SAML X.509 Authentication-based Attribute Sharing Profile

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Abstract:
This profile specifies the use of SAML attribute queries and assertions to support distributed authorization in support of X.509v3-based authentication.

Status:
This is a Draft.

Committee members should submit comments and potential errata to the security-services@lists.oasis-open.org list. Others should submit them to the security-services-comment@lists.oasis-open.org list (to post, you must subscribe; to subscribe, send a message to security-services-comment-request@lists.oasis-open.org with "subscribe" in the body) or use other OASIS-supported means of submitting comments. The committee will publish vetted errata on the Security Services TC web page (http://www.oasis-open.org/committees/security/).

For information on whether any patents have been disclosed that may be essential to implementing this specification, and any offers of patent licensing terms, please refer to the Intellectual Property Rights web page for the Security Services TC (http://www.oasis-open.org/committees/security/ipr.php).
1 X.509 Authentication-based Attribute Sharing Profile

[SAMLCore] defines an Attribute Query/Response Protocol for retrieving a principal's attributes. This profile describes the use of this protocol with the SOAP binding defined in [SAMLBind], and additional guidelines for protecting the privacy of the principal with encryption, to support the retrieval of attributes of a principal authenticated using an X.509v3 certificate.

1.1 Required Information

Identification: urn:oasis:names:tc:SAML:2.0:profiles:x509authattributesharing

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

SAML Confirmation Method Identifiers: This profile uses either of the SAML 'bearer' or "holder-of-key" subject confirmation methods, identified by, respectively:

- urn:oasis:names:tc:SAML:2.0:cm:bearer
- urn:oasis:names:tc:SAML:2.0:cm:holder-of-key

Description: Given below.

Updates: NA

Extends: Attribute Query/Response Profile (Should we capture these relationships?)

1.2 Motivating Use Case

1.2.1 Overview

A principal attempts to access a web resource maintained at a service provider. Principal authentication is accomplished through the presentation of a trusted X.509v3 certificate (i.e. the federated credential is a certificate and not a SAML assertion) and by the demonstration of proof of possession of the associated private key.

Even after the principal has been authenticated, the service provider requires additional information about the principal in order to determine whether to grant access to some privileged resource(s). To get this information the service provider uses a synchronous 'back-channel' to query an identity provider for the required information about the principal. This is configured outside of SAML. When the identity provider returns to the service provider the relevant attributes, the service provider is now able to make an informed authorization decision.

1.2.2 Sequence

The sequence of steps for the full use case is shown below.

Note: those steps constrained by this profile are hilted with a gray box - the other steps are shown only for completeness, the profile does not constrain them.
1. HTTP Request to Service Provider
   In step 1, the principal, via an HTTP User Agent, makes an HTTP request for a secured resource at the service provider without a security context.

2. Service Provider requests Authentication
   In step 2, the service provider requests that the principal be authenticated.

3. Authentication
   In step 3, the principal authenticates to the service provider with an X.509v3 certificate. The service provider will authenticate to the principal at the same time (i.e., SSL mutual authentication MUST be performed).

4. Request Attributes
   In step 4, the service provider sends a SAML <AttributeQuery> to the identity provider over the SAML SOAP Binding, using the DistinguishedName (DN) (in encrypted format) from the principal's X.509v3 certificate (presented in step 3 above) within the <Subject> element. The service provider will sign the attribute request such that the identity provider will be able to determine its origin and integrity.

   The location to which the service provider sends the <AttributeQuery> is determined by a service provider configuration setting.

5. Return Attributes
   In step 5, after verifying that the service provider is a valid requester, the identity provider issues a <Response> message containing appropriate attributes (in encrypted format) for the principal. The identity provider will sign the response such that the service provider will be able to determine...
its origin and integrity. The <Subject> element in response MUST contain a
<ConfirmationMethod> of either 'bearer' or 'holder-of-key' within the
<SubjectConfirmation>. If 'holder-of-key', the identity provider MUST populate the
<SubjectConfirmationData> with a <KeyInfo> element that will allow the principal to
subsequently confirm themselves to the service provider.

6. Confirm Subject

In this step, the service provider verifies whether the <KeyInfo> matches the public key used by
the service provider to authenticate the principal. If the public key matches exactly, proceed to
step 7. If the public key does not match exactly, the service provider MUST reconfirm the
principal using <KeyInfo> prior to granting access to the resource.

7. Return resource

Based on the results of steps 5 and 6, having received the response from the identity provider, the
service provider evaluates the principal's user agent with an error, or can return the requested
resource.

Of the sequence steps described above, it is steps 4 and 5 that are profiled below.

1.3 Profile Description

In this profile, a service provider uses the SAML SOAP Binding to send an <AttributeQuery> message
directly to an identity provider. This message contains an encrypted name identifier assigned to a
principal that authenticated to the service provider using an X.509v3 certificate.

The service provider MUST authenticate to the identity provider by signing the <AttributeQuery>
message. In addition, the requester MAY use TLS or SSL client authentication.

If the identity provider receiving the request can

(1) Decrypt and recognize the name identifier

(2) Fulfill the request based on authentication of the requester and any applicable policies

it will respond with a successful <Response> containing the relevant attributes for the identified principal.
The returned attributes MUST be encrypted as described below.

The responding identity provider MUST authenticate to the requester, both by signing the <Response>
message and through TLS or SSL server authentication.

1.3.1 <AttributeQuery> Issued by Service provider to Identity Provider

The identity provider MUST process the <AttributeQuery> message and any enclosed <Assertion>
elements as described in [SAMLCore] and in the [Attribute Request/Response Profile].

All HTTP requests/responses MUST be made over either SSL 3.0 ([SSL3]) or TLS 1.0 ([RFC2246]) to
maintain confidentiality and message integrity.

1.3.1.1 <AttributeQuery> Usage

The <AttributeQuery>MUST conform to the following:

- The <Subject> element must contain an <EncryptedID> element carrying the encrypted
value of the principal's DN. See section for details on the use of encryption.
• It MUST contain a <Signature> element carrying the signature of the service provider over the request.

1.3.1.2 Use of Encryption

[SAMLCore] defines the <EncryptedID> element as a means of applying confidentiality to a name identifier.
In this profile the service provider MUST use the <EncryptedID> to carry the DN of the principal in the <AttributeQuery>.
The service provider MAY use a previously established symmetric key to encrypt the principal's DN. If the service provider reuses a symmetric key to encrypt the DN, the resulting ciphertext is placed in the <xenc:EncryptedData> element and the <EncryptedID> element MUST NOT contain an <xenc:EncryptedKey> element.
Alternatively, the service provider MAY generate a new symmetric key for encrypting the principal's DN. The service provider then encrypts the DN with that key, and places the resulting ciphertext in the <xenc:EncryptedData> element. The symmetric key MUST be encrypted with the identity provider's public key and the resulting ciphertext placed in the <xenc:EncryptedKey> element.
Encryption MUST be performed before the digital signature operation.

1.3.1.3 Use of Digital Signatures

[SAMLCore] provides the <Signature> element as a mean of providing integrity and authenticity for a message.
In this profile, a service provider MUST sign the <AttributeQuery> containing the <EncryptedID> to allow the identity provider to verify both its origin and that it was not modified in transit.

1.3.2 <Response> issued by Identity Provider to Service Provider

The service provider MUST process the <Response> message and any enclosed <Assertion> elements as described in the [Attribute Request/Response Profile].
All HTTP requests/responses MUST be made over either SSL 3.0 ([SSL3]) or TLS 1.0 ([RFC2246]) to maintain confidentiality and message integrity.

1.3.2.1 <Response> Usage

If the identity provider wishes to return an error, it MUST NOT include any assertions in the <Response> message. Otherwise, if the request is successful the <Response> element MUST conform to the following:
• It MUST contain exactly one <EncryptedAssertion> element.
• The encrypted content of the <EncryptedAssertion> is an <Assertion> element that MUST satisfy the following conditions:
  • The <Subject> element MUST contain a <ConfirmationMethod> of either 'bearer' or 'holder-of-key' within the <SubjectConfirmation>. If 'holder-of-key', the identity provider MUST populate the <SubjectConfirmationData> with a <KeyInfo> element that will allow the principal to subsequently confirm themselves to the service provider. The identity provider MAY use the public key from within the principal's X.509v3 certificate for this purpose.
  • It MUST contain exactly one <AttributeStatement> that reflects the attributes of
the principal to the service provider.

- The `<Assertion>` MUST contain a `<Signature>` element carrying the signature of the identity provider.
- The `<Assertion>` MUST contain an `<AudienceRestrictionCondition>` including the service provider's unique identifier as an `<Audience>`.
- Other conditions (and other `<Audience>` elements) MAY be included as requested by the service provider or at the discretion of the identity provider. Any additional conditions MUST be understood by and accepted by the service provider in order for the assertion to be considered valid.

1.3.2.2 Use of Digital Signatures

[SAMLCore] provides the `<Signature>` element as a mean of providing integrity and authenticity for a message. In this profile, the identity provider MUST sign the `<Assertion>` in order to allow the service provider to verify both its origin and that it was not modified in transit. The signature is calculated before the encryption operation.

1.3.2.3 Use of Encryption

[SAMLCore] defines the `<EncryptedAssertion>` element as a mean of applying confidentiality to the contents of an assertion. In this profile the identity provider MUST use the `<EncryptedAssertion>` element to carry the returned attribute values for the principal.

The identity provider MAY use the symmetric key used for encrypting the principal's DN on the initial `<AttributeQuery>` in order to encrypt the returned `<Assertion>` . If the identity provider reuses a key in this manner, the `<EncryptedAssertion>` element MUST NOT contain an `<xenc:EncryptedKey>` element. Alternatively, the identity provider MAY generate a symmetric key for encrypting the assertion carrying the attributes and place the resulting ciphertext in the `<xenc:EncryptedData>` element. The symmetric key used to encrypt the assertion MUST be encrypted with the service provider's public key and the resulting ciphertext placed in the `<xenc:EncryptedKey>` element within the `<EncryptedAssertion>` element.

1.4 Implementation Guidance (informative)

The following guidance is informatively provided for implementers.

1.4.1.1 Identify Provider Policy

The motivation for this profile is to specify a secure means of using X.509 authentication in association with SAML attributes. As such, security considerations are highly important from the perspective of the profile. The policy configuration of Identity Providers SHOULD permit only a strictly limited list of attribute responses in SAML assertions. Wildcard-like `<AttributeQuery>` requests SHOULD be prohibited by policy, and rejected by Identity Providers.
14.1.2 Caching of Attributes

A capability to cache user attributes that are returned in assertions SHOULD be provided. Cache expiration settings SHOULD be configurable by administrators. The identity of the user for which the assertion was issued SHOULD NOT be human readable (i.e., clear text) in cache files. Attributes SHOULD NOT be cached for a period that extends beyond their lifetime.
2 References

[SAMLBind] Bindings for the OASIS Security Assertion Markup Language (SAML) V2.0, DRAFT
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