Subject-based Profiles for SAML V1.1 Assertions

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This profile places constraints upon SAML V1.1 subjects and assertions so that they have properties similar to SAML V2.0 subjects and assertions.

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1 Introduction

This profile places constraints upon SAML V1.1 subjects and assertions so that they have properties similar to SAML V2.0 subjects and assertions. The Subject-based Profiles for SAML V1.1 Assertions specifies two profiles:

- SAML V1.1 Subject Profile
- SAML V1.1 Subject-based Assertion Profile

The primary goal of the SAML V1.1 Subject-based Assertion Profile (which relies on the SAML V1.1 Subject Profile) is to provide guidance to deployments that support both SAML V1.1 and V2.0. In that case, there is some flexibility in SAML V1.1 that is not present in SAML V2.0 (and vice versa). This profile places constraints upon SAML V1.1 subjects and assertions so that they have properties similar to SAML V2.0 subjects and assertions. This may aid interoperability and speed the ultimate transition from SAML V1.1 to SAML V2.0.

An implementation of the SAML V1.1 Web Browser SSO Profile is very likely conformant to this profile. Other applications of SAML may not be conformant, however. For example, the Web Services Security SAML Token Profile [WSSSAML] provides for both SAML V1.1 and SAML V2.0 tokens. Due to differences between the two versions of SAML, an implementation that wished to support both would tend to constrain the tokens such that they exhibited an equivalent semantic. This profile provides one such set of constraints.

A major difference between SAML V1.1 and SAML V2.0 is that the latter elevates the `<saml2:Subject>` element to be a child element of the `<saml2:Assertion>` element, and therefore the `<saml2:Subject>` element applies to all the statements in the assertion. In SAML V1.1, on the other hand, each statement has its own `<saml:Subject>` element, which opens the door to a range of possibilities. This profile constrains SAML V1.1 assertions so that each statement contains an equivalent `<saml:Subject>` element. Formally, this is done by extending the notion of strongly matches to an equivalence relation, which culminates in section 3.3.

1.1 Terminology

This specification uses normative text to describe the contents of conforming SAML subjects and assertions.

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 [RFC 2119]:

…they MUST only be used where it is actually required for interoperability 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:

<table>
<thead>
<tr>
<th>Prefix</th>
<th>XML Namespace</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>saml:</td>
<td>urn:oasis:names:tc:SAML:1.1:assertion</td>
<td>This is the SAML V1.1 assertion namespace [SAMLCore].</td>
</tr>
</tbody>
</table>
1.2 Outline
Section 2 describes a profile that constrains SAML V1.1 subjects so that they have properties similar to SAML V2.0 subjects. Section 3 describes a profile that places constraints upon SAML V1.1 assertions so that they have properties similar to SAML V2.0 assertions. Finally, section 4 specifies requirements that all conforming implementations must follow.

1.3 Normative References


1.4 Non-Normative References


2 SAML V1.1 Subject Profile

This SAML V1.1 Subject Profile constrains SAML V1.1 subjects so that they have properties similar to SAML V2.0 subjects.

2.1 Required Information

Identification:
urn:oasis:names:tc:SAML:1.1:profiles:subject

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

Description: Given below.

Updates: N/A

Extends: N/A

2.2 Profile Description

This profile specifies a SAML V1.1 <saml:Subject> element that can be readily mapped to SAML V2.0.

2.3 Usage of <saml:Subject> Element

Neither SAML V1.1 nor SAML V2.0 explicitly requires a name identifier, but certain SAML V2.0 profiles (most notably the Single Logout Profile) implicitly require one, so a <saml:Subject> element that conforms to this profile SHOULD contain a <saml:NameIdentifier> element. To further align with SAML V2.0, the NameQualifier attribute on the <saml:NameIdentifier> element SHOULD be omitted unless the identifier's type definition explicitly defines its use and semantics. In particular, if the Format attribute on the <saml:NameIdentifier> element has a value specified in section 7.3 of [SAMLCore], the NameQualifier attribute SHOULD be omitted.

Certain deprecated features of SAML V1.1 were removed in SAML V2.0. Thus a <saml:Subject> that conforms to this profile MUST NOT contain a <saml:NameIdentifier> element with any of the following Format attribute values:

- urn:oasis:names:tc:SAML:1.0:assertion#emailAddress
- urn:oasis:names:tc:SAML:1.0:assertion#X509SubjectName
- urn:oasis:names:tc:SAML:1.0:assertion#WindowsDomainQualifiedName

See section 7.3 of [SAMLCore] for the URIs to be used in lieu of these deprecated values.

In SAML V1.1, a <saml:Subject> element contains at most one <saml:SubjectConfirmation> element containing one or more <saml:ConfirmationMethod> elements. In SAML V2.0, on the other hand, there may be multiple <saml2:SubjectConfirmation> elements, each with a required Method attribute. Therefore, a <saml:Subject> element that conforms to this profile MAY contain a <saml:SubjectConfirmation> element, but that element MUST contain one and only one <saml:ConfirmationMethod> element.

2.4 Example

<!-- SAML V1.1 Subject -->
<saml:Subject>
  <saml:NameIdentifier
    Format="urn:oasis:names:tc:SAML:1.1:nameid-format:X509SubjectName">
    C=US, O=NCSA-TEST, OU=User, CN=trscavo@uiuc.edu
  </saml:NameIdentifier>
</saml:Subject>
2.5 Strongly Matching Subjects

In general, the notion of strongly matches defined in section 3.4.4 of [SAMLCore] is overly restrictive, for at least two reasons: 1) a <saml:NameIdentifier> element with no Format attribute is semantically equivalent to a <saml:NameIdentifier> element with Format equal to "urn:oasis:names:tc:SAML:1.1:nameid-format:unspecified", and 2) a <saml:SubjectConfirmation> element with confirmation method "urn:oasis:names:tc:SAML:1.0:cm:holder-of-key" must have a <ds:KeyInfo> element, but two distinct <ds:KeyInfo> elements can refer to the same key, so two distinct <saml:SubjectConfirmation> elements can be semantically equivalent. For these reasons, especially the latter, this profile adopts an alternate definition of strongly matches that more closely aligns with SAML V2.0.

The name identifier part of the definition of strongly matches in the two versions of SAML is the same if we ignore the language regarding encryption in the SAML V2.0 definition (which of course SAML V1.1 does not support). On the other hand, the subject confirmation part of strongly matches has a distinctly different flavor, so we reformulate the subject confirmation part of strongly matches in SAML V1.1 so that it aligns with SAML V2.0.

For these reasons, this profile adopts the following alternate definition (which aligns with SAML V2.0):

A <saml:Subject> element S1 strongly matches S2 if and only if the following two conditions both apply:

- If S2 includes a <saml:NameIdentifier> element, then S1 MUST include an identical <saml:NameIdentifier> element.
- If S2 contains a <saml:SubjectConfirmation> element, then S1 MUST contain a <saml:SubjectConfirmation> element such that the subject identified by S1 can be confirmed in the manner described by the <saml:SubjectConfirmation> element in S2.
Like the definition of strongly matches in [SAMLCore], the above relation is not symmetric since S1 strongly matches S2 does not imply that S2 strongly matches S1. In other words, the order of operands S1, S2 matters.
3 SAML V1.1 Subject-based Assertion Profile

This SAML V1.1 Subject-based Assertion Profile places constraints upon SAML V1.1 assertions so that they have properties similar to SAML V2.0 assertions.

In SAML V1.1, each statement contains a `<saml:Subject>` element, but in SAML V2.0, there is one `<saml2:Subject>` element per assertion. Thus, in SAML V2.0, every statement necessarily applies to the same subject. To achieve an equivalent semantic in SAML V1.1, this profile places suitable restrictions on multi-statement assertions.

See section 2 of the SAML V1.1 Assertions and Protocols specification [SAMLCore] for general requirements regarding SAML assertions. Where this profile conflicts with [SAMLCore], the former takes precedence.

3.1 Required Information

Identification:

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

Description: Given below.

Updates: N/A

Extends: N/A

3.2 Profile Description

This profile places the following constraints upon conforming assertions:

- Deprecated elements must not be used.
- Each statement of the assertion must have a `<saml:Subject>` element.
- Each `<saml:Subject>` element must satisfy the SAML Subject Profile described in section 2. Moreover, each pair of `<saml:Subject>` elements must very strongly match, a notion made precise in the next section.

Such an assertion is called a subject-based assertion.

3.3 Usage of `<saml:Assertion>` Element

An assertion that conforms to this profile MUST satisfy the following general requirements:

- The assertion MUST NOT contain a `<saml:AuthorityBinding>` element.
- Every statement in the assertion MUST have a type derived from abstract type `<saml:SubjectStatementAbstractType>` [SAMLCore].
- The `<saml:Subject>` element of each statement MUST satisfy the SAML Subject Profile described in section 2.
- If the `<saml:Assertion>` element contains more than one statement, each pair of `<saml:Subject>` elements MUST very strongly match, which we now define. Let S1 and S2 be two `<saml:Subject>` elements. S1 very strongly matches S2 if S1 strongly matches S2 and S2 strongly matches S1. Note that this definition depends on the notion of strongly matches defined in the previous section 2.5.

An assertion is valid according to this profile if and only if it satisfies the above requirements.
3.4 Example

The following SAML assertion was obtained by a principal who authenticated to an identity provider via TLS [RFC2246] client authentication. Note that the `<saml:Subject>` elements in the two statements very strongly match (indeed, the `<saml:Subject>` elements are identical).

```xml
<!-- SAML Assertion for an X.509 Subject -->
<saml:Assertion
    xmlns:saml="urn:oasis:names:tc:SAML:1.0:assertion"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
    AssertionID="_33776a319493ad607b7ab3e689482e45"
    IssueInstant="2006-07-17T20:31:41Z"
    Issuer="https://idp.example.org/saml"
    MajorVersion="1" MinorVersion="1">
    <!-- assertion lifetime constrained by principal's X.509 cert -->
    <saml:Conditions
        NotBefore="2006-07-17T20:31:41Z"
        NotOnOrAfter="2006-07-18T20:21:41Z">
    </saml:Conditions>
    <saml:AuthenticationStatement
        AuthenticationInstant="2006-07-17T20:31:41Z"
        AuthenticationMethod="urn:ietf:rfc:2246">
        <saml:Subject>
            <saml:NameIdentifier
                Format="urn:oasis:names:tc:SAML:1.1:nameid-format:X509SubjectName">
                C=US, O=NCSA-TEST, OU=User, CN=trscavo@uiuc.edu
            </saml:NameIdentifier>
            <saml:SubjectConfirmation>
                <saml:ConfirmationMethod>
                    urn:oasis:names:tc:SAML:1.0:cm:holder-of-key
                </saml:ConfirmationMethod>
                <ds:KeyInfo>
                    <ds:X509Data>
                        <!-- subject's X.509 cert -->
                        MIICiDCCAXAXCQDE9ieWrm62jANBgkqkhiG9wDBAQFADBDFMQswCQDVQQGEwJV
                        UzMEMBQA1UEChMtMjTKQzJSU1RVMQ0wCwYDVQQLEkRvCVyMRmWEOYDVQQDEwPT
                        UCI1ZXJzU2VHMB4XDTA2MdcxOHw4NjE0MVoXDTA2MdcxODiwMjE0MVoXwZEMakG
                        A1UEbEMCVMVyjQoBqNVBoa7CUC5DU0EtVEVTVDENNAgSA1UEAxMEeXNiLjZEMBcG
                        A1UERAmQwHJzY2Fb081aXJvVmgZVkdTCBzbzNABQkqkhiG9wBAQEEFAAObqAogKc
                        qYeXeM4lRI3KBqfS1CkG9Kty6zBjm+ItsaJINNOVcb73t+I5Xkne1Yfie
                        nCC03y0axh6a9G5QXMy+5wKQXa8RzdW28N3a73wfjMjXJXOUeQvERccs9Ei6WCC
                        q2hObGhbuSh+JFv31IIi4L1B5MCsbujsS71r/xsadsU2rC8cawEAATAAnBqkhlkG
                        9wOBAQFAQFAQAOCAEQzAdYtcMw0B7TVk1efJ7+11j10I24U1KvbLzd20PvCtCv6fVHX
                        EjkQxZkJXre26+YIdiMxsEz1RdjesNmotDw8+sVp6avB5EXY3ez7EAE1L4g
                        cjyK2U4DbrMyWaxWI12KbMFeE9K+FiiiiTskLcKgFzngwLj
                        semiHhtCTc reckon5y02+3cdog52s0tVDFBsvBUvDix20vh679JR6H1gjtk4GExp
                        E91JV0wDE038ubQJ1JTXT1hsMMLyUQvH/c0ReJbn92Vj4dI/yy6PtY/8ncYLYNkjg
                        oVNOJ/yjmOkttn91TLyTiuY4OuJsZRO1+zWLy9g==
                    </ds:X509Data>
                </ds:KeyInfo>
            </saml:SubjectConfirmation>
        </saml:Subject>
    </saml:AuthenticationStatement>
</saml:Assertion>
```

394        <urn:oasis:names:tc:SAML:1.0:cm:holder-of-key>
395            </saml:ConfirmationMethod>
396        </ds:KeyInfo>
397        <ds:X509Data>
398            <!-- subject's X.509 cert -->
399        </ds:X509Certificate>
400        <ds:KeyInfo>
401            <ds:X509Data>
402                <!-- subject's X.509 cert -->
403            </ds:X509Certificate>
404        </ds:KeyInfo>
405        </saml:SubjectConfirmation>
406        </saml:Subject>
407        <saml:Attribute
408            AttributeNamespace="urn:mace:shibboleth:1.0:attributeNamespace:uri"
409            AttributeName="urn:mace:dir:attribute-def:eduPersonPrincipalName">
410                <saml:AttributeValue Scope="uiuc.edu">
411                    trscavo
412                </saml:AttributeValue>
413            </saml:Attribute>
414            <saml:Attribute
415                AttributeNamespace="urn:mace:shibboleth:1.0:attributeNamespace:uri"
416                AttributeName="urn:mace:dir:attribute-def:givenName">
417                    <saml:AttributeValue xsi:type="xs:string">
418                        Tom
419                    </saml:AttributeValue>
420            </saml:Attribute>
421            <saml:Attribute
422                AttributeNamespace="urn:mace:shibboleth:1.0:attributeNamespace:uri"
423                AttributeName="urn:mace:dir:attribute-def:sn">
424                    <saml:AttributeValue xsi:type="xs:string">
425                        Scavo
426                    </saml:AttributeValue>
427            </saml:Attribute>
428            <saml:Attribute
429                AttributeNamespace="urn:mace:shibboleth:1.0:attributeNamespace:uri"
430                AttributeName="urn:mace:dir:attribute-def:mail">
431                    <saml:AttributeValue>
432                        trscavo@gmail.com
433                    </saml:AttributeValue>
434            </saml:Attribute>
435            <saml:Attribute
436                AttributeNamespace="urn:mace:shibboleth:1.0:attributeNamespace:uri"
437                AttributeName="urn:mace:dir:attribute-def:mail">
438                    <saml:AttributeValue>
439                        trscavo@gmail.com
440                    </saml:AttributeValue>
441            </saml:Attribute>
442        </saml:AttributeStatement>
443        </ds:Signature>...
444        </saml:Statement>
445    </saml:Assertion>
446
447
448
449

The attributes in the above example conform to the MACE-Dir Attribute Profile for SAML 1.1 [MACEAttrib]
and are for illustration purposes only.

3.5 Complex type SubjectStatementType

Recall that a SAML V1.1 assertion contains at least one statement. SAML V2.0, on the other hand,
permits empty assertions, that is, subject-based assertions with no statements. To duplicate this capability
in SAML V1.1, we define a trivial extension of saml:SubjectStatementAbstractType:
The following example illustrates a `<saml:Assertion>` containing a `<saml:SubjectStatement>` of type `samlsap:SubjectStatementType`.

```xml
<saml:Assertion
  xmlns:saml="urn:oasis:names:tc:SAML:1.0:assertion"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  AssertionID="cT_S_T-vKMi4T8_PzkeSUXkC68."
  IssueInstant="2006-07-17T20:31:41Z"
  Issuer="https://idp.example.org/saml"
  MajorVersion="1" MinorVersion="1">
  <saml:Conditions
    NotBefore="2006-07-17T20:31:41Z"
    NotOnOrAfter="2006-07-18T20:31:41Z">
  </saml:Conditions>
  <saml:SubjectStatement
    xsi:type="samlsap:SubjectStatementType">
    <saml:Subject>
      <saml:NameIdentifier
        Format="urn:oasis:names:tc:SAML:1.1:nameid-format:X509SubjectName">
        C=US, O=NCSA-TEST, OU=User, CN=trscavo@uiuc.edu
      </saml:NameIdentifier>
    </saml:Subject>
  </saml:SubjectStatement>
</saml:Assertion>
```

Note that the above `<saml:SubjectStatement>` element has no content apart from a `<saml:Subject>` element.
4 Implementation Conformance

An implementation of this specification shall be ...
5 Acknowledgments

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<thead>
<tr>
<th>Document ID</th>
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</tr>
</thead>
<tbody>
<tr>
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<td>Initial draft</td>
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