to put the XPath expression into canonical form.

102 Schema Centric XML Canonicalization Version 1.0 [ScC14N] describes many canonicalization issues for  
103 XML documents that should be addressed.

## 104 2.3 Signing schemas

105 The parsing of any XACML **data object** depends on having an accurate copy of all schemas on which the  
106 XACML **data object** depends. Note that the inclusion of a schema URI in the XACML schema instance  
107 attributes does not guarantee that an accurate copy of the schema will be used: an attacker may  
108 substitute a bogus schema that contains the correct identifier. Signatures can help protect against  
109 substitution or modification of the schemas on which an XACML **data object** depends. Use of signatures  
110 for this purpose are described in this section.

111 In most cases, a **data object** signer SHOULD include a <Reference> element for each schema on  
112 which the XACML **data object** depends in the <SignedInfo> element that contains the <Reference>  
113 to or including the XACML **data object** itself.

114 In some cases, the **data object** signer knows that all PDPs that will evaluate a given XACML **data object**  
115 will have accurate copies of certain schemas needed to parse the **data object**, and does not want to  
116 force the PDP to verify the message digest for such schemas. In these cases the **data object** signer  
117 MAY omit <Reference> elements for any schema whose verification is not needed.

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## 118 **3 Conformance**

119 In implementation may conform as a producer and/or a consumer of signed policies.

### 120 **3.1 As a producer of signed policies**

121 An implementation conforms to this specification as a producer if it is able to produce XACML policies  
122 with XML digital signatures as specified in section 2 of this document.

### 123 **3.2 As a consumer of signed policies**

124 An implementation conforms to this specification as a consumer if it is able to consume XACML policies  
125 with XML digital signatures as specified in section 2 of this document.

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157

158

## B. Revision History

159 [optional; should not be included in OASIS Standards]

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Revision	Date	Editor	Changes Made
WD 1		Erik Rissanen	Initial conversion to XACML 3.0.
WD 2	24 December 2007	Erik Rissanen	Convert to current OASIS template.
WD 3	4 April	Erik Rissanen	Editorial cleanups
WD 4	17 Dec 2009	Erik Rissanen	Fix formatting of OASIS references Update acknowledgments
WD 5	4 Jan 2009	Erik Rissanen	Updated cross references Fix typos
WD 6	8 Mar	Erik Rissanen	Updated cross references Fix OASIS formatting issues

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