Level of Assurance Authentication Context Profiles for SAML 2.0

Draft 01

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Specification URIs:

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Technical Committee:
OASIS [official name of technical committee] TC

Chair(s):
Hal Lockhart, BEA Systems, Inc.
Brian Campbell, Ping Identity Corporation

Editor(s):
Eric Tiffany, Liberty Alliance

Related Work:
This specification is a profile of the SAML 2.0 Authentication Context specification [SAMLAC].

Declared XML Namespace(s):
[list namespaces here]
[list namespaces here]

Abstract:

This profile reduces the scope of the mechanisms described in the full Authentication Context specification so as to provide a simplified way of representing a Level-of-Assurance (LOA) authentication scheme. A general schema restriction is presented, along with specific examples implementing the NIST 800-63 levels of assurance [NIST 800-63].

Status:

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Table of Contents

1 Introduction

The *Level of Assurance Authentication Context Profiles for SAML 2.0* describes two profiles of the SAML Authentication Context [SAMLAC] specification:

- A general, restricted version of the AuthnContext schema that may be used as the basis for representing levels of assurance (or other abstract authentication models) defined by external documentation.
- A specific set of `AuthnContextClass` schema derived from the general case which implements the [NIST 800-63] levels of assurance.

1.1 Motivation [Non-Normative]

Many existing (and potential) SAML federation deployments have adopted a “levels of assurance” (or LOA) model for categorizing the wide variety of authentication methods into a small number of levels, typically based on some notion of the strength of the authentication. Federation members (service providers or “relying parties”) then decide which level of assurance is required to access specific protected resources, based on some assessment of “value” or “risk”.

The SAML authentication context mechanisms provide a variety of possible options for representing the details of a LOA scheme. However, this profile is motivated by several related notions:

- The SAML authentication context scheme is comprehensive, but quite complex. Deployers find that this complexity is a barrier to designing authentication contexts that match their LOA requirements.
- Representing the details of a LOA scheme using a the full expressiveness of the authentication context schema results in XML documents that must be passed in-band with authentication events and parsed by SAML implementations. In most cases, the processing requirements are not sustainable and interoperability issues have not been explored.

The approach taken here simply represents each level in a LOA scheme as a separate authentication context class. Each level class is characterized by a URI, and the body of the schema simply contains a reference to the external documentation that defines the LOA scheme. These URI values are conveyed in the `<RequestedAuthnContext>` element of an authentication request and the `<AuthnContextClassRef>` element in the authentication response

1.2 Limitations [Non-Normative]

There are at least two limitations to using this approach:

- The URIs representing the levels must be configured into every system in the deployment, and the ordering of the URI levels must be decided and configured out-of-band.
- The authentication assertions carrying these LOA authentication context URIs do not convey any details about the authentication event, although such details are implied by the level indicated by the URI.

1.3 Terminology

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 IETF [RFC 2119].

1.4 Normative References

[RFC 2119] S. Bradner. *Key words for use in RFCs to Indicate Requirement Levels*. IETF RFC 2119, March 1997. http://www.ietf.org/rfc/rfc2119.txt.

[NIST 800-63] NIST Special Publication 800-63 Version 1.0.2, *Electronic Authentication Guideline*, NIST, April 2006. See http://csrc.nist.gov/publications/nistpubs/800-63/SP800-63V1_0_2.pdf

[SAMLAC] J. Kemp et al. *Authentication Context for the OASIS Security Assertion Markup Language (SAML) V2.0*. OASIS SSTC, March 2005. Document ID saml-authn-context-2.0-os. See http://www.oasis-open.org/committees/security/.

[SAMLCore] S. Cantor et al. *Assertions and Protocols for the OASIS Security Assertion Markup Language (SAML) V2.0*. OASIS Standard, March 2005. See http://docs.oasis-open.org/security/saml/v2.0/saml-core-2.0-os.pdf

1.5 Non-normative References

[Reference] [reference citation]

[Reference] [reference citation]

2 General Level-of-Assurance Profile

The following schema redefines the basic abstract AuthnContextDeclarationBaseType to limit the allowed elements to the GoverningAgreements. The functional definition of the GoverningAgreementRefType is not changed from the original schema in [SAMLAC], but documentationj is added to serve as a reminder that definitions derived from this schema should redefine GoverningAgreementRefType to suit a particular LOA purpose.

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" finalDefault="extension"
    blockDefault="substitution" version="2.0">

    <xs:redefine schemaLocation="saml-schema-authn-context-types-2.0.xsd">

        <xs:annotation>
            <xs:documentation>
                Base class for building level-of-assurance style AuthnContext
                class definitions.
            </xs:documentation>
        </xs:annotation>

        <xs:complexType name="AuthnContextDeclarationBaseType">
            <xs:complexContent>
                <xs:restriction base="AuthnContextDeclarationBaseType">
                    <xs:sequence>
                        <xs:element ref="Identification" minOccurs="0"/>
                        <xs:element ref="TechnicalProtection" minOccurs="0"/>
                        <xs:element ref="OperationalProtection" minOccurs="0"/>
                        <xs:element ref="AuthnMethod" minOccurs="0"/>
                        <xs:element ref="GoverningAgreements" minOccurs="1"
                                    maxOccurs="1"/>
                        <xs:element ref="Extension" minOccurs="0"
                                    maxOccurs="unbounded"/>
                    </xs:sequence>
                    <xs:attribute name="ID" type="xs:ID" use="optional"/>
                </xs:restriction>
            </xs:complexContent>
        </xs:complexType>

        <xs:complexType name="GoverningAgreementRefType">
            <xs:annotation>
                <xs:documentation>
                    A specific restriction of this type specifying or
                    enumerating the governing document(s) and/or section
                    within such document(s) that define this particular
                    level of assurance.
                </xs:documentation>
            </xs:annotation>
            <xs:complexContent>
                <xs:restriction base="GoverningAgreementRefType">
                   <xs:attribute name="governingAgreementRef"
                                 type="xs:anyURI"  use="required"/>
                </xs:restriction>
            </xs:complexContent>
        </xs:complexType>

    </xs:redefine>

</xs:schema>
```

2.1 Example Derived Class

The following schema is based on the general LOA schema above, and further constrains the governing agreements to be limited to an enumerated set of references:

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema
    targetNamespace="urn:oasis:loa:example"
```

```
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns="urn:oasis:loa:example"
    finalDefault="extension"
    blockDefault="substitution"
    version="2.0">

    <xs:redefine schemaLocation="saml-schema-authn-context-loa-profile.xsd">

        <xs:annotation>
            <xs:documentation>
                Class identifier: urn:oasis:loa:example
                Reference Documents: loa-1.pdf, loa-2.pdf
            </xs:documentation>
        </xs:annotation>

        <xs:complexType name="GoverningAgreementRefType">
            <xs:complexContent>
                <xs:restriction base="GoverningAgreementRefType">
                    <xs:attribute name="governingAgreementRef" use="required">
                        <xs:simpleType>
                            <xs:restriction base="xs:anyURI">
                                <xs:enumeration
value="http://example.com/loa-1.pdf"/>
                                <xs:enumeration
value="http://example.com/loa-2.pdf"/>
                            </xs:restriction>
                        </xs:simpleType>
                    </xs:attribute>
                </xs:restriction>
            </xs:complexContent>
        </xs:complexType>

    </xs:redefine>

</xs:schema>
```

3 NIST 800-63 LOA Using SAML LOA Profile

The following schema define the following URIs to represent the four levels of assurance described in [NIST 800-63].

- urn:oasis:names:tc:SAML:2.0:post:ac:classes:nist-800-63:1
- urn:oasis:names:tc:SAML:2.0:post:ac:classes:nist-800-63:2
- urn:oasis:names:tc:SAML:2.0:post:ac:classes:nist-800-63:3
- urn:oasis:names:tc:SAML:2.0:post:ac:classes:nist-800-63:4

Editors Note: it occurs to me that these schema might also be represented as AuthenticationContextDeclaration instances, based on a class defined with an enumeration such as the example above. One might also employ an extension to explicitly indicate the numeric level as an integer. I welcome comments as to whether this would be a more straighforward approach.

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema
    targetNamespace="urn:oasis:names:tc:SAML:2.0:post:ac:classes:nist-800-63:1"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns="urn:oasis:names:tc:SAML:2.0:post:ac:classes:nist-800-63:1"
    finalDefault="extension"
    blockDefault="substitution"
    version="2.0">

    <xs:redefine schemaLocation="saml-schema-authn-context-loa-profile.xsd">

        <xs:annotation>
            <xs:documentation>
                Class identifier:
                    urn:oasis:names:tc:SAML:2.0:post:ac:classes:nist-800-63:1
                Document identifier: saml-schema-authn-context-nist-level1.xsd
            </xs:documentation>
        </xs:annotation>

        <xs:complexType name="GoverningAgreementRefType">
            <xs:complexContent>
                <xs:restriction base="GoverningAgreementRefType">
                    <xs:attribute name="governingAgreementRef" type="xs:anyURI"
                        fixed="http://csrc.nist.gov/publications/nistpubs/800-63
/SP800-63V1_0_2.pdf"
                        use="required"/>
                </xs:restriction>
            </xs:complexContent>
        </xs:complexType>

    </xs:redefine>

</xs:schema>
```

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema
    targetNamespace="urn:oasis:names:tc:SAML:2.0:post:ac:classes:nist-800-63:2"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns="urn:oasis:names:tc:SAML:2.0:post:ac:classes:nist-800-63:2"
    finalDefault="extension"
    blockDefault="substitution"
    version="2.0">

    <xs:redefine schemaLocation="saml-schema-authn-context-loa-profile.xsd">

        <xs:annotation>
            <xs:documentation>
                Class identifier:
                    urn:oasis:names:tc:SAML:2.0:post:ac:classes:nist-800-63:2
                Document identifier: saml-schema-authn-context-nist-level2.xsd
```

```
            </xs:documentation>
        </xs:annotation>

        <xs:complexType name="GoverningAgreementRefType">
            <xs:complexContent>
                <xs:restriction base="GoverningAgreementRefType">
                    <xs:attribute name="governingAgreementRef" type="xs:anyURI"
                        fixed="http://csrc.nist.gov/publications/nistpubs/800-63
/SP800-63V1_0_2.pdf"
                        use="required"/>
                </xs:restriction>
            </xs:complexContent>
        </xs:complexType>

    </xs:redefine>

</xs:schema>
```

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema
    targetNamespace="urn:oasis:names:tc:SAML:2.0:post:ac:classes:nist-800-63:3"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns="urn:oasis:names:tc:SAML:2.0:post:ac:classes:nist-800-63:3"
    finalDefault="extension"
    blockDefault="substitution"
    version="2.0">

    <xs:redefine schemaLocation="saml-schema-authn-context-loa-profile.xsd">

        <xs:annotation>
            <xs:documentation>
                Class identifier:
                    urn:oasis:names:tc:SAML:2.0:post:ac:classes:nist-800-63:3
                Document identifier: saml-schema-authn-context-nist-level3.xsd
            </xs:documentation>
        </xs:annotation>

        <xs:complexType name="GoverningAgreementRefType">
            <xs:complexContent>
                <xs:restriction base="GoverningAgreementRefType">
                    <xs:attribute name="governingAgreementRef" type="xs:anyURI"
                        fixed="http://csrc.nist.gov/publications/nistpubs/800-63
/SP800-63V1_0_2.pdf"
                        use="required"/>
                </xs:restriction>
            </xs:complexContent>
        </xs:complexType>

    </xs:redefine>

</xs:schema>
```

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema
    targetNamespace="urn:oasis:names:tc:SAML:2.0:post:ac:classes:nist-800-63:4"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns="urn:oasis:names:tc:SAML:2.0:post:ac:classes:nist-800-63:4"
    finalDefault="extension"
    blockDefault="substitution"
    version="2.0">

    <xs:redefine schemaLocation="saml-schema-authn-context-loa-profile.xsd">

        <xs:annotation>
            <xs:documentation>
                Class identifier: urn:oasis:names:tc:SAML:
2.0:post:ac:classes:nist-800-63:4
                Document identifier: saml-schema-authn-context-nist-level4.xsd
            </xs:documentation>
```

```
        </xs:annotation>

        <xs:complexType name="GoverningAgreementRefType">
            <xs:complexContent>
                <xs:restriction base="GoverningAgreementRefType">
                    <xs:attribute name="governingAgreementRef" type="xs:anyURI"
                        fixed="http://csrc.nist.gov/publications/nistpubs/800-63
/SP800-63V1_0_2.pdf"
                        use="required"/>
                </xs:restriction>
            </xs:complexContent>
        </xs:complexType>

    </xs:redefine>

</xs:schema>
```

4 SAML LOA Profile Conformance

To conform to this profile, implementations MUST implement the provisions of sections 3.3.2.2.1 of [SAMLCore] concerning the processing of <RequestedAuthnContext>.

Appendix A. Acknowledgments

The following individuals have participated in the creation of this specification and are gratefully acknowledged

Participants:

- [Participant name, affiliation | Individual member]
- [Participant name, affiliation | Individual member]
- [Participant name, affiliation | Individual member]

Appendix B. Revision History

[optional; should not be included in OASIS standards]

Appendix C. Non-Normative Text