

XML Digital Signatures Working Group
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J. Reagle,
W3C/MIT

XML-Signature Requirements

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W3C Status of this document

This is a Last Call XML Signature Requirements public Working Draft. This report is not expected to be advanced to Recommendation. Instead, this Last Call designation is (1) a representation of WG consensus, (2) an invitation for comments that will affect the future course of the technical specification, and (3) an opportunity to identify and obtain commitments regarding WG dependencies. This document will be referred to at least the W3C XML Plenary Interest Group and W3C Chairs Working Group. Last Call period ends when dependencies between WGs have been acknowledged and the Signature Chairs have procured

commitments of review. This is expected to take six weeks from the date of publication.

This document attempts to capture the Working Group's consensus though

it contains points which are still uncertain or not well specified. Issues which are still being actively discussed during the publication of this document are of class="discuss" and rendered in navy by style sheet compliant applications.

Please send comments to the editor <reagle@w3.org> and cc: the list <w3c-ietf-xmlsig@w3.org>. Publication as a Working Draft does not imply endorsement by the W3C membership. This is a draft document and may be updated, replaced or obsoleted by other documents at any time. It is inappropriate to cite W3C Drafts as other than "work in progress". A list of current W3C working drafts can be found at <http://www.w3.org/TR>

Abstract

This document lists the design principles, scope, and requirements for the XML Digital Signature specification. It includes requirements as they relate to the signature syntax, data model, format, cryptographic processing, and external requirements and coordination.

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1 1. Introduction

The XML 1.0 Recommendation [XML] describes the syntax of a class of data objects called XML documents. The mission of this working group is to develop a XML syntax used for representing signatures on digital content and procedures for computing and verifying such signatures. Signatures will provide data integrity, authentication, and/or non-repudiability.

This document lists the design principles, scope, and requirements over three things: (1) the scope of work available to the WG, (2) the XML signature specification, and (3) applications that implement the specification. It includes requirements as they relate to the signature syntax, data model, format, cryptographic processing, and external requirements and coordination. Those things that are required are designated as "must," those things that are optional are designated by "may," those things that are optional but recommended are designated as "should."

[2](#) 2. Design Principles and Scope

1. The specification must describe how to a sign digital content, and

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XML content in particular. [Charter]

2. XML-signatures are generated from a hash over the canonical form of a signature manifest. The manifest must support references to Web resources, the hash of the resource content (or its canonicalized form), and (optionally) the resource content type. [Brown, List(Solo)] Web resources are defined as any digital content that can be addressed using the syntax of XLink locator [XLink]).
 Comment: Scenarios are being explored which examine the ability to sign without requiring a manifest whereas the scope of the signed content is designated by the relative placement of signature elements in the XML stream/tree. For instance:

```
<html> .....</body><dsig xmlns="http://..." referent=""><html>.
```

 or

```
<html><title>pricelist</title>...<dsig xmlns="http://..."> ...</dsig></html>
```
3. The meaning of a signature is simple: The XML-signature syntax associates the content of resources listed in a manifest with a key via a strong one-way transformation.
 1. The XML-signature syntax must be extensible such that it can support arbitrary application/trust semantics and assertion capabilities -- that can also be signed.
 [Charter(Requirement1&4), List(Bugbee, Solo)]
 2. The WG is not chartered to specify trust semantics, but syntax and processing rules necessary for communicating signature validity (authenticity, integrity and non-repudiation). [Charter(Requirement1)] At the Chairs' discretion and in order to test the extensibility of the syntax, the WG may produce non-standard-track proposals defining common semantics (e.g., package, timestamps, endorsement, etc.) relevant to signed assertions about Web resources in a schema definition [XML, RDF] or link type definition [XLink].
 Comment: A more formal definition of a signed resource is the following evaluates as true "definition(inputs):constraints" where R is a resource., I is a resource identifier (URI), and C is content (sequence-of-octets).
 signed-resource(I, C, key, sig): there was some request R such that GET(R) = C and address(R) = I and sign-doc(C, key, sig)
 sign-doc(C, key, sig): sig is the value of a strong one-way function over content and key that yields C integrity/validity and K non-repudiability
4. The specification must not specify methods of confidentiality though the Working Group may report on the feasibility of such work in a future or rechartered activity. [List(Bugbee)]
5. The specification must only require the provision of key information essential to checking the validity of the cryptographic signature. For instance, identity and key recovery

information might be of interest to particular applications, but they are not within the class of required information defined in this specification. [List(Reagle)]

6. The specification must define or reference at least one method of canonicalizing and hashing the signature syntax (i.e., the

manifest and signature blocks). [Oslo] The specification must not specify methods of canonicalizing resource content [Charter], though it may specify security requirements over such methods. [Oslo] Such content is normalized by specifying an appropriate content C14N (canonicalization) algorithm [DOMHASH, XML-C14N]. Applications are expected to normalize application specific semantics prior to handing data to a XML-signature application. [Charter]

7. XML-signature applications must be conformant with the specifications as follows:
 1. XML-namespaces [XML-namespaces] within its own signature syntax. Applications may choose C14N algorithms which do or do not process namespaces within XML content. For instance, some C14N algorithms may opt remove all namespace declarations, others may rewrite namespace declarations to provide for context independent declarations within every element.
 2. XLink [Xlink] within its own signature syntax. Applications must use XLink locators within the signature manifest to reference resources. Signature applications must not embed or expand XLink references in signed content, though applications may choose C14N algorithms which provide this feature.
 3. XML-Pointers [XPointer] within its own signature syntax. If applications reference/select parts of XML documents, they must use XML-Pointer within an XLink locator. [WS-list(1)]The WG may specify security requirements that constrain the operation of these dependencies to ensure consistent and secure signature generation and operation. [Oslo]
8. XML-signatures must be developed as part of the broader Web design philosophy of decentralization, URIs, Web data, modularity/layering/extensibility, and assertions as statements about statements. [Berners-Lee, WebData] In this context, existing cryptographic provider (and infrastructure) primitives should be taken advantage of. [List(Solo)]

3. Requirements

3.1 1. Signature Data Model and Syntax

1. XML-signature data structures must be based on the RDF data model [RDF] but need not use the RDF serialization syntax. [Charter]
2. XML-signatures apply to any resource addressable by a locator -- including non-XML content. XML-signature referents are identified with XML locators (URIs or fragments) within the manifest that refer to external or internal resources (i.e., network accessible or within the same XML document/package). [Berners-Lee, Brown, List(Vincent), WS, XFDL]

3. XML-signatures must be able to apply to a part or totality of a XML document. [Charter, Brown]

Comment: A related requirement under consideration is requiring the specification to support the ability to indicate those portions of a document one signs via exclusion of those portions

one does not wish to sign. This feature allows one to create signatures that have document closure, retain ancestor information, and retain element order of non-continuous regions that must be signed. We are considering implementing this requirement via (1) a special <dsig:exclude> element, (2) an exclude list accompanying the resource locator, or (3) a request to change the XML-Fragment or XPointer specifications to yield this functionality. See List(Boyer(1,2)) for further discussion of this issue.

4. Multiple XML-signatures must be able to exist over the static content of a Web resource given varied keys, content transformations, and algorithm specifications (signature, hash, canonicalization, etc.). [Charter, Brown]
5. XML-signatures are first class objects themselves and consequently must be able to be referenced and signed. [Berners-Lee]
6. The specification must permit the use of varied digital signature and message authentication codes, such as symmetric and asymmetric authentication schemes as well as dynamic agreement of keying material. [Brown] Resource or algorithm identifier are a first class objects, and must be addressable by a URI. [Beners-Lee]
7. XML-signatures must be able to apply to the original version of an included/encoded resource. [WS-list (Brown/Himes)]

3.2 2. Format

1. An XML-signature must be an XML element (as defined by production 39 of the XML1.0 specification. [XML])
2. An XML document of a certain type must still be recognizable as its original type when signed. For example, an XML form, when signed, should still be recognizable as a XML form to its application after it has been signed. [WS-summary]
3. XML-signature must provide a mechanism that facilitates the production of composite documents -- by addition or deletion -- while preserving the signature characteristics (integrity, authentication, and non-repudiatability) of the consituent parts. [Charter, Brown, List(Bugbee)]
4. A key use of XML-signatures will be detached Web signatures. However, signatures may be embedded within or encapsulate XML or encoded content. [Charter] This WG must specify a simple method of packaging and encapsulation if no W3C Recommendation is available.

3.3 3. Cryptography and Processing

1. The specification must permit arbitrary cryptographic signature and message authentication algorithms, symmetric and asymmetric authentication schemes, and key agreement methods. [Brown]
2. The specification must specify at least one mandatory to implement signature canonicalization, content canonicalization, hash, and

signature algorithm.

3. In the event of redundant attributes within the XML Signature syntax and relevant cryptographic blobs, XML Signature applications prefer the XML Signature semantics.

Comment: Another possibility is that an error should be generated,

however it isn't where a conflict will be flagged between the various function and application layers regardless.

3.4 4. Coordination

1. The XML Signature specification should meet the requirements of the following applications:
 1. Internet Open Trading Protocol v1.0 [IOTP]
 2. Financial Services Mark Up Language v2.0 [Charter]
 3. At least one forms application [XFA, XFDL]
 2. To ensure that all requirements within this document are adequately addressed, the XML Signature specification must be reviewed by a designated member of the following communities:
 1. XML Syntax Working Group: canonicalization dependencies. [Charter]
 2. XML Linking Working Group: signature referants. [Charter]
 3. XML Schema Working Group: signature schema design. [Charter]
 4. Metadata Coordination Group: data model design. [Charter]
 5. W3C Internationalization Interest Group: [AC Review]
 6. XML Package Working Group: signed content in/over packages.
 7. XML Fragment Working Group: signing portions of XML content.
- Comment: Members of the WG are very interested in signing and processing XML fragments and packaged components. Boyer asserts that [XML-fragment] does not "identify non-contiguous portions of a document in such a way that the relative positions of the connected components is preserved." Packaging is a capability critical to XML-Signature applications, but it is clearly dependent on clear trust/semantic definitions, package application requirements, and even cache-like application requirements. It is not clear how this work will be addressed.

4 4. References

AC Review

Misha Wolf. "The Charter should include the I18N WG in the section on 'Coordination with Other Groups.'"
<http://lists.w3.org/Archives/Team/xml-dsig-review/1999May/0007.html>

Berners-Lee

Axioms of Web Architecture: URIs.
<http://www.w3.org/DesignIssues/Axioms.html>
Web Architecture from 50,000 feet
<http://www.w3.org/DesignIssues/Architecture.html>

Brown-XML-DSig

Internet Draft. Digital Signatures for XML
<http://search.ietf.org/internet-drafts/draft-ietf-xmlsig-signa>

[ture-00.txt](#)

Charter

XML Signature (xmldsig) Charter.

<http://www.w3.org/1999/05/XML-DSig-charter-990521.html>

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DOMHASH

Internet Draft. Digest Values for DOM (DOMHASH)

<http://search.ietf.org/internet-drafts/draft-hiroshi-dom-hash-01.txt>

FSML

FSML 1.5 Reference Specification

<http://www.echeck.org/library/ref/fsml-v1500a.pdf>

InfoSet-Req

XML Information Set Requirements Note.

<http://www.w3.org/TR/1999/NOTE-xml-infoset-req-19990218.html>

IOTP

Internet Open Trading Protocol v1.0

[draft-ietf-trade-iotp-v1.0-protocol-04.txt](http://www.ietf.org/internet-drafts/draft-ietf-trade-iotp-v1.0-protocol-04.txt)

IOTP-DSig

Internet Draft. Digital Signatures for the Internet Open Trading Protocol

<http://www.ietf.org/internet-drafts/draft-ietf-trade-iotp-v1.0-dsig-00.txt>

Oslo

Minutes of the XML Signature WG Sessions at IETF face-to-face meeting in Oslo.

RDF

RDF Schema

<http://www.w3.org/TR/1999/PR-rdf-schema-19990303>

RDF Model and Syntax

<http://www.w3.org/TR/1999/REC-rdf-syntax-19990222>

Signature WG List

<http://lists.w3.org/Archives/Public/w3c-ietf-xmlsig/>

URI

Uniform Resource Identifiers (URI): Generic Syntax

<http://www.ietf.org/rfc/rfc2396.txt>

WS (list, summary)

XML-DSig '99: The W3C Signed XML Workshop

<http://www.w3.org/DSig/signed-XML99/>

<http://www.w3.org/DSig/signed-XML99/summary.html>

XLink

XML Linking Language

<http://www.w3.org/1999/07/WD-xlink-19990726>

XML

Extensible Markup Language (XML) Recommendation.
<http://www.w3.org/TR/1998/REC-xml-19980210>

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XML-C14N

XML Canonicalization Requirements.

<http://www.w3.org/TR/1999/NOTE-xml-canonical-req-19990605>

XFA

XML Forms Architecture (XFA)

<http://www.w3.org/Submission/1999/05/>

XFDL

Extensible Forms Description Language (XFDL) 4.0

<http://www.w3.org/Submission/1998/16/>

XML-Fragment

XML-Fragment Interchange

<http://www.w3.org/1999/06/WD-xml-fragment-19990630.html>

XML-namespaces

Namespaces in XML

<http://www.w3.org/TR/1999/REC-xml-names-19990114>

XML-schema

XML Schema Part 1: Structures

<http://www.w3.org/1999/05/06-xmlschema-1/>

[XML](#) Schema Part 2: Datatypes

<http://www.w3.org/1999/05/06-xmlschema-2/>

XPointer

XML Pointer Language (XPointer)

<http://www.w3.org/1999/07/WD-xptr-19990709>

WebData

Web Architecture: Describing and Exchanging Data.

<http://www.w3.org/1999/04/WebData>

