XML Signature 2.0 Strawman Proposal

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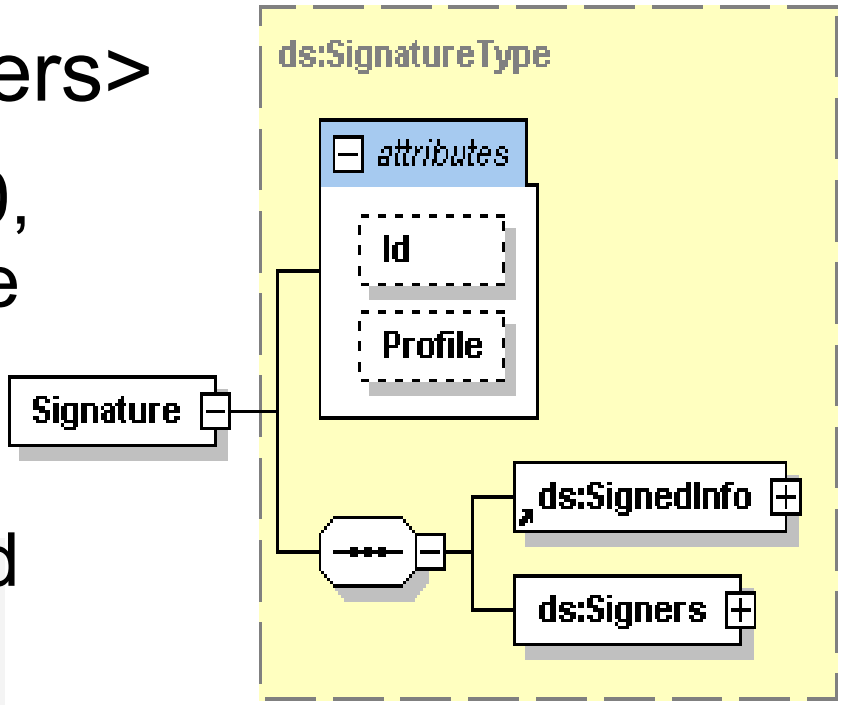
Overview

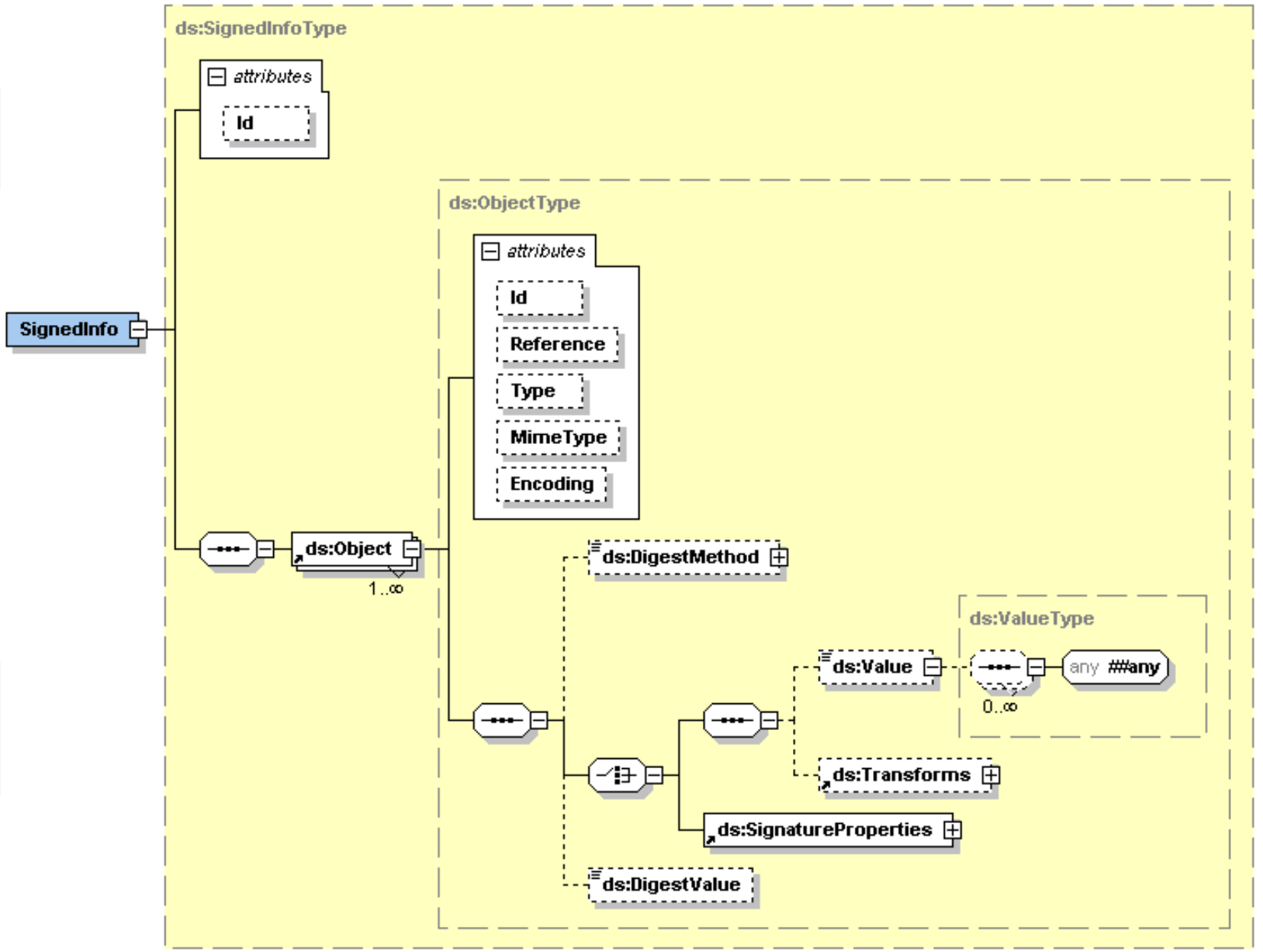
- Single-pass Creation and Validation
- Direct Support for Multiple Signers
- Remove Need for Generalized Canonicalization
- Signature Profiles (Including Profiles for Algorithms)

V2.0 Structure

- Two child elements: <SignedInfo> and <Signers>
  - <SignedInfo>, like in V1.0, specifies the objects to be signed
  - <Signers> indicates the entities signing the signed info



<SignedInfo> Structure



<SignedInfo> Example

```
<ds:Signature xmlns:xsi="http://www.w3.org/2001/XMLSchema-
   instance" xmlns:ds="http://www.w3.org/2008/xmldsig#"
   xmlns:saml="urn:oasis:names:tc:SAML:2.0:assertion"
   xmlns:xenc="http://www.w3.org/2001/04/xmlenc#"
   xsi:schemaLocation="http://www.w3.org/2008/xmldsig#
                                    xmldsig-core-schema-2.0.xsd"
   Profile="http://.../ExampleProfile.xml">
<ds:SignedInfo>
    <ds:Object Reference="http://xmlsec.com/logo.gif">
        <ds:DigestMethod Algorithm=" ...#sha1"/>
    </ds:Object>
    <ds:Object>
        <ds:DigestMethod Algorithm="...#md9"/>
        <ds:Value>Some text or XML</ds:Value>
        <ds:DigestValue>BaSe64DiGeSt</ds:DigestValue>
    </ds:Object>
</ds:SignedInfo>
   ...
```

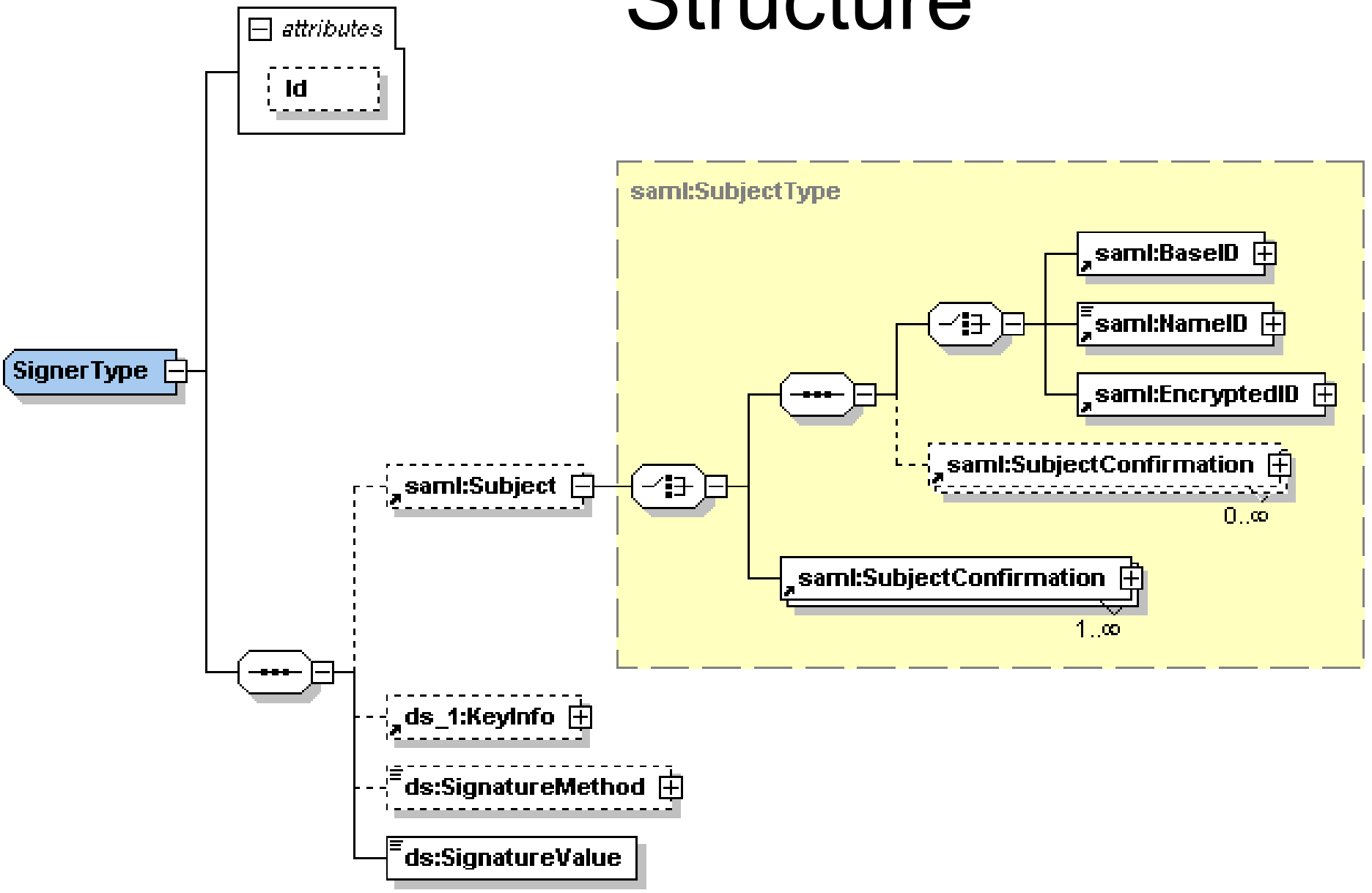
<SignedInfo> Description

- Unlike v1.0, signed objects can be inside <SignedInfo>
- Allows Creator to specify the digest algorithm, specify the object, digest it and specify the digest value
- Both the digest algorithm and digest value are optional
- Objects may be specified by either value or reference
- Q: Do we also need to support enveloped objects outside of <SignedInfo>?

<SignedInfo> Description

- Support for transforms like in V1.0
- Signature properties, also like in V1.0, can be specified
- Q: Is <Manifest> support needed?

<Signers>/<Signer> Structure



<Signers> Description

- Identifies one or more signers
- Identity of a signer specified using SAML <Subject> element (removing some of the SAML-specific attributes and child elements)
  - Allows encrypted identifier for signer
- <KeyInfo> can be specified for a Signer (optional)
- Signature algorithm (optional) and signature value (required) specified for each signer

<Signers> Example

```
...
<ds:Signers>
    <ds:Signer>
        <saml:Subject>
        <saml:NameID Format="urn:oasis:names:...:emailAddress">
            edsimon@xmlsec.com
          </saml:NameID>
        </saml:Subject>
        <ds:SignatureMethod Algorithm=
                                    "...#suite-b-elliptic-curve"/>
        <ds:SignatureValue>BaSe64SiGvAlUe01</ds:SignatureValue>
    </ds:Signer>
...
```

<Signers> Example

```
...
    <ds:Signer>
        <saml:Subject>
            <saml:EncryptedID>
                <xenc:EncryptedData>
                    <xenc:CipherData>
                        <xenc:CipherValue>
                            encryptedxID
                        </xenc:CipherValue>
                    </xenc:CipherData>
                </xenc:EncryptedData>
            </saml:EncryptedID>
        </saml:Subject>
        <ds:SignatureValue>BaSe64SiGvAlUe02</ds:SignatureValue>
    </ds:Signer>
  </ds:Signers>
</ds:Signature>
```

Canonicalization

- To robustly hash the <SignedInfo> element, one needs to change its textual XML representation into octets
- The process of creating a standard textual XML representation is called canonicalization
- Generalized canonicalization's problem domain includes all the things one could do in XML, for every type of application, that may affect its text representation but not its infoset
- Therefore it is, inter alia, resource-intensive

Canonicalization

- Better to use namespace-specific canonicalization
- Namespace-specific canonicalization is canonicalization that, rather than trying to encompass all use cases, is tailored and optimized for a particular namespace

Canonicalization

- In XML Signature, we need a reliable hash of <SignedInfo>,
- So we define – in the XML Signature specification – how to reliably hash <SignedInfo> which means we (the XML Signature group) need to define a canonical text form of <SignedInfo> for hashing
- Note: We can define the text form so precisely that the term canonicalization need not even be used

<SignedInfo> Canonicalization

- The canonical form of <SignedInfo> is:

```
– '<SignedInfo' + ' Id="var"'{?}
  + ' xmlns=".../2008/xmldsig#">'
    + ('<Object' + ' Encoding="var"'{?} '
    +  ' Id="var"'{?} + ' MimeType="var"'{?}
    + ' Reference="var"'{?} + ' Type="var"'{?}
    + '>'
      + ('<Value>' + ... + '</Value>'){?}
      + ('<DigestMethod'
      + ' Algorithm="var"'{?} '
      + '>' + ... + '</DigestMethod>'){?}
      + ('<DigestValue>'
      + ... + '</DigestValue>'){?}
      + '</Value>'){?}
    + '</Object>'){1..*}
  + '</SignedInfo>'
```

<SignedInfo> Canonicalization

- For canonicalizing the <SignedInfo> element:
  - For elements defined in the Signature schema, only the attributes defined in the schema for it are canonicalized – except for the @xmlns attibute on <SignedInfo> which points to the Signature namespace
  - Those attributes are set as per general canonicalization (lexicographical order, double quotation marks, etc.)

<SignedInfo> Canonicalization

- ...
  - The canonicalization of the content of the <Transform>, <DigestMethod>, and <Value> elements will be specified by XML Signature when that content is defined by XML Signature – otherwise, it will be defined in the signature profile (XML Signature could define a default)
  - Canonicalisation of URIs -- wrt xml:base -- still thinking about that ;)

Processing

- Single-pass on both creation and validation (correct me if I am wrong!)
- Order of element processing is <SignedInfo>, <Object>, <DigestMethod>, <Value>, <DigestValue>, (<Object> repeated as necessary), get hash of <SignedInfo>, <Signer>, <SignatureMethod>, <SignatureValue>, (<Signer> repeated as necessary)

Profiles

- The Signature element has a @ Profile attribute for specifying a profile to be used when interpreting the signature
- The profile refines the generic XML Signature specification into one specifically suited to the application of the signature
- Potential to have a list of profiles, each refining a subset of the prior profile (e.g. First profile is an XBRL profile, second profile restricts crypto algorithms)

Profiles

- A profile may specify (for example):
  - Allowance of attributes and specific values; for example, " Specify the Id attribute of the first SignedInfo Object element as 'object1'
  - Use of transforms; e.g. "only Transform X and Transform Y are allowed”
  - Digest and Signature algorithms; use MD5 for hashing and DSA-SHA1 for signing
- Verification of compliance with signature profiles is up to applications; XML Signature only defines how to specify profiles

END