Authentication Context for the OASIS Security Assertion Markup Language (SAML) V2.0

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Abstract:

This specification defines a syntax for the definition of authentication context declarations and an initial list of authentication context classes for use with SAML.

Status:

This is a **Committee Draft** approved by the Security Services Technical Committee on 15 January 2005.

Committee members should submit comments and potential errata to the security-services@lists.oasis-open.org list. Others should submit them by filling out the web form located at http://www.oasis-open.org/committees/comments/form.php?wg_abbrev=security. The committee will publish on its web page (http://www.oasis-open.org/committees/security) a catalog of any changes made to this document.

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).

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1 Introduction

This specification defines a syntax for the definition of authentication context declarations and an initial list of authentication context classes.

1.1 Authentication Context Concepts

If a relying party is to rely on the authentication of a principal by an authentication authority, the relying party may require information additional to the assertion itself in order to assess the level of confidence they can place in that assertion. This specification defines an XML Schema for the creation of Authentication Context declarations - XML documents that allow the authentication authority to provide to the relying party this additional information. Additionally, this specification defines a number of Authentication Context classes; categories into which many Authentication Context declarations will fall, thereby simplifying their interpretation.

The OASIS Security Assertion Markup Language does not prescribe a single technology, protocol, or policy for the processes by which authentication authorities issue identities to principals and by which those principals subsequently authenticate themselves to the authentication authority. Different authentication authorities will choose different technologies, follow different processes, and be bound by different legal obligations with respect to how they authenticate principals.

The choices that an authentication authority makes here will be driven in large part by the requirements of the relying parties with which the authentication authority interacts. These requirements themselves will be determined by the nature of the service (that is, the sensitivity of any information exchanged, the associated financial value, the relying parties' risk tolerance, etc.) that the relying party will be providing to the principal.

Consequently, for anything other than trivial services, if the relying party is to place sufficient confidence in the authentication assertions it receives from an authentication authority, it will be necessary for it to know which technologies, protocols, and processes were used or followed for the original authentication mechanism on which the authentication assertion is based. Armed with this information and trusting the origin of the actual assertion, the relying party will be better able to make an informed entitlements decision regarding what services the subject of the authentication assertion should be allowed to access.

Authentication context is defined as the information, additional to the authentication assertion itself, that the relying party may require before it makes an entitlements decision with respect to an authentication assertion. Such context may include, *but is not limited to*, the actual authentication method used (see the SAML assertions and protocols specification [SAMLCore] for more information).

1.2 Notation and 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 [RFC 2119].

```
Listings of XML schemas appear like this.

Example code listings appear like this.
```

This specification uses schema documents conforming to W3C XML Schema [Schema1] and normative text to describe the syntax and semantics of XML-encoded SAML assertions and protocol messages. In cases of disagreement between the SAML authentication context schema documents and schema listings in this specification, the schema documents take precedence. Note that in some cases the normative text of this specification imposes constraints beyond those indicated by the schema documents.

Conventional XML namespace prefixes are used throughout the listings in this specification to stand for

151 their respective namespaces as follows, whether or not a namespace declaration is present in the
152 example:

Prefix	XML Namespace	Comments
`ac:`	urn:oasis:names:tc:SAML:2.0:ac	This is the namespace defined in this specification and in a schema [SAMLAC-xsd].
`xs:`	http://www.w3.org/2001/XMLSchema	This namespace is defined in the W3C XML Schema specification [Schema1].

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154 This specification uses the following typographical conventions in text: `<SAMLElement>`,
155 `<ns:ForeignElement>`, `XMLAttribute`, **Datatype**, `OtherKeyword`.

2 Authentication Context Declaration

If a relying party is to rely on the authentication of another entity by an authentication authority, the relying party may require information additional to the authentication itself to allow it to put the authentication into a risk-management context. This information could include:

- The initial user identification mechanisms (for example, face-to-face, online, shared secret).
- The mechanisms for minimizing compromise of credentials (for example, credential renewal frequency, client-side key generation).
- The mechanisms for storing and protecting credentials (for example, smartcard, password rules).
- The authentication mechanism or method (for example, password, certificate-based SSL).

The variations and permutations in the characteristics listed above guarantee that not all authentication assertions will be the same with respect to the confidence that a relying party can place in it; a particular authentication assertion will be characterized by the values for each of these (and other) variables.

A SAML authentication authority can deliver to a relying party the additional authentication context information in the form of an authentication context declaration, an XML document either inserted directly or referenced within the authentication assertion that the authentication authority provides to the relying party.

SAML requesters are able to request that an authentication comply with a specified authentication context by identifying that context in an authentication request. A requester may also specify that an authentication must be conducted with an authentication context that *exceeds* some stated value (for some agreed definition of "exceeds"). See the SAML assertions and protocols specification [SAMLCore] for more information.

2.1 Data Model

A particular authentication context declaration defined in this specification will capture characteristics of the processes, procedures, and mechanisms by which the authentication authority verified the subject before issuing an identity, protects the secrets on which subsequent authentications are based, and the mechanisms used for this authentication. These characteristics are categorized in the Authentication Context schema as follows:

- Identification - Characteristics that describe the processes and mechanism the authentication authority uses to initially create an association between a subject and the identity (or name) by which the subject will be known.
- Technical Protection - Characteristics that describe how the "secret" (the knowledge or possession of which allows the subject to authenticate to the authentication authority) is kept secure.
- Operational Protection - Characteristics that describe procedural security controls employed by the authentication authority (for example, security audits, records archival).
- Authentication Method - Characteristics that define the mechanisms by which the subject of the issued assertion authenticates to the authentication authority (for example, a password versus a smartcard).
- Governing Agreements - Characteristics that describe the legal framework (e.g. liability constraints and contractual obligations) underlying the authentication event and/or its associated technical authentication infrastructure.

2.2 Extensibility

The authentication context declaration schema [SAMLAC-xsd] has well-defined extensibility points through the `<Extension>` element. Authentication authorities can use this element to insert additional authentication context details for the SAML assertions they issue (assuming that the consuming relying party will be able to understand these extensions). These additional elements MUST be in a separate XML Namespace to that of the authentication context declaration base or class schema that applies to the declaration itself.

2.3 Processing Rules

Additional processing rules for authentication context declarations are specified in the SAML assertions and protocols specification [SAMLCore]. Note that in most respects, these processing rules amount to deployments sharing common interpretations of the relative strength or quality of particular authentication context declarations and cannot be expressed in absolute terms or provided as rules that implementations must follow.

2.4 Schema

This section lists the complete Authentication Context Types XML Schema [SAMLAC-Types], and the Authentication Context XML schema [SAMLAC-xsd] itself, used for the validation of individual generalized declarations. The types schema has no target namespace itself, and is then included by [SAMLAC-xsd].

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

  <xs:annotation>
    <xs:documentation>
      Document identifier: sstc-saml-schema-authn-context-types-2.0
      Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
      Revision history:
        V2.0 CD-04 (January, 2005):
          New core authentication context schema types for SAML V2.0.
    </xs:documentation>
  </xs:annotation>

  <xs:element name="AuthenticationContextDeclaration"
type="AuthnContextDeclarationBaseType">
    <xs:annotation>
      <xs:documentation>
        A particular assertion on an identity
        provider's part with respect to the authentication
        context associated with an authentication assertion.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="Identification" type="IdentificationType">
    <xs:annotation>
      <xs:documentation>
        Refers to those characteristics that describe the
        processes and mechanisms
        the Authentication Authority uses to initially create
        an association between a Principal
        and the identity (or name) by which the Principal will
        be known
      </xs:documentation>
    </xs:annotation>
```

```
  </xs:element>

  <xs:element name="PhysicalVerification">
    <xs:annotation>
      <xs:documentation>
        This element indicates that identification has been
        performed in a physical
        face-to-face meeting with the principal and not in an
        online manner.
      </xs:documentation>
    </xs:annotation>
    <xs:complexType>
      <xs:attribute name="credentialLevel">
        <xs:simpleType>
          <xs:restriction base="xs:NMTOKEN">
            <xs:enumeration value="primary"/>
            <xs:enumeration value="secondary"/>
          </xs:restriction>
        </xs:simpleType>
      </xs:attribute>
    </xs:complexType>
  </xs:element>

  <xs:element name="WrittenConsent" type="ExtensionOnlyType"/>

  <xs:element name="TechnicalProtection" type="TechnicalProtectionBaseType">
    <xs:annotation>
      <xs:documentation>
        Refers to those characterstics that describe how the
        'secret' (the knowledge or possession
        of which allows the Principal to authenticate to the
        Authentication Authority) is kept secure
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="SecretKeyProtection" type="SecretKeyProtectionType">
    <xs:annotation>
      <xs:documentation>
        This element indicates the types and strengths of
        facilities
        of a UA used to protect a shared secret key from
        unauthorized access and/or use.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="PrivateKeyProtection" type="PrivateKeyProtectionType">
    <xs:annotation>
      <xs:documentation>
        This element indicates the types and strengths of
        facilities
        of a UA used to protect a private key from
        unauthorized access and/or use.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="KeyActivation" type="KeyActivationType">
    <xs:annotation>
      <xs:documentation>The actions that must be performed
        before the private key can be used. </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="KeySharing" type="KeySharingType">
    <xs:annotation>
```

```
      <xs:documentation>Whether or not the private key is shared
        with the certificate authority.</xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="KeyStorage" type="KeyStorageType">
    <xs:annotation>
      <xs:documentation>
        In which medium is the key stored.
        memory - the key is stored in memory.
        smartcard - the key is stored in a smartcard.
        token - the key is stored in a hardware token.
        MobileDevice - the key is stored in a mobile device.
        MobileAuthCard - the key is stored in a mobile
        authentication card.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="SubscriberLineNumber" type="ExtensionOnlyType"/>
  <xs:element name="UserSuffix" type="ExtensionOnlyType"/>

  <xs:element name="Password" type="PasswordType">
    <xs:annotation>
      <xs:documentation>
        This element indicates that a password (or passphrase)
        has been used to
        authenticate the Principal to a remote system.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="ActivationPin" type="ActivationPinType">
    <xs:annotation>
      <xs:documentation>
        This element indicates that a Pin (Personal
        Identification Number) has been used to authenticate the Principal to
        some local system in order to activate a key.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="Token" type="TokenType">
    <xs:annotation>
      <xs:documentation>
        This element indicates that a hardware or software
        token is used
        as a method of identifying the Principal.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="TimeSyncToken" type="TimeSyncTokenType">
    <xs:annotation>
      <xs:documentation>
        This element indicates that a time synchronization
        token is used to identify the Principal. hardware -
        the time synchonization
        token has been implemented in hardware. software - the
        time synchronization
        token has been implemented in software. SeedLength -
        the length, in bits, of the
        random seed used in the time synchronization token.
      </xs:documentation>
    </xs:annotation>
  </xs:element>
```

```
  <xs:element name="Smartcard" type="ExtensionOnlyType">
    <xs:annotation>
      <xs:documentation>
        This element indicates that a smartcard is used to
        identity the Principal.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="Length" type="LengthType">
    <xs:annotation>
      <xs:documentation>
        This element indicates the minimum and/or maximum
        ASCII length of the password which is enforced (by the UA or the
        IdP). In other words, this is the minimum and/or maximum number of
        ASCII characters required to represent a valid password.
        min - the minimum number of ASCII characters required
        in a valid password, as enforced by the UA or the IdP.
        max - the maximum number of ASCII characters required
        in a valid password, as enforced by the UA or the IdP.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="ActivationLimit" type="ActivationLimitType">
    <xs:annotation>
      <xs:documentation>
        This element indicates the length of time for which an
        PIN-based authentication is valid.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="Generation">
    <xs:annotation>
      <xs:documentation>
        Indicates whether the password was chosen by the
        Principal or auto-supplied by the Authentication Authority.
        principalchosen - the Principal is allowed to choose
        the value of the password. This is true even if
        the initial password is chosen at random by the UA or
        the IdP and the Principal is then free to change
        the password.
        automatic - the password is chosen by the UA or the
        IdP to be cryptographically strong in some sense,
        or to satisfy certain password rules, and that the
        Principal is not free to change it or to choose a new password.
      </xs:documentation>
    </xs:annotation>

    <xs:complexType>
      <xs:attribute name="mechanism" use="required">
        <xs:simpleType>
          <xs:restriction base="xs:NMTOKEN">
            <xs:enumeration value="principalchosen"/>
            <xs:enumeration value="automatic"/>
          </xs:restriction>
        </xs:simpleType>
      </xs:attribute>
    </xs:complexType>
  </xs:element>

  <xs:element name="AuthnMethod" type="AuthnMethodBaseType">
    <xs:annotation>
      <xs:documentation>
        Refers to those characteristics that define the
        mechanisms by which the Principal authenticates to the Authentication
```

```
        Authority.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="PrincipalAuthenticationMechanism"
type="PrincipalAuthenticationMechanismType">
    <xs:annotation>
      <xs:documentation>
        The method that a Principal employs to perform
        authentication to local system components.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="Authenticator" type="AuthenticatorBaseType">
    <xs:annotation>
      <xs:documentation>
        The method applied to validate a principal's
        authentication across a network
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="ComplexAuthenticator" type="ComplexAuthenticatorType">
    <xs:annotation>
      <xs:documentation>
        Supports Authenticators with nested combinations of
        additional complexity.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="PreviousSession" type="ExtensionOnlyType">
    <xs:annotation>
      <xs:documentation>
        Indicates that the Principal has been strongly
        authenticated in a previous session during which the IdP has set a
        cookie in the UA. During the present session the Principal has only
        been authenticated by the UA returning the cookie to the IdP.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="ResumeSession" type="ExtensionOnlyType">
    <xs:annotation>
      <xs:documentation>
        Rather like PreviousSession but using stronger
        security. A secret that was established in a previous session with
        the Authentication Authority has been cached by the local system and
        is now re-used (e.g. a Master Secret is used to derive new session
        keys in TLS, SSL, WTLS).
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="ZeroKnowledge" type="ExtensionOnlyType">
    <xs:annotation>
      <xs:documentation>
        This element indicates that the Principal has been
        authenticated by a zero knowledge technique as specified in ISO/IEC
        9798-5.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

```

```
  <xs:element name="SharedSecretChallengeResponse"
type="SharedSecretChallengeResponseType"/>

  <xs:complexType name="SharedSecretChallengeResponseType">
    <xs:annotation>
      <xs:documentation>
        This element indicates that the Principal has been
        authenticated by a challenge-response protocol utilizing shared secret
        keys and symmetric cryptography.
      </xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:attribute name="method" type="xs:anyURI" use="optional"/>
  </xs:complexType>

  <xs:element name="DigSig" type="PublicKeyType">
    <xs:annotation>
      <xs:documentation>
        This element indicates that the Principal has been
        authenticated by a mechanism which involves the Principal computing a
        digital signature over at least challenge data provided by the IdP.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="AsymmetricDecryption" type="PublicKeyType">
    <xs:annotation>
      <xs:documentation>
        The local system has a private key but it is used
        in decryption mode, rather than signature mode. For example, the
        Authentication Authority generates a secret and encrypts it using the
        local system's public key: the local system then proves it has
        decrypted the secret.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="AsymmetricKeyAgreement" type="PublicKeyType">
    <xs:annotation>
      <xs:documentation>
        The local system has a private key and uses it for
        shared secret key agreement with the Authentication Authority (e.g.
        via Diffie Helman).
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:complexType name="PublicKeyType">
    <xs:sequence>
      <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:attribute name="keyValidation" use="optional"/>
  </xs:complexType>

  <xs:element name="IPAddress" type="ExtensionOnlyType">
    <xs:annotation>
      <xs:documentation>
        This element indicates that the Principal has been
        authenticated through connection from a particular IP address.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="SharedSecretDynamicPlaintext" type="ExtensionOnlyType">
    <xs:annotation>
```

```
      <xs:documentation>
        The local system and Authentication Authority
        share a secret key. The local system uses this to encrypt a
        randomised string to pass to the Authentication Authority.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="AuthenticatorTransportProtocol"
type="AuthenticatorTransportProtocolType">
    <xs:annotation>
      <xs:documentation>
        The protocol across which Authenticator information is
        transferred to an Authentication Authority verifier.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="HTTP" type="ExtensionOnlyType">
    <xs:annotation>
      <xs:documentation>
        This element indicates that the Authenticator has been
        transmitted using bare HTTP utilizing no additional security
        protocols.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="IPSec" type="ExtensionOnlyType">
    <xs:annotation>
      <xs:documentation>
        This element indicates that the Authenticator has been
        transmitted using a transport mechanism protected by an IPSEC session.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="WTLS" type="ExtensionOnlyType">
    <xs:annotation>
      <xs:documentation>
        This element indicates that the Authenticator has been
        transmitted using a transport mechanism protected by a WTLS session.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="MobileNetworkNoEncryption" type="ExtensionOnlyType">
    <xs:annotation>
      <xs:documentation>
        This element indicates that the Authenticator has been
        transmitted solely across a mobile network using no additional
        security mechanism.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="MobileNetworkRadioEncryption" type="ExtensionOnlyType"/>
  <xs:element name="MobileNetworkEndToEndEncryption" type="ExtensionOnlyType"/>

  <xs:element name="SSL" type="ExtensionOnlyType">
    <xs:annotation>
      <xs:documentation>
        This element indicates that the Authenticator has been
        transmitted using a transport mechnanism protected by an SSL or TLS
        session.
      </xs:documentation>
    </xs:annotation>
```

```
  </xs:element>

  <xs:element name="PSTN" type="ExtensionOnlyType"/>
  <xs:element name="ISDN" type="ExtensionOnlyType"/>
  <xs:element name="ADSL" type="ExtensionOnlyType"/>

  <xs:element name="OperationalProtection" type="OperationalProtectionType">
    <xs:annotation>
      <xs:documentation>
        Refers to those characteristics that describe
        procedural security controls employed by the Authentication Authority.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="SecurityAudit" type="SecurityAuditType"/>
  <xs:element name="SwitchAudit" type="ExtensionOnlyType"/>
  <xs:element name="DeactivationCallCenter" type="ExtensionOnlyType"/>

  <xs:element name="GoverningAgreements" type="GoverningAgreementsType">
    <xs:annotation>
      <xs:documentation>
        Provides a mechanism for linking to external (likely
        human readable) documents in which additional business agreements,
        (e.g. liability constraints, obligations, etc) can be placed.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="GoverningAgreementRef" type="GoverningAgreementRefType"/>

  <xs:simpleType name="nymType">
    <xs:restriction base="xs:NMTOKEN">
      <xs:enumeration value="anonymity"/>
      <xs:enumeration value="verinymity"/>
      <xs:enumeration value="pseudonymity"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="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="0"/>
      <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:attribute name="ID" type="xs:ID" use="optional"/>
  </xs:complexType>

  <xs:complexType name="IdentificationType">
    <xs:sequence>
      <xs:element ref="PhysicalVerification" minOccurs="0"/>
      <xs:element ref="WrittenConsent" minOccurs="0"/>
      <xs:element ref="GoverningAgreements" minOccurs="0"/>
      <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:attribute name="nym" type="nymType">
      <xs:annotation>
        <xs:documentation>
          This attribute indicates whether or not the
          Identification mechanisms allow the actions of the Principal to be
          linked to an actual end user.
        </xs:documentation>
      </xs:annotation>
    </xs:attribute>
```

```
  </xs:complexType>

  <xs:complexType name="TechnicalProtectionBaseType">
    <xs:sequence>
      <xs:choice minOccurs="0">
        <xs:element ref="PrivateKeyProtection"/>
        <xs:element ref="SecretKeyProtection"/>
      </xs:choice>
      <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="OperationalProtectionType">
    <xs:sequence>
      <xs:element ref="SecurityAudit" minOccurs="0"/>
      <xs:element ref="DeactivationCallCenter" minOccurs="0"/>
      <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="AuthnMethodBaseType">
    <xs:sequence>
      <xs:element ref="PrincipalAuthenticationMechanism" minOccurs="0"/>
      <xs:element ref="Authenticator" minOccurs="0"/>
      <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
      <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="GoverningAgreementsType">
    <xs:sequence>
      <xs:element ref="GoverningAgreementRef" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="GoverningAgreementRefType">
    <xs:attribute name="governingAgreementRef" type="xs:anyURI" use="required"/>
  </xs:complexType>

  <xs:complexType name="PrincipalAuthenticationMechanismType">
    <xs:sequence>
      <xs:element ref="Password" minOccurs="0"/>
      <xs:element ref="RestrictedPassword" minOccurs="0"/>
      <xs:element ref="Token" minOccurs="0"/>
      <xs:element ref="Smartcard" minOccurs="0"/>
      <xs:element ref="ActivationPin" minOccurs="0"/>
      <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:attribute name="preauth" type="xs:integer" use="optional"/>
  </xs:complexType>

  <xs:group name="AuthenticatorChoiceGroup">
    <xs:choice>
      <xs:element ref="PreviousSession"/>
      <xs:element ref="ResumeSession"/>
      <xs:element ref="DigSig"/>
      <xs:element ref="Password"/>
      <xs:element ref="RestrictedPassword"/>
      <xs:element ref="ZeroKnowledge"/>
      <xs:element ref="SharedSecretChallengeResponse"/>
      <xs:element ref="SharedSecretDynamicPlaintext"/>
      <xs:element ref="IPAddress"/>
      <xs:element ref="AsymmetricDecryption"/>
      <xs:element ref="AsymmetricKeyAgreement"/>
      <xs:element ref="SubscriberLineNumber"/>
      <xs:element ref="UserSuffix"/>
      <xs:element ref="ComplexAuthenticator"/>
```

```
    </xs:choice>
  </xs:group>

  <xs:group name="AuthenticatorSequenceGroup">
    <xs:sequence>
      <xs:element ref="PreviousSession" minOccurs="0"/>
      <xs:element ref="ResumeSession" minOccurs="0"/>
      <xs:element ref="DigSig" minOccurs="0"/>
      <xs:element ref="Password" minOccurs="0"/>
      <xs:element ref="RestrictedPassword" minOccurs="0"/>
      <xs:element ref="ZeroKnowledge" minOccurs="0"/>
      <xs:element ref="SharedSecretChallengeResponse" minOccurs="0"/>
      <xs:element ref="SharedSecretDynamicPlaintext" minOccurs="0"/>
      <xs:element ref="IPAddress" minOccurs="0"/>
      <xs:element ref="AsymmetricDecryption" minOccurs="0"/>
      <xs:element ref="AsymmetricKeyAgreement" minOccurs="0"/>
      <xs:element ref="SubscriberLineNumber" minOccurs="0"/>
      <xs:element ref="UserSuffix" minOccurs="0"/>
      <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:group>

  <xs:complexType name="AuthenticatorBaseType">
    <xs:sequence>
      <xs:group ref="AuthenticatorChoiceGroup"/>
      <xs:group ref="AuthenticatorSequenceGroup"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="ComplexAuthenticatorType">
    <xs:sequence>
      <xs:group ref="AuthenticatorChoiceGroup"/>
      <xs:group ref="AuthenticatorSequenceGroup"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="AuthenticatorTransportProtocolType">
    <xs:sequence>
      <xs:choice minOccurs="0">
        <xs:element ref="HTTP"/>
        <xs:element ref="SSL"/>
        <xs:element ref="MobileNetworkNoEncryption"/>
        <xs:element ref="MobileNetworkRadioEncryption"/>
        <xs:element ref="MobileNetworkEndToEndEncryption"/>
        <xs:element ref="WTLS"/>
        <xs:element ref="IPSec"/>
        <xs:element ref="PSTN"/>
        <xs:element ref="ISDN"/>
        <xs:element ref="ADSL"/>
      </xs:choice>
      <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="KeyActivationType">
    <xs:sequence>
      <xs:element ref="ActivationPin" minOccurs="0"/>
      <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="KeySharingType">
    <xs:attribute name="sharing" type="xs:boolean" use="required"/>
  </xs:complexType>

  <xs:complexType name="PrivateKeyProtectionType">
    <xs:sequence>
```

```
      <xs:element ref="KeyActivation" minOccurs="0"/>
      <xs:element ref="KeyStorage" minOccurs="0"/>
      <xs:element ref="KeySharing" minOccurs="0"/>
      <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="PasswordType">
    <xs:sequence>
      <xs:element ref="Length" minOccurs="0"/>
      <xs:element ref="Alphabet" minOccurs="0"/>
      <xs:element ref="Generation" minOccurs="0"/>
      <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:attribute name="ExternalVerification" type="xs:anyURI" use="optional"/>
  </xs:complexType>

  <xs:element name="RestrictedPassword" type="RestrictedPasswordType"/>

  <xs:complexType name="RestrictedPasswordType">
    <xs:complexContent>
      <xs:restriction base="PasswordType">
        <xs:sequence>
          <xs:element name="Length" type="RestrictedLengthType" minOccurs="1"/>
          <xs:element ref="Generation" minOccurs="0"/>
          <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
        <xs:attribute name="ExternalVerification" type="xs:anyURI"
use="optional"/>
      </xs:restriction>
    </xs:complexContent>
  </xs:complexType>

  <xs:complexType name="RestrictedLengthType">
    <xs:complexContent>
      <xs:restriction base="LengthType">
        <xs:attribute name="min" use="required">
          <xs:simpleType>
            <xs:restriction base="xs:integer">
              <xs:minInclusive value="3"/>
            </xs:restriction>
          </xs:simpleType>
        </xs:attribute>
        <xs:attribute name="max" type="xs:integer" use="optional"/>
      </xs:restriction>
    </xs:complexContent>
  </xs:complexType>

  <xs:complexType name="ActivationPinType">
    <xs:sequence>
      <xs:element ref="Length" minOccurs="0"/>
      <xs:element ref="Alphabet" minOccurs="0"/>
      <xs:element ref="Generation" minOccurs="0"/>
      <xs:element ref="ActivationLimit" minOccurs="0"/>
      <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

  <xs:element name="Alphabet" type="AlphabetType"/>
  <xs:complexType name="AlphabetType">
    <xs:attribute name="requiredChars" type="xs:string" use="required"/>
    <xs:attribute name="excludedChars" type="xs:string" use="optional"/>
    <xs:attribute name="case" type="xs:string" use="optional"/>
  </xs:complexType>

  <xs:complexType name="TokenType">
    <xs:sequence>
```

```
      <xs:element ref="TimeSyncToken"/>
      <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

  <xs:simpleType name="DeviceTypeType">
    <xs:restriction base="xs:NMTOKEN">
      <xs:enumeration value="hardware"/>
      <xs:enumeration value="software"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="booleanType">
    <xs:restriction base="xs:NMTOKEN">
      <xs:enumeration value="true"/>
      <xs:enumeration value="false"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="TimeSyncTokenType">
    <xs:attribute name="DeviceType" type="DeviceTypeType" use="required"/>
    <xs:attribute name="SeedLength" type="xs:integer" use="required"/>
    <xs:attribute name="DeviceInHand" type="booleanType" use="required"/>
  </xs:complexType>

  <xs:complexType name="ActivationLimitType">
    <xs:choice>
      <xs:element ref="ActivationLimitDuration"/>
      <xs:element ref="ActivationLimitUsages"/>
      <xs:element ref="ActivationLimitSession"/>
    </xs:choice>
  </xs:complexType>

  <xs:element name="ActivationLimitDuration" type="ActivationLimitDurationType">
    <xs:annotation>
      <xs:documentation>
        This element indicates that the Key Activation Limit is
        defined as a specific duration of time.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="ActivationLimitUsages" type="ActivationLimitUsagesType">
    <xs:annotation>
      <xs:documentation>
        This element indicates that the Key Activation Limit is
        defined as a number of usages.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:element name="ActivationLimitSession" type="ActivationLimitSessionType">
    <xs:annotation>
      <xs:documentation>
        This element indicates that the Key Activation Limit is
        the session.
      </xs:documentation>
    </xs:annotation>
  </xs:element>

  <xs:complexType name="ActivationLimitDurationType">
    <xs:attribute name="duration" type="xs:duration" use="required"/>
  </xs:complexType>

  <xs:complexType name="ActivationLimitUsagesType">
    <xs:attribute name="number" type="xs:integer" use="required"/>
  </xs:complexType>
```

```
  <xs:complexType name="ActivationLimitSessionType"/>

  <xs:complexType name="LengthType">
    <xs:attribute name="min" type="xs:integer" use="required"/>
    <xs:attribute name="max" type="xs:integer" use="optional"/>
  </xs:complexType>

  <xs:simpleType name="mediumType">
    <xs:restriction base="xs:NMTOKEN">
      <xs:enumeration value="memory"/>
      <xs:enumeration value="smartcard"/>
      <xs:enumeration value="token"/>
      <xs:enumeration value="MobileDevice"/>
      <xs:enumeration value="MobileAuthCard"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="KeyStorageType">
    <xs:attribute name="medium" type="mediumType" use="required"/>
  </xs:complexType>

  <xs:complexType name="SecretKeyProtectionType">
    <xs:sequence>
      <xs:element ref="KeyActivation" minOccurs="0"/>
      <xs:element ref="KeyStorage" minOccurs="0"/>
      <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="SecurityAuditType">
    <xs:sequence>
      <xs:element ref="SwitchAudit" minOccurs="0"/>
      <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="ExtensionOnlyType">
    <xs:sequence>
      <xs:element ref="Extension" minOccurs="0"  maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

  <xs:element name="Extension" type="ExtensionType"/>

  <xs:complexType name="ExtensionType">
    <xs:sequence>
      <xs:any namespace="##other" processContents="lax" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

</xs:schema>
```

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

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

```
      Document identifier: sstc-saml-schema-authn-context-2.0
      Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
      Revision history:
        V2.0 CD-04 (January, 2005):
          New core authentication context schema for SAML V2.0.
          This is just an include of all types from the schema
          referred to in the include statement below.
    </xs:documentation>
  </xs:annotation>

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

</xs:schema>
```

3 Authentication Context Classes

The number of permutations of different characteristics ensures that there is a theoretically infinite number of unique authentication contexts. The implication is that, in theory, any particular relying party would be expected to be able to parse arbitrary authentication context declarations and, more importantly, to analyze the declaration in order to assess the "quality" of the associated authentication assertion. Making such an assessment is non-trivial.

Fortunately, an optimization is possible. In practice many authentication contexts will fall into categories determined by industry practices and technology. For instance, many B2C web browser authentication contexts will be (partially) defined by the principal authenticating to the authentication authority through the presentation of a password over an SSL protected session. In the enterprise world, certificate-based authentication will be common. Of course, the full authentication context is not limited to the specifics of how the principal authenticated. Nevertheless, the authentication method is often the most visible characteristic and as such, can serve as a useful classifer for a class of related authentication contexts.

The concept is expressed in this specification as a definition of a series of authentication context classes. Each class defines a proper subset of the full set of authentication contexts. Classes have been chosen as representative of the current practices and technologies for authentication technologies, and provide asserting and relying parties a convenient shorthand when referring to authentication context issues.

For instance, an authentication authority may include with the complete authentication context declaration it provides to a relying party an assertion that the authentication context also belongs to an authentication context class. For some relying parties, this assertion is sufficient detail for it to be able to assign an appropriate level of confidence to the associated authentication assertion. Other relying parties might prefer to examine the complete authentication context declaration itself. Likewise, the ability to refer to an authentication context class rather than being required to list the complete details of a specific authentication context declaration will simplify how the relying party can express its desires and/or requirements to an authentication authority.

3.1 Advantages of Authentication Context Classes

The introduction of the additional layer of classes and the definition of an initial list of representative and flexible classes are expected to:

- Make it easier for the authentication authority and relying party to come to an agreement on what are acceptable authentication contexts by giving them a framework for discussion.
- Make it easier for relying parties to indicate their preferences when requesting a step-up authentication assertion from an authentication authority.
- Simplify for relying parties the burden of processing authentication context declarations by giving them the option of being satisfied by the associated class.
- Insulate relying parties from the impact of new authentication technologies.
- Make it easier for authentication authorities to publish their authentication capabilities, for example, through WSDL.

3.2 Processing Rules

Further processing rules for authentication context classes are described in the SAML assertions and protocols specification [SAMLCore]. Note that in most respects, these processing rules amount to deployments sharing common interpretations of the relative strength or quality of particular authentication context classes and cannot be expressed in absolute terms or provided as rules that implementations must follow.

3.3 Extensibility

As does the core authentication context declaration schema, the separate authentication context class schemas allow the <Extension> element in certain locations of the tree structure. In general, where the <Extension> element occurred as a child of an <xs:choice> element, this option was removed in creating the appropriate class schema definition as a restriction of the base type. When the <Extension> element occurred as an optional child of an <xs:sequence> element, the <Extension> element was allowed to remain in addition to any required elements.

Consequently, authentication context declarations can include the <Extension> element (with additional elements in different namespaces) and still conform to authentication context class schemas (if they meet the other requirements of the schema of course).

The authentication context class schemas restrict type definitions in the base authentication context schema. As an extension point, the authentication context class schemas themselves can be further restricted – their type definitions serving as base types in some other schema (potentially defined by some community wishing a more tightly defined authentication context class). To prevent logical inconsistencies, any such schema extensions can only further constrain the type definitions of the class schema. To enforce this constraint, the authentication context class schemas are defined with the finalDefault="extension" attribute on the <schema> element to prevent this type of derivation.

Additional authentication context classes MAY be developed by groups other than the Security Services Technical Committee. OASIS members may wish to document and submit them for consideration by the SSTC in a future version of the specification, and other groups may simply wish to inform the committee of their work. Please refer to the SSTC web site for further details.

Guidelines for the specification of new context classes are as follows:

- Specify a URI that uniquely identifies the context class.
- Provide contact information for the author of the class.
- Provide a textual description of the circumstances under which this class should be used.
- Provide a valid XML schema [Schema1] document implementing the class.

Authors of new classes are encouraged to review the classes defined within this specification in order to guide their work.

3.4 Schemas

Authentication context classes are listed in the following subsections. The classes are listed in alphabetical order; no other ranking is implied by the order of classes. Classes are uniquely identified by URIs with the following initial stem:

```
urn:oasis:names:tc:SAML:2.0:ac:classes
```

The class schemas are defined as restrictions of parts of the base authentication context "types" schema. XML instances that validate against a given authentication context class schema are said to *conform* to that authentication context class.

Note that because the class schema imports and redefines the elements and types into the class schema namespace, a class-conforming authentication context declaration does not simultaneously validate against the base authentication context schema.

3.4.1 Internet Protocol

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:InternetProtocol

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-IP]).

The Internet Protocol class is applicable when a principal is authenticated through the use of a provided IP address.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema
  targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:InternetProtocol"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:InternetProtocol"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier:
urn:oasis:names:tc:SAML:2.0:ac:classes:InternetProtocol
        Document identifier: sstc-saml-schema-authn-context-ip-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism" minOccurs="0"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:element ref="IPAddress"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

```

```
  </xs:redefine>

</xs:schema>
```

3.4.2 InternetProtocolPassword

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:InternetProtocolPassword

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-IPP]).

The Internet Protocol Password class is applicable when a principal is authenticated through the use of a provided IP address, in addition to a username/password.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema
  targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:InternetProtocolPassw
ord"
  xmlns:ac="urn:oasis:names:tc:SAML:2.0:ac"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:InternetProtocolPassword"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier:
urn:oasis:names:tc:SAML:2.0:ac:classes:InternetProtocolPassword
        Document identifier: sstc-saml-schema-authn-context-ippword-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism" minOccurs="0"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
```

```
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:element ref="Password"/>
            <xs:element ref="IPAddress"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

3.4.3 Kerberos

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:Kerberos

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-Kerb]).

This class is applicable when the principal has authenticated using a password to a local authentication authority, in order to acquire a Kerberos ticket. That Kerberos ticket is then used for subsequent network authentication.

> **Note:** It is possible for the authentication authority to indicate (via this context class) a pre-authentication data type which was used by the Kerberos Key Distribution Center [RFC 1510] when authenticating the principal. The method used by the authentication authority to obtain this information is outside of the scope of this specification, but it is strongly recommended that a trusted method be deployed to pass the pre-authentication data type and any other Kerberos related context details (e.g. ticket lifetime) to the authentication authority.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:Kerberos"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:Kerberos"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier: urn:oasis:names:tc:SAML:2.0:ac:classes:Kerberos
        Document identifier: sstc-saml-schema-authn-context-kerberos-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PrincipalAuthenticationMechanismType">
      <xs:complexContent>
        <xs:restriction base="PrincipalAuthenticationMechanismType">
          <xs:sequence>
              <xs:element ref="RestrictedPassword"/>
          </xs:sequence>
          <xs:attribute name="preauth" type="xs:integer" use="optional"/>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:element ref="SharedSecretChallengeResponse"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="SharedSecretChallengeResponseType">
      <xs:complexContent>
        <xs:restriction base="SharedSecretChallengeResponseType">
          <xs:attribute name="method" type="xs:anyURI"
fixed="urn:oasis:names:tc:SAML:2.0:ac:classes:Kerberos"/>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

An example of an XML instance conforming to this class schema is as follows:

```
<AuthenticationContextDeclaration
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:Kerberos">

  <AuthnMethod>

    <PrincipalAuthenticationMechanism preauth="0">
      <RestrictedPassword>
        <Length min="4"/>
      </RestrictedPassword>
    </PrincipalAuthenticationMechanism>

    <Authenticator>
      <AuthenticatorSequence>
        <SharedSecretChallengeResponse
method="urn:oasis:names:tc:SAML:2.0:ac:classes:Kerberos"/>
      </AuthenticatorSequence>
    </Authenticator>

  </AuthnMethod>

</AuthenticationContextDeclaration>
```

3.4.4 MobileOneFactorUnregistered

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:MobileOneFactorUnregistered

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-MOFU]).

Reflects no mobile customer registration procedures and an authentication of the mobile device without requiring explicit end-user interaction. This context class authenticates only the device and never the user; it is useful when services other than the mobile operator want to add a secure device authentication to their authentication process.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema
  targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:MobileOneFactorUnregi
stered"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:MobileOneFactorUnregistered"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier:
urn:oasis:names:tc:SAML:2.0:ac:classes:MobileOneFactorUnregistered
        Document identifier: sstc-saml-schema-authn-context-mobileonefactor-
unreg-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism" minOccurs="0"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="DigSig"/>
              <xs:element ref="ZeroKnowledge"/>
              <xs:element ref="SharedSecretChallengeResponse"/>
              <xs:element ref="SharedSecretDynamicPlaintext"/>
              <xs:element ref="AsymmetricDecryption"/>
              <xs:element ref="AsymmetricKeyAgreement"/>
            </xs:choice>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorTransportProtocolType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorTransportProtocolType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="SSL"/>
              <xs:element ref="MobileNetworkNoEncryption"/>
              <xs:element ref="MobileNetworkRadioEncryption"/>
              <xs:element ref="MobileNetworkEndToEndEncryption"/>
              <xs:element ref="WTLS"/>
            </xs:choice>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="OperationalProtectionType">
      <xs:complexContent>
        <xs:restriction base="OperationalProtectionType">
          <xs:sequence>
            <xs:element ref="SecurityAudit"/>
            <xs:element ref="DeactivationCallCenter"/>
```

```
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="TechnicalProtectionBaseType">
      <xs:complexContent>
        <xs:restriction base="TechnicalProtectionBaseType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="PrivateKeyProtection"/>
              <xs:element ref="SecretKeyProtection"/>
            </xs:choice>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PrivateKeyProtectionType">
      <xs:complexContent>
        <xs:restriction base="PrivateKeyProtectionType">
          <xs:sequence>
            <xs:element ref="KeyStorage"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="SecretKeyProtectionType">
      <xs:complexContent>
        <xs:restriction base="SecretKeyProtectionType">
          <xs:sequence>
            <xs:element ref="KeyStorage"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="KeyStorageType">
      <xs:complexContent>
        <xs:restriction base="KeyStorageType">
          <xs:attribute name="medium" use="required">
            <xs:simpleType>
              <xs:restriction base="mediumType">
                <xs:enumeration value="MobileDevice"/>
                <xs:enumeration value="MobileAuthCard"/>
                <xs:enumeration value="smartcard"/>
              </xs:restriction>
            </xs:simpleType>
          </xs:attribute>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="SecurityAuditType">
      <xs:complexContent>
        <xs:restriction base="SecurityAuditType">
          <xs:sequence>
            <xs:element ref="SwitchAudit"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
```

```
    </xs:complexType>

    <xs:complexType name="IdentificationType">
      <xs:complexContent>
        <xs:restriction base="IdentificationType">
          <xs:sequence>
            <xs:element ref="GoverningAgreements"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
          <xs:attribute name="nym">
            <xs:simpleType>
              <xs:restriction base="nymType">
                <xs:enumeration value="anonymity"/>
                <xs:enumeration value="pseudonymity"/>
              </xs:restriction>
            </xs:simpleType>
          </xs:attribute>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

3.4.5 MobileTwoFactorUnregistered

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:MobileTwoFactorUnregistered

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-MTFU]).

Reflects no mobile customer registration procedures and a two-factor based authentication, such as secure device and user PIN. This context class is useful when a service other than the mobile operator wants to link their customer ID to a mobile supplied two-factor authentication service by capturing mobile phone data at enrollment.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema
targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:MobileTwoFactorUnregist
ered"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:MobileTwoFactorUnregistered"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier:
urn:oasis:names:tc:SAML:2.0:ac:classes:MobileTwoFactorUnregistered
        Document identifier: sstc-saml-schema-authn-context-mobiletwofactor-
unreg-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism" minOccurs="0"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="DigSig"/>
              <xs:element ref="ZeroKnowledge"/>
              <xs:element ref="SharedSecretChallengeResponse"/>
              <xs:element ref="SharedSecretDynamicPlaintext"/>
              <xs:element ref="AsymmetricDecryption"/>
              <xs:element ref="AsymmetricKeyAgreement"/>
              <xs:element ref="ComplexAuthenticator"/>
            </xs:choice>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="ComplexAuthenticatorType">
      <xs:complexContent>
        <xs:restriction base="ComplexAuthenticatorType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="SharedSecretChallengeResponse"/>
              <xs:element ref="SharedSecretDynamicPlaintext"/>
            </xs:choice>
            <xs:element ref="Password"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorTransportProtocolType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorTransportProtocolType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="SSL"/>
              <xs:element ref="MobileNetworkNoEncryption"/>
```

```
            <xs:element ref="MobileNetworkRadioEncryption"/>
            <xs:element ref="MobileNetworkEndToEndEncryption"/>
            <xs:element ref="WTLS"/>
          </xs:choice>
          <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:restriction>
    </xs:complexContent>
  </xs:complexType>

  <xs:complexType name="OperationalProtectionType">
    <xs:complexContent>
      <xs:restriction base="OperationalProtectionType">
        <xs:sequence>
          <xs:element ref="SecurityAudit"/>
          <xs:element ref="DeactivationCallCenter"/>
          <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:restriction>
    </xs:complexContent>
  </xs:complexType>

  <xs:complexType name="TechnicalProtectionBaseType">
    <xs:complexContent>
      <xs:restriction base="TechnicalProtectionBaseType">
        <xs:sequence>
          <xs:choice>
            <xs:element ref="PrivateKeyProtection"/>
            <xs:element ref="SecretKeyProtection"/>
          </xs:choice>
          <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:restriction>
    </xs:complexContent>
  </xs:complexType>

  <xs:complexType name="PrivateKeyProtectionType">
    <xs:complexContent>
      <xs:restriction base="PrivateKeyProtectionType">
        <xs:sequence>
          <xs:element ref="KeyActivation"/>
          <xs:element ref="KeyStorage"/>
          <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:restriction>
    </xs:complexContent>
  </xs:complexType>

  <xs:complexType name="SecretKeyProtectionType">
    <xs:complexContent>
      <xs:restriction base="SecretKeyProtectionType">
        <xs:sequence>
          <xs:element ref="KeyActivation"/>
          <xs:element ref="KeyStorage"/>
          <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:restriction>
    </xs:complexContent>
  </xs:complexType>

  <xs:complexType name="KeyStorageType">
    <xs:complexContent>
      <xs:restriction base="KeyStorageType">
        <xs:attribute name="medium" use="required">
          <xs:simpleType>
            <xs:restriction base="mediumType">
              <xs:enumeration value="MobileDevice"/>
```

```
                <xs:enumeration value="MobileAuthCard"/>
                <xs:enumeration value="smartcard"/>
              </xs:restriction>
            </xs:simpleType>
          </xs:attribute>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="SecurityAuditType">
      <xs:complexContent>
        <xs:restriction base="SecurityAuditType">
          <xs:sequence>
            <xs:element ref="SwitchAudit"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="IdentificationType">
      <xs:complexContent>
        <xs:restriction base="IdentificationType">
          <xs:sequence>
            <xs:element ref="GoverningAgreements"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
          <xs:attribute name="nym">
            <xs:simpleType>
              <xs:restriction base="nymType">
                <xs:enumeration value="anonymity"/>
                <xs:enumeration value="pseudonymity"/>
              </xs:restriction>
            </xs:simpleType>
          </xs:attribute>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

3.4.6 MobileOneFactorContract

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:MobileOneFactorContract

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-MOFC]).

Reflects mobile contract customer registration procedures and a single factor authentication. For example, a digital signing device with tamper resistant memory for key storage, such as the mobile MSISDN, but no required PIN or biometric for real-time user authentication.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema
  targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:MobileOneFactorContra
ct"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:MobileOneFactorContract"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

```
    <xs:annotation>
      <xs:documentation>
        Class identifier:
urn:oasis:names:tc:SAML:2.0:ac:classes:MobileOneFactorContract
        Document identifier: sstc-saml-schema-authn-context-mobileonefactor-
reg-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism" minOccurs="0"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="DigSig"/>
              <xs:element ref="ZeroKnowledge"/>
              <xs:element ref="SharedSecretChallengeResponse"/>
              <xs:element ref="SharedSecretDynamicPlaintext"/>
              <xs:element ref="AsymmetricDecryption"/>
              <xs:element ref="AsymmetricKeyAgreement"/>
            </xs:choice>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorTransportProtocolType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorTransportProtocolType">
          <xs:sequence>
            <xs:choice>
```

```
            <xs:element ref="SSL"/>
            <xs:element ref="MobileNetworkNoEncryption"/>
            <xs:element ref="MobileNetworkRadioEncryption"/>
            <xs:element ref="MobileNetworkEndToEndEncryption"/>
            <xs:element ref="WTLS"/>
          </xs:choice>
          <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:restriction>
    </xs:complexContent>
  </xs:complexType>

  <xs:complexType name="OperationalProtectionType">
    <xs:complexContent>
      <xs:restriction base="OperationalProtectionType">
        <xs:sequence>
          <xs:element ref="SecurityAudit"/>
          <xs:element ref="DeactivationCallCenter"/>
          <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:restriction>
    </xs:complexContent>
  </xs:complexType>

  <xs:complexType name="TechnicalProtectionBaseType">
    <xs:complexContent>
      <xs:restriction base="TechnicalProtectionBaseType">
        <xs:sequence>
          <xs:choice>
            <xs:element ref="PrivateKeyProtection"/>
            <xs:element ref="SecretKeyProtection"/>
          </xs:choice>
          <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:restriction>
    </xs:complexContent>
  </xs:complexType>

  <xs:complexType name="PrivateKeyProtectionType">
    <xs:complexContent>
      <xs:restriction base="PrivateKeyProtectionType">
        <xs:sequence>
          <xs:element ref="KeyStorage"/>
          <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:restriction>
    </xs:complexContent>
  </xs:complexType>

  <xs:complexType name="SecretKeyProtectionType">
    <xs:complexContent>
      <xs:restriction base="SecretKeyProtectionType">
        <xs:sequence>
          <xs:element ref="KeyStorage"/>
          <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
        </xs:sequence>
      </xs:restriction>
    </xs:complexContent>
  </xs:complexType>

  <xs:complexType name="KeyStorageType">
    <xs:complexContent>
      <xs:restriction base="KeyStorageType">
        <xs:attribute name="medium" use="required">
          <xs:simpleType>
            <xs:restriction base="mediumType">
              <xs:enumeration value="smartcard"/>
```

```
                <xs:enumeration value="MobileDevice"/>
                <xs:enumeration value="MobileAuthCard"/>
              </xs:restriction>
            </xs:simpleType>
          </xs:attribute>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="SecurityAuditType">
      <xs:complexContent>
        <xs:restriction base="SecurityAuditType">
          <xs:sequence>
            <xs:element ref="SwitchAudit"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="IdentificationType">
      <xs:complexContent>
        <xs:restriction base="IdentificationType">
          <xs:sequence>
            <xs:element ref="PhysicalVerification"/>
            <xs:element ref="WrittenConsent"/>
            <xs:element ref="GoverningAgreements"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
          <xs:attribute name="nym">
            <xs:simpleType>
              <xs:restriction base="nymType">
                <xs:enumeration value="anonymity"/>
                <xs:enumeration value="verinymity"/>
                <xs:enumeration value="pseudonymity"/>
              </xs:restriction>
            </xs:simpleType>
          </xs:attribute>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

3.4.7 MobileTwoFactorContract

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:MobileTwoFactorContract

(Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-MTFC]).

Reflects mobile contract customer registration procedures and a two-factor based authentication. For example, a digital signing device with tamper resistant memory for key storage, such as a GSM SIM, that requires explicit proof of user identity and intent, such as a PIN or biometric.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema
targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:MobileTwoFactorContract"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:MobileTwoFactorContract"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">
```

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

    <xs:annotation>
      <xs:documentation>
        Class identifier:
urn:oasis:names:tc:SAML:2.0:ac:classes:MobileTwoFactorContract
        Document identifier: sstc-saml-schema-authn-context-mobiletwofactor-
reg-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism" minOccurs="0"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="DigSig"/>
              <xs:element ref="ZeroKnowledge"/>
              <xs:element ref="SharedSecretChallengeResponse"/>
              <xs:element ref="SharedSecretDynamicPlaintext"/>
              <xs:element ref="AsymmetricDecryption"/>
              <xs:element ref="AsymmetricKeyAgreement"/>
              <xs:element ref="ComplexAuthenticator"/>
            </xs:choice>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="ComplexAuthenticatorType">
      <xs:complexContent>
```

```
        <xs:restriction base="ComplexAuthenticatorType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="SharedSecretChallengeResponse"/>
              <xs:element ref="SharedSecretDynamicPlaintext"/>
            </xs:choice>
            <xs:element ref="Password"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorTransportProtocolType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorTransportProtocolType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="SSL"/>
              <xs:element ref="MobileNetworkNoEncryption"/>
              <xs:element ref="MobileNetworkRadioEncryption"/>
              <xs:element ref="MobileNetworkEndToEndEncryption"/>
              <xs:element ref="WTLS"/>
            </xs:choice>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="OperationalProtectionType">
      <xs:complexContent>
        <xs:restriction base="OperationalProtectionType">
          <xs:sequence>
            <xs:element ref="SecurityAudit"/>
            <xs:element ref="DeactivationCallCenter"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="TechnicalProtectionBaseType">
      <xs:complexContent>
        <xs:restriction base="TechnicalProtectionBaseType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="PrivateKeyProtection"/>
              <xs:element ref="SecretKeyProtection"/>
            </xs:choice>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PrivateKeyProtectionType">
      <xs:complexContent>
        <xs:restriction base="PrivateKeyProtectionType">
          <xs:sequence>
            <xs:element ref="KeyActivation"/>
            <xs:element ref="KeyStorage"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>
```

```
    <xs:complexType name="SecretKeyProtectionType">
      <xs:complexContent>
        <xs:restriction base="SecretKeyProtectionType">
          <xs:sequence>
            <xs:element ref="KeyActivation"/>
            <xs:element ref="KeyStorage"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="KeyStorageType">
      <xs:complexContent>
        <xs:restriction base="KeyStorageType">
          <xs:attribute name="medium" use="required">
            <xs:simpleType>
              <xs:restriction base="mediumType">
                <xs:enumeration value="MobileDevice"/>
                <xs:enumeration value="MobileAuthCard"/>
                <xs:enumeration value="smartcard"/>
              </xs:restriction>
            </xs:simpleType>
          </xs:attribute>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="SecurityAuditType">
      <xs:complexContent>
        <xs:restriction base="SecurityAuditType">
          <xs:sequence>
            <xs:element ref="SwitchAudit"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="IdentificationType">
      <xs:complexContent>
        <xs:restriction base="IdentificationType">
          <xs:sequence>
            <xs:element ref="PhysicalVerification"/>
            <xs:element ref="WrittenConsent"/>
            <xs:element ref="GoverningAgreements"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
          <xs:attribute name="nym">
            <xs:simpleType>
              <xs:restriction base="nymType">
                <xs:enumeration value="anonymity"/>
                <xs:enumeration value="verinymity"/>
                <xs:enumeration value="pseudonymity"/>
              </xs:restriction>
            </xs:simpleType>
          </xs:attribute>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

3.4.8 Password

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:Password

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-Pass]).

The Password class is applicable when a principal authenticates to an authentication authority through the presentation of a password over an unprotected HTTP session.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:Password"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:Password"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier: urn:oasis:names:tc:SAML:2.0:ac:classes:Password
        Document identifier: sstc-saml-schema-authn-context-pword-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism" minOccurs="0"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:element ref="RestrictedPassword"/>
```

```
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

Following is an example of an XML instance that conforms to the context class schema:

```
<AuthenticationContextDeclaration
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:Password">

  <AuthnMethod>
    <Authenticator>
      <AuthenticatorSequence>
        <RestrictedPassword>
          <Length min="4"/>
        </RestrictedPassword>
      </AuthenticatorSequence>
    </Authenticator>
  </AuthnMethod>

</AuthenticationContextDeclaration>
```

3.4.9 PasswordProtectedTransport

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:PasswordProtectedTransport

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-PPT]).

The PasswordProtectedTransport class is applicable when a principal authenticates to an authentication authority through the presentation of a password over a protected session.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema
targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:PasswordProtectedTransp
ort"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:PasswordProtectedTransport"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier:
urn:oasis:names:tc:SAML:2.0:ac:classes:PasswordProtectedTransport
        Document identifier: sstc-saml-schema-authn-context-ppt-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism" minOccurs="0"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:element ref="RestrictedPassword"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorTransportProtocolType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorTransportProtocolType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="SSL"/>
              <xs:element ref="MobileNetworkRadioEncryption"/>
              <xs:element ref="MobileNetworkEndToEndEncryption"/>
              <xs:element ref="WTLS"/>
              <xs:element ref="IPSec"/>
            </xs:choice>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

3.4.10 PreviousSession

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:PreviousSession

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-Prev]).

The PreviousSession class is applicable when a principal had authenticated to an authentication authority at some point in the past using any authentication context supported by that authentication authority. Consequently, a subsequent authentication event that the authentication authority will assert to the relying

party may be significantly separated in time from the principal's current resource access request.

The context for the previously authenticated session is explicitly not included in this context class because the user has not authenticated during this session, and so the mechanism that the user employed to authenticate in a previous session should not be used as part of a decision on whether to now allow access to a resource.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema
targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:PreviousSession"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:PreviousSession"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier: urn:oasis:names:tc:SAML:2.0:ac:classes:PreviousSession
        Document identifier: sstc-saml-schema-authn-context-session-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism" minOccurs="0"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:element ref="PreviousSession"/>
          </xs:sequence>
        </xs:restriction>
```

```
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

3.4.11 Public Key – X.509

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:X509

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-X509]).

The X509 context class indicates that the principal authenticated by means of a digital signature where the key was validated as part of an X.509 Public Key Infrastructure.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:X509"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:X509"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier: urn:oasis:names:tc:SAML:2.0:ac:classes:X509
        Document identifier: sstc-saml-schema-authn-context-x509-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
```

```
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PrincipalAuthenticationMechanismType">
      <xs:complexContent>
        <xs:restriction base="PrincipalAuthenticationMechanismType">
          <xs:sequence>
            <xs:element ref="RestrictedPassword"/>
          </xs:sequence>
          <xs:attribute name="preauth" type="xs:integer" use="optional"/>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:element ref="DigSig"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PublicKeyType">
      <xs:complexContent>
        <xs:restriction base="PublicKeyType">
          <xs:attribute name="keyValidation" type="xs:anyURI"
fixed="urn:oasis:names:tc:SAML:2.0:ac:classes:X509"/>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

3.4.12 Public Key – PGP

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:PGP

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-PGP]).

The PGP context class indicates that the principal authenticated by means of a digital signature where the key was validated as part of a PGP Public Key Infrastructure.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:PGP"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:PGP"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier: urn:oasis:names:tc:SAML:2.0:ac:classes:PGP
        Document identifier: sstc-saml-schema-authn-context-pgp-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
```

```
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PrincipalAuthenticationMechanismType">
      <xs:complexContent>
        <xs:restriction base="PrincipalAuthenticationMechanismType">
          <xs:sequence>
            <xs:element ref="RestrictedPassword"/>
          </xs:sequence>
          <xs:attribute name="preauth" type="xs:integer" use="optional"/>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:element ref="DigSig"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PublicKeyType">
      <xs:complexContent>
        <xs:restriction base="PublicKeyType">
          <xs:attribute name="keyValidation"
fixed="urn:oasis:names:tc:SAML:2.0:ac:classes:PGP"/>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

3.4.13 Public Key – SPKI

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:SPKI

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-SPKI]).

The SPKI context class indicates that the principal authenticated by means of a digital signature where the key was validated via an SPKI Infrastructure.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:SPKI"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:SPKI"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier: urn:oasis:names:tc:SAML:2.0:ac:classes:SPKI
        Document identifier: sstc-saml-schema-authn-context-spki-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PrincipalAuthenticationMechanismType">
      <xs:complexContent>
        <xs:restriction base="PrincipalAuthenticationMechanismType">
          <xs:sequence>
            <xs:element ref="RestrictedPassword"/>
```

```
          </xs:sequence>
          <xs:attribute name="preauth" type="xs:integer" use="optional"/>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:element ref="DigSig"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PublicKeyType">
      <xs:complexContent>
        <xs:restriction base="PublicKeyType">
          <xs:attribute name="keyValidation"
fixed="urn:oasis:names:tc:SAML:2.0:ac:classes:SPKI"/>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

3.4.14 Public Key - XML Digital Signature

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:XMLDSig

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-XSig].

This context class indicates that the principal authenticated by means of a digital signature according to the processing rules specified in the XML Digital Signature specification [XMLSig].

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:XMLDSig"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:XMLDSig"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier: urn:oasis:names:tc:SAML:2.0:ac:classes:XMLDSig
        Document identifier: sstc-saml-schema-authn-context-xmldsig-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PrincipalAuthenticationMechanismType">
      <xs:complexContent>
        <xs:restriction base="PrincipalAuthenticationMechanismType">
          <xs:sequence>
            <xs:element ref="RestrictedPassword"/>
          </xs:sequence>
          <xs:attribute name="preauth" type="xs:integer" use="optional"/>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:element ref="DigSig"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PublicKeyType">
      <xs:complexContent>
        <xs:restriction base="PublicKeyType">
          <xs:attribute name="keyValidation" type="xs:anyURI"
fixed="urn:ietf:rfc:3075"/>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

3.4.15 Smartcard

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:Smartcard

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-Smart]).

The Smartcard class is identified when a principal authenticates to an authentication authority using a smartcard.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:Smartcard"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:Smartcard"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier: urn:oasis:names:tc:SAML:2.0:ac:classes:Smartcard
        Document identifier: sstc-saml-schema-authn-context-smartcard-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PrincipalAuthenticationMechanismType">
      <xs:complexContent>
        <xs:restriction base="PrincipalAuthenticationMechanismType">
          <xs:sequence>
            <xs:element ref="Smartcard"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

```

```
</xs:schema>
```

3.4.16 SmartcardPKI

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:SmartcardPKI

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-SmPKI]).

The SmartcardPKI class is applicable when a principal authenticates to an authentication authority through a two-factor authentication mechanism using a smartcard with enclosed private key and a PIN.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:SmartcardPKI"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:SmartcardPKI"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier: urn:oasis:names:tc:SAML:2.0:ac:classes:SmartcardPKI
        Document identifier: sstc-saml-schema-authn-context-smartcardpki-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="OperationalProtection" minOccurs="0"/>
            <xs:element ref="AuthnMethod"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="TechnicalProtectionBaseType">
      <xs:complexContent>
```

```
        <xs:restriction base="TechnicalProtectionBaseType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="PrivateKeyProtection"/>
            </xs:choice>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PrincipalAuthenticationMechanismType">
      <xs:complexContent>
        <xs:restriction base="PrincipalAuthenticationMechanismType">
          <xs:sequence>
            <xs:element ref="Smartcard"/>
            <xs:element ref="ActivationPin"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="DigSig"/>
              <xs:element ref="AsymmetricDecryption"/>
              <xs:element ref="AsymmetricKeyAgreement"/>
            </xs:choice>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PrivateKeyProtectionType">
      <xs:complexContent>
        <xs:restriction base="PrivateKeyProtectionType">
          <xs:sequence>
            <xs:element ref="KeyActivation"/>
            <xs:element ref="KeyStorage"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="KeyActivationType">
      <xs:complexContent>
        <xs:restriction base="KeyActivationType">
          <xs:sequence>
            <xs:element ref="ActivationPin"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="KeyStorageType">
      <xs:complexContent>
        <xs:restriction base="KeyStorageType">
          <xs:attribute name="medium" use="required">
            <xs:simpleType>
              <xs:restriction base="mediumType">
                <xs:enumeration value="smartcard"/>
              </xs:restriction>
```

```
            </xs:simpleType>
          </xs:attribute>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

3.4.17 SoftwarePKI

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:SoftwarePKI

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-SwPKI]).

The Software-PKI class is applicable when a principal uses an X.509 certificate stored in software to authenticate to the authentication authority.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:SoftwarePKI"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:SoftwarePKI"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier: urn:oasis:names:tc:SAML:2.0:ac:classes:SoftwarePKI
        Document identifier: sstc-saml-schema-authn-context-softwarepki-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="OperationalProtection" minOccurs="0"/>
            <xs:element ref="AuthnMethod"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
```

```
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="TechnicalProtectionBaseType">
      <xs:complexContent>
        <xs:restriction base="TechnicalProtectionBaseType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="PrivateKeyProtection"/>
            </xs:choice>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PrincipalAuthenticationMechanismType">
      <xs:complexContent>
        <xs:restriction base="PrincipalAuthenticationMechanismType">
          <xs:sequence>
            <xs:element ref="ActivationPin"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="DigSig"/>
              <xs:element ref="AsymmetricDecryption"/>
              <xs:element ref="AsymmetricKeyAgreement"/>
            </xs:choice>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PrivateKeyProtectionType">
      <xs:complexContent>
        <xs:restriction base="PrivateKeyProtectionType">
          <xs:sequence>
            <xs:element ref="KeyActivation"/>
            <xs:element ref="KeyStorage"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="KeyActivationType">
      <xs:complexContent>
        <xs:restriction base="KeyActivationType">
          <xs:sequence>
            <xs:element ref="ActivationPin"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

```

```
    <xs:complexType name="KeyStorageType">
      <xs:complexContent>
        <xs:restriction base="KeyStorageType">
          <xs:attribute name="medium" use="required">
            <xs:simpleType>
              <xs:restriction base="mediumType">
                <xs:enumeration value="memory"/>
              </xs:restriction>
            </xs:simpleType>
          </xs:attribute>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

3.4.18 Telephony

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:Telephony

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-Tele]).

This class is used to indicate that the principal authenticated via the provision of a fixed-line telephone number, transported via a telephony protocol such as ADSL.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:Telephony"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:Telephony"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier: urn:oasis:names:tc:SAML:2.0:ac:classes:Telephony
        Document identifier: sstc-saml-schema-authn-context-telephony-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism" minOccurs="0"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:element ref="SubscriberLineNumber"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorTransportProtocolType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorTransportProtocolType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="PSTN"/>
              <xs:element ref="ISDN"/>
              <xs:element ref="ADSL"/>
            </xs:choice>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

3.4.19 Telephony ("Nomadic")

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:NomadTelephony

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-TNom]).

Indicates that the principal is "roaming" (perhaps using a phone card) and authenticates via the means of the line number, a user suffix, and a password element.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema
targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:NomadTelephony"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:NomadTelephony"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
```

```
      <xs:documentation>
        Class identifier: urn:oasis:names:tc:SAML:2.0:ac:classes:NomadTelephony
        Document identifier: sstc-saml-schema-authn-context-nomad-telephony-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism" minOccurs="0"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:element ref="Password"/>
            <xs:element ref="SubscriberLineNumber"/>
            <xs:element ref="UserSuffix"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorTransportProtocolType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorTransportProtocolType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="PSTN"/>
              <xs:element ref="ISDN"/>
              <xs:element ref="ADSL"/>
            </xs:choice>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

```

```
  </xs:redefine>

</xs:schema>
```

3.4.20 Telephony (Personalized)

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:PersonalTelephony

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-TPers]).

This class is used to indicate that the principal authenticated via the provision of a fixed-line telephone number and a user suffix, transported via a telephony protocol such as ADSL.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema
targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:PersonalizedTelephony"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:PersonalizedTelephony"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier:
urn:oasis:names:tc:SAML:2.0:ac:classes:PersonalizedTelephony
        Document identifier: sstc-saml-schema-authn-context-personal-telephony-
2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism" minOccurs="0"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
```

```
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:element ref="SubscriberLineNumber"/>
            <xs:element ref="UserSuffix"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorTransportProtocolType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorTransportProtocolType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="PSTN"/>
              <xs:element ref="ISDN"/>
              <xs:element ref="ADSL"/>
            </xs:choice>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

3.4.21 Telephony (Authenticated)

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:AuthenticatedTelephony

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-TAuthn]).

Indicates that the principal authenticated via the means of the line number, a user suffix, and a password element.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema
targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:AuthenticatedTelephony"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:AuthenticatedTelephony"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier:
urn:oasis:names:tc:SAML:2.0:ac:classes:AuthenticatedTelephony
        Document identifier: sstc-saml-schema-authn-context-auth-telephony-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism" minOccurs="0"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:element ref="Password"/>
            <xs:element ref="SubscriberLineNumber"/>
            <xs:element ref="UserSuffix"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorTransportProtocolType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorTransportProtocolType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="PSTN"/>
              <xs:element ref="ISDN"/>
              <xs:element ref="ADSL"/>
            </xs:choice>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>
  </xs:redefine>

</xs:schema>
```

3.4.22 Secure Remote Password

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:SecureRemotePassword

Note that this URI is also used as the target namespace in the corresponding authentication context class

schema document ([SAMLAC-SRP]).

The Secure Remote Password class is applicable when the authentication was performed by means of Secure Remote Password as specified in [RFC 2945].

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema
targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:SecureRemotePassword"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:SecureRemotePassword"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier:
urn:oasis:names:tc:SAML:2.0:ac:classes:SecureRemotePassword
        Document identifier: sstc-saml-schema-authn-context-srp-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PrincipalAuthenticationMechanismType">
      <xs:complexContent>
        <xs:restriction base="PrincipalAuthenticationMechanismType">
          <xs:sequence>
            <xs:element ref="RestrictedPassword"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>
```

```
    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:element ref="SharedSecretChallengeResponse"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="SharedSecretChallengeResponseType">
      <xs:complexContent>
        <xs:restriction base="SharedSecretChallengeResponseType">
          <xs:attribute name="method" type="xs:anyURI"
fixed="urn:ietf:rfc:2945"/>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

3.4.23 SSL/TLS Certificate-Based Client Authentication

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:TLSClient

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-SSL]).

This class indicates that the principal authenticated by means of a client certificate, secured with the SSL/TLS transport.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:TLSClient"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:TLSClient"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier: urn:oasis:names:tc:SAML:2.0:ac:classes:TLSClient
        Document identifier: sstc-saml-schema-authn-context-sslcert-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
</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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
```

```
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PrincipalAuthenticationMechanismType">
      <xs:complexContent>
        <xs:restriction base="PrincipalAuthenticationMechanismType">
          <xs:sequence>
            <xs:element ref="RestrictedPassword"/>
          </xs:sequence>
          <xs:attribute name="preauth" type="xs:integer" use="optional"/>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorBaseType">
          <xs:sequence>
            <xs:element ref="DigSig"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PublicKeyType">
      <xs:complexContent>
        <xs:restriction base="PublicKeyType">
          <xs:attribute name="keyValidation" type="xs:anyURI"
fixed="urn:oasis:names:tc:SAML:2.0:ac:classes:X509"/>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="AuthenticatorTransportProtocolType">
      <xs:complexContent>
        <xs:restriction base="AuthenticatorTransportProtocolType">
          <xs:sequence>
            <xs:choice>
              <xs:element ref="SSL"/>
              <xs:element ref="WTLS"/>
            </xs:choice>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

3.4.24 TimeSyncToken

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:TimeSyncToken

Note that this URI is also used as the target namespace in the corresponding authentication context class schema document ([SAMLAC-TST]).

The TimeSyncToken class is applicable when a principal authenticates through a time synchronization token.

```
<?xml version="1.0" encoding="UTF-8"?>

<xs:schema
targetNamespace="urn:oasis:names:tc:SAML:2.0:ac:classes:TimeSyncToken"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="urn:oasis:names:tc:SAML:2.0:ac:classes:TimeSyncToken"
  finalDefault="extension"
  blockDefault="substitution"
  version="2.0">

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

    <xs:annotation>
      <xs:documentation>
        Class identifier: urn:oasis:names:tc:SAML:2.0:ac:classes:TimeSyncToken
        Document identifier: sstc-saml-schema-authn-context-timesync-2.0
        Location: http://www.oasis-
open.org/committees/documents.php?wg_abbrev=security
        Revision history:
          V2.0 CD-04 (January, 2005):
            New authentication context class schema for SAML V2.0.
      </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"/>
            <xs:element ref="GoverningAgreements" minOccurs="0"/>
            <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="AuthnMethodBaseType">
      <xs:complexContent>
        <xs:restriction base="AuthnMethodBaseType">
          <xs:sequence>
            <xs:element ref="PrincipalAuthenticationMechanism" minOccurs="0"/>
            <xs:element ref="Authenticator"/>
            <xs:element ref="AuthenticatorTransportProtocol" minOccurs="0"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="PrincipalAuthenticationMechanismType">
      <xs:complexContent>
        <xs:restriction base="PrincipalAuthenticationMechanismType">
```

```
          <xs:sequence>
            <xs:element ref="Token"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="TokenType">
      <xs:complexContent>
        <xs:restriction base="TokenType">
          <xs:sequence>
            <xs:element ref="TimeSyncToken"/>
            <xs:element ref="Extension" minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="TimeSyncTokenType">
      <xs:complexContent>
        <xs:restriction base="TimeSyncTokenType">
          <xs:attribute name="DeviceType" use="required">
            <xs:simpleType>
              <xs:restriction base="DeviceTypeType">
                <xs:enumeration value="hardware"/>
              </xs:restriction>
            </xs:simpleType>
          </xs:attribute>

          <xs:attribute name="SeedLength" use="required">
            <xs:simpleType>
              <xs:restriction base="xs:integer">
                <xs:minInclusive value="64"/>
              </xs:restriction>
            </xs:simpleType>
          </xs:attribute>

          <xs:attribute name="DeviceInHand" use="required">
            <xs:simpleType>
              <xs:restriction base="booleanType">
                <xs:enumeration value="true"/>
              </xs:restriction>
            </xs:simpleType>
          </xs:attribute>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:redefine>

</xs:schema>
```

3.4.25 Unspecified

URI: urn:oasis:names:tc:SAML:2.0:ac:classes:unspecified

The Unspecified class indicates that the authentication was performed by unspecified means.

4 References

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Appendix A. Acknowledgments

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