SAML Profile for the Metadata Query Protocol

Abstract

   This document profiles the Metadata Query Protocol for use with SAML
   metadata.

   This document is a product of the Research and Education Federations
   (REFEDS) Working Group process.

Editorial Note (To be removed by RFC Editor before publication)

   Discussion of this draft takes place on the MDX mailing list
   (mdx@lists.iay.org.uk), which is accessed from [MDX.list].

   XML versions, latest edits and the issues list for this document are
   available from [md-query].

   The changes in this draft are summarized in Appendix A.21.

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1. Introduction

This document profiles the Metadata Query Protocol
[I-D.young-md-query] for use with SAML metadata [SAML2Meta].

The Research and Education Federations group ([REFEDS]) is the voice
that articulates the mutual needs of research and education identity
federations worldwide. It aims to represent the requirements of
research and education in the ever-growing space of access and
identity management.

From time to time REFEDS will wish to publish a document in the
Internet RFC series. Such documents will be published as part of the
RFC Independent Submission Stream [RFC4844]; however the REFEDS
working group sign-off process will have been followed for these
documents, as described in the REFEDS Participant's Agreement
[REFEDS.agreement].

This document is a product of the REFEDS Working Group process.

1.1. Notation and Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
"SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and
"OPTIONAL" in this document are to be interpreted as described in
BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all
capitals, as shown here.

This document makes use of the Augmented BNF metalanguage defined in
[STD68].

2. Request Profile

2.1. Content Type

Requests compliant with this profile MUST include the following HTTP
header to indicate that the metadata returned should be SAML
metadata (see Appendix A of [SAML2Meta]):

Accept: application/samlmetadata+xml

2.2. Identifiers

2.2.1. Unique Identifier

Each entity known to the responder MUST be associated with the
unique identifier of the entity, corresponding to the entityID
attribute of the entity's EntityDescriptor element in SAML metadata.

2.2.2. Transformed Identifier

SAML 2.0 [SAML2Core] includes profiles based on the transfer of an
"artifact" containing the unique identifier of a SAML entity
transformed by means of the SHA-1 [RFC3174] hash algorithm (see
[SAML2Bind] sections 3.6 and 3.6.4).

In order to support use cases in which clients may be in possession
of only such a transformed representation of a SAML entity's unique
identifier without any way to establish the original entity
identifier, a responder compliant with this profile MUST associate
each entity with an identifier matching the sha1id production in the
following ABNF grammar, and treat such an identifier as equivalent
to the corresponding untransformed identifier:

```
SHA1     = %x73 %x68 %x61 %x31 ; lower case "sha1"
DIGIT    = %x30-39
HEXDIGIT = DIGIT | %x61-66 ; lower case a-f
sha1id   = "{" SHA1 "}" sha1hex
sha1hex  = 40*HEXDIGIT
```

In the above, the sha1hex component encodes the 20-octet (160-bit)
binary SHA-1 hash value as a sequence of 40 lower case hexadecimal
digits.

For example, the identifier

http://example.org/service

transformed by means of SHA-1 hashing would become

{sha1}11d72e8cf351eb6c75c721e838f469677ab41bdb

Responder implementations MAY detect malformed SHA-1 transformed
identifiers (for example where the string of characters following
the "}" contains characters other than hexadecimal digits, or is
other than exactly 40 characters in length) and return an HTTP
status code of 400 ("bad request"). Alternatively, implementations
MAY process these as normal identifiers and return an HTTP status
code of 404 ("not found") if appropriate.

2.2.3. Additional Identifiers

Entities MAY also be associated with any number of additional
responder-defined identifiers naming arbitrary groups of entities.

3. Response Profile

3.1. Response Cardinality

A request may return information for any number of entities,
including none. Responses compliant with this profile MUST use the
appropriate representation described below depending on the number
of EntityDescriptor elements returned.

3.1.1. No Entity Descriptors Returned

A response which returns no EntityDescriptor elements MUST be
represented by an HTTP status code of 404 ("not found").

3.1.2. One Entity Descriptor Returned

A response which returns a single EntityDescriptor element MUST use
that element as its document element. The responder MUST NOT make
use of a EntitiesDescriptor element in this situation (see
[SAML2Meta] section 2.3).

Such a response MUST include the following HTTP header to indicate
that the metadata returned is SAML metadata:

Content-Type: application/samlmetadata+xml

3.1.3. More Than One Entity Descriptor Returned

A response which returns more than one EntityDescriptor element MUST
consist of a document element which is an EntitiesDescriptor
element, containing the returned EntityDescriptor elements as
children. Responses MUST NOT contain nested EntitiesDescriptor
elements.

Such a response MUST include the following HTTP header to indicate
that the metadata returned is SAML metadata:

Content-Type: application/samlmetadata+xml

4. Security Considerations

4.1. Integrity

As SAML metadata contains information necessary for the secure
operation of interacting services it is strongly RECOMMENDED that a
mechanism for integrity checking is provided to clients.

It is RECOMMENDED that the integrity checking mechanism provided by
a responder is a digital signature embedded in the returned metadata
document, as defined by [SAML2Meta] section 3.

Such digital signatures:

  *SHOULD use an RSA keypair whose modulus is no less than 2048 bits
   in length.

  *MUST NOT use the SHA-1 cryptographic hash algorithm as a digest
   algorithm.

  *MUST NOT use the MD5 cryptographic hash algorithm as a digest
   algorithm.

  *SHOULD otherwise follow current cryptographic best practices in
   algorithm selection.

4.2. Use of SHA-1 in Transformed Identifiers

This profile mandates the availability of an identifier synonym
mechanism based on the SHA-1 cryptographic hash algorithm. Although
SHA-1 is now regarded as weak enough to exclude it from use in new
cryptographic systems, its use in this profile is necessary for full
support of the SAML 2.0 standard.

The use of SHA-1 in section 3.6.4 of [SAML2Bind], and its resulting
use in this protocol, would be vulnerable to an attack in which
metadata was introduced into a system by an attacker capable of
creating an entity identifier with the same SHA-1 hash as that of an
existing entity's identifier.

Such an identifier is known as a *second preimage* of the original,
and SHA-1's resistance to discovery of it is referred to as SHA-1's
second-preimage resistance.

As demonstrated by the the [SHAttered] and [Shambles] attacks, the
SHA-1 algorithm is known to have weak collision resistance. However,
at the time of writing no attacks are known on SHA-1's second-
preimage resistance; a result in this area would be required to
provide the basis of an attack based on duplicating the SHA-1 hash

of an existing identifier. As a result, the use of SHA-1 in SAML and in this protocol is not believed to introduce a security concern.

Implementations may guard against the possibility of a future practical attack on the second-preimage resistance of SHA-1 by treating two entities whose entityID values have the same SHA-1 equivalent as an indicator of malicious intent on the part of the owner of one of the entities.

5. IANA Considerations

This document has no actions for IANA.

6. Acknowledgements

The editor would like to acknowledge the following individuals for their contributions to this document:

Scott Cantor (The Ohio State University)

Leif Johansson (SUNET)

Joe St Sauver (University of Oregon)

Tom Scavo (Internet2)

7. References

7.1. Normative References

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[STD68]   Crocker, D., Ed. and P. Overell, "Augmented BNF for Syntax Specifications: ABNF", STD 68, RFC 5234, DOI 10.17487/RFC5234, January 2008, <https://www.rfc-editor.org/info/rfc5234>.

7.2. Informative References

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[REFEDS]   Research and Education Federations, "REFEDS Home Page", <http://www.refeds.org/>.

[REFEDS.agreement] Research and Education Federations, "REFEDS Participant's Agreement", <https://refeds.org/about/about_agreement.html>.

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[Shambles] "SHA-1 is a Shambles", January 2020, <https://sha-
mbles.github.io>.

[SHAttered] "SHAttered", February 2017, <https://shattered.io>.

Appendix A. Change Log (to be removed by RFC Editor before publication)

A.1. draft-young-md-query-saml-00

Initial version.

A.2. Since draft-young-md-query-saml-00

Added REFEDS RFC stream boilerplate.

A.3. Since draft-young-md-query-saml-01

Bump reference to the Metadata Query Protocol [I-D.young-md-query].

Rework Section 2.2 to make the role of transformed identifiers
clearer. This changes the semantics slightly (malformed transformed
identifiers may now result in a 404 return rather than 400) but this
gives implementers more latitude in the way that they handle the
feature.

A.4. Since draft-young-md-query-saml-02

Bump reference to the Metadata Query Protocol [I-D.young-md-query].

A.5. Since draft-young-md-query-saml-03

Bump reference to the Metadata Query Protocol [I-D.young-md-query].

Added an Editorial Note to help direct readers back to the
discussion.

A.6. Since draft-young-md-query-saml-04

Fix reference to the Metadata Query Protocol [I-D.young-md-query].

A.7. Since draft-young-md-query-saml-05

Bump reference to the Metadata Query Protocol [I-D.young-md-query].

A.8. Since draft-young-md-query-saml-06

Bump reference to the Metadata Query Protocol [I-D.young-md-query].

A.9. Since draft-young-md-query-saml-07

Bump reference to the Metadata Query Protocol [I-D.young-md-query].

A.10. Since draft-young-md-query-saml-08

Bump reference to the Metadata Query Protocol [I-D.young-md-query].

Modernise normative language to include [RFC8174].

Improved references to RFCs.

A.11. Since draft-young-md-query-saml-09

Bump reference to the Metadata Query Protocol [I-D.young-md-query].

A.12. Since draft-young-md-query-saml-10

Bump reference to the Metadata Query Protocol [I-D.young-md-query].

Replace citations in the abstract with straight textual mentions, as
required by the ID-NITS checklist.

A.13. Since draft-young-md-query-saml-11

Bump reference to the Metadata Query Protocol [I-D.young-md-query].

Strengthen Section 4.1 so that SHA-1 now MUST NOT be used in the
context of digital signatures. This brings the section in line with
current best practice recommendations, particularly in light of the
[SHAttered] and [Shambles] attacks.

Revised Section 4.2 on the use of SHA-1 in transformed identifiers
to:

  *Make clear that this is a SAML-level issue, not one introduced by
   the query protocol.

  *Reference the attacks demonstrating SHA-1's weak collision
   resistance.

  *Identify second-preimage resistance as the potential source of
   the attack we'd be concerned about for the query protocol.

  *Note that SHA-1's second-preimage resistance is at present
   uncompromised.

A.14. Since draft-young-md-query-saml-12

Bump reference to the Metadata Query Protocol [I-D.young-md-query].

A.15. Since draft-young-md-query-saml-13

Bump reference to the Metadata Query Protocol [I-D.young-md-query].

A.16. Since draft-young-md-query-saml-14

Bump reference to the Metadata Query Protocol [I-D.young-md-query].

A.17. Since draft-young-md-query-saml-15

Bump reference to the Metadata Query Protocol [I-D.young-md-query].

A.18. Since draft-young-md-query-saml-16

Bump reference to the Metadata Query Protocol [I-D.young-md-query].

A.19. Since draft-young-md-query-saml-17

Bump reference to the Metadata Query Protocol [I-D.young-md-query].

A.20. Since draft-young-md-query-18

Formatting changes to allow rendering with xml2rfc version 3.

Bump reference to the Metadata Query Protocol [I-D.young-md-query].

A.21. Since draft-young-md-query-19

Bump reference to the Metadata Query Protocol [I-D.young-md-query].

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