Digital Signature Service Core Protocols, Elements, and Bindings Version 2.0

Committee Specification 01

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Additional artifacts:
This prose specification is one component of a Work Product that also includes:

- JSON and XML schemas: https://docs.oasis-open.org/dss-x/dss-core/v2.0/cs01/schema/

Related work:
This specification replaces or supersedes:

- *Digital Signature Service Core Protocols, Elements, and Bindings Version 1.0*. Edited by Stefan Drees. 11 April 2007. OASIS Standard. http://docs.oasis-open.org/dss/v1.0/oasis-dss-core-spec-v1.0-os.html.

Declared XML namespaces:

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- http://docs.oasis-open.org/dss-x/ns/base
- http://docs.oasis-open.org/dss-x/ns/nsList
- http://docs.oasis-open.org/dss-x/ns/xmldsig/rewritten
- http://docs.oasis-open.org/dss-x/ns/saml2/rewritten

Abstract:
This document defines JSON and XML based request/response protocols for signing and verifying documents and other data. It also defines a timestamp format, and a signature property for use with these protocols. Finally, it defines transport and security bindings for the protocols.

Status:
This document was last revised or approved by the OASIS Digital Signature Services eXtended (DSS-X) TC on the above date. The level of approval is also listed above. Check the "Latest version" location noted above for possible later revisions of this document. Any other numbered Versions and other technical work produced by the Technical Committee (TC) are listed at https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=dss-x#technical.

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Note that any machine-readable content (Computer Language Definitions) declared Normative for this Work Product is provided in separate plain text files. In the event of a discrepancy between any such plain text file and display content in the Work Product's prose narrative document(s), the content in the separate plain text file prevails.

Citation format:
When referencing this specification the following citation format should be used:

[DSS-v2.0]

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1 Introduction

[All text is normative unless otherwise labeled]

1.1 IPR Policy

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1.2 Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119] and [RFC8174].

1.2.1 Terms and Definitions

For the purposes of this document no specific terms or definitions have been identified as deviating from the usual meaning in the context of XML / JSON schema, digital signatures or transport.

1.2.2 Abbreviated Terms

ASN.1 — Abstract Syntax Notation One

URI — (IETF) Uniform Resource Identifier

XML — (W3C) Extensible Markup Language

XSD — (W3C) XML Schema

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1.4 Non-Normative References

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1.5 Typographical Conventions

Keywords defined by this specification use this `monospaced` font.

```
Normative source code uses this paragraph style.
```

Text following the special symbol («) – an opening Guillemet (or French quotation mark) – within this specification identifies automatically testable requirements to aid assertion tools. Every such statement is separated from the following text with the special end symbol (») – a closing Guillemet and has been assigned a reference that follows that end symbol in one of the three patterns:

1. [DSS-section#-local#] if it applies regardless of syntax
2. [JDSS-section#-local#] if it applies only to JSON syntax
3. [XDSS-section#-local#] if it applies only to XML syntax

Some sections of this specification are illustrated with non-normative examples.

Example 1: text describing an example uses this paragraph style

```
Non-normative examples use this paragraph style.
```

All examples in this document are non-normative and informative only.

Representation-specific text is indented and marked with vertical lines.

> **Representation-Specific Headline**
>
> Normative representation-specific text

All other text is normative unless otherwise labelled e.g. like:

Non-normative Comment:

> This is a pure informative comment that may be present, because the information conveyed is deemed useful advice or common pitfalls learned from implementer or operator experience and often given including the rationale.

1.6 DSS Overview (Non-normative)

This specification describes two request/response protocols:

1. signing protocol
2. verifying protocol

Using the first protocol a client can send documents (or document hashes) to a server and receive back a signature on the documents. Using the second protocol a client can send documents (or document hashes) and a signature to a server and receive back an answer on whether the signature is valid or not.

The top-level components for the signing protocol are

- `SignRequest` (see section 4.3.1) as input and
- `SignResponse` (see section 4.3.2) as output.

For the verification protocol the top-level components are

- `VerifyRequest` (see section 4.3.3) as input and
- `VerifyResponse` (see section 4.3.4) as output.

Additionally, this version of the core includes asynchronous requests initially specified in the Asynchronous Processing Abstract Profile [DSSAsync].

The elements in which the protocols are formulated are provided in a sematic level and also in JSON and XML syntax. Provided are additional mappings from the generic to the specific entities.

These protocol operations could be useful in a variety of contexts – for example, they could allow clients to access a single corporate key for signing press releases, with centralized access control, auditing and archiving of signature requests. They could also allow clients to create and verify signatures without the need for complex client software and security-sensitive configuration.

The signing and verifying protocols are chiefly designed to support the creation and verification of XML signatures **[XMLDSIG]**, XML timestamps (see **[DSS1Core],** section 5.1), binary timestamps **[RFC 3161]** and CMS signatures **[RFC 5652]**. These protocols are intended to be extensible to other types of signatures and timestamps, such as PGP signatures **[RFC 2440]**.

It is expected that the signing and verifying protocols will be *profiled* to meet many different application scenarios. In anticipation of this, these protocols have only a minimal set of required elements, which deal with transferring "input documents" and signatures back and forth between client and server. The input documents to be signed or verified can be transferred in their entirety or the client can hash the documents themselves and only send the hash values to save bandwidth and protect the confidentiality of the document content.

All functionality besides transferring input documents and signatures is relegated to a framework of "optional inputs" and "optional outputs". This document defines a number of optional inputs and outputs. Profiles of these protocols can pick and choose which optional inputs and outputs to support and can introduce their own optional inputs and outputs when they need functionality not anticipated by this specification.

Examples of optional inputs to the signing protocol include: what type of signature to produce, which key to sign with, who the signature is intended for, and what signed and unsigned properties to place in the signature. Examples of optional inputs to the verifying protocol include: the time for which the client would like to know the signature's validity status, additional validation data necessary to verify the signature (such as certificates and CRLs), and requests for the server to return information such as the signer's name or the signing time.

The signing and verifying protocol messages must be transferred over some underlying protocol(s) which provide message transport and security. A *binding* specifies how to use the signing and verifying protocols with some underlying protocol such as HTTP POST or TLS. Section 7 Asynchronous Processing Model provides an initial set of bindings.

The previous version of specification (**[DSS1Core])** defines two elements that are related to these protocols. First, an XML timestamp element is defined in **[DSS1Core],** section 5.1. The signing and verifying protocols can be used to create and verify both XML and binary timestamps; a profile for doing so is defined in **[XML-TSP]**. Second, a `RequesterIdentity` element is defined in (see **[DSS1Core],** section 5.2). This element can be used as a signature property in an XML signature, to give the name of the end-user who requested the signature. These elements remain unchanged and are not repeated in this specification.

2 Design Considerations

2.1 Version 2.0 goal [non-normative]

The main changes of this version of the DSS/X core document compared to version 1.0 are:

- Considering the set of comments and bug reports arrived since version DSS 1.0 became standard
- Inclusion of requirements that became known only after publication of version 1.0
- Simplification of the core schema, e.g. by dropping elements seldom used
- Support for syntaxes other than XML
- Support transport formats other than SOAP
- Integration of the 'Asynchronous Processing Profile' [DSSAsync] into the core
- Enable profiles to define multi-signature processing by changing the cardinality of signature objects to 'unbounded'. This document does not define mechanisms for addressing and processing of multiple signatures within one call. This is left to specific profiles.

Define a sematic model that can be mapped to different syntaxes. In this document the focus is on XML and JSON, but support for other syntaxes should be possible. Therefore, only the common denominator of syntax features can be used:

- Focus on Base64 as the most versatile way to transport documents and signatures
- Avoid the use of XML specifics (like e.g. mixed content)
- Provide namespace / URI for XPath evaluation explicitly
- Avoid `xs:any` by replacing it with an enumeration of possible types, and if that is not feasible, use base64 blobs as a fall back

To support implementers and to ease the use of the protocol with common frameworks the following list of requirements was compiled:

- One unique object model for all transport syntaxes
- Define type and cardinality of `OptionalInputs` and `OptionalOutputs` child elements explicitly
- Rearrange sequences and choices to produce a strongly typed object model

Regardless of the use of JSON as a transport syntax the handling of JSON signatures will not be covered by this document. Specific profiles will address signatures e.g. conformant to [RFC7515].

The provided schemes of DSS-X version 2 reflect these requirements. The XML schemes of version 1 and 2 share many similarities but are not compatible.

2.2 Transforming DSS 1.0 into 2.0

This section describes the several actions taken to fulfil the goals listed in the previous section.

2.2.1 Circumventing xs:any

The XML schema type 'any' allows an object to contain arbitrary structures. This comes handy for writers of specifications as an extension point because the structures transported don't need to be defined upfront. But this advantage at the specification stage comes with a price at the implementation stage. The structures intended to be supported by a client or a server system MUST be known to be implementable. But the usual tools for schema support leave the task of handling the content of an any type to the developer. Without extensive testing problems with unexpected content may occur at runtime, even while using typed languages.

As a successor of the `OptionalInputs` element (see section 2.7 of version 1.0 of this document) the component `OptionalInputsVerify` (see section 4.4.5) defines its child elements and their cardinality explicitly. When using additional profiles, the relevant components of the core schema can be redefined using the XML schema's 'redefine' element or JSON schema's 'allOf' as described in section 2.5.1 .

Another usage scenario for 'xs:any' is the transport of unknown data objects. As sample use case is the Property component (see section 4.4.16). This component is intended to contain signature attributes of unknown structure. In this version of the specification the 'xs:any' type is replaced by a structure containing base64-encoded data and meta data (component Any, see section 4.2.4). When using XML as the transport syntax this seems to be a disadvantage. But direct XML fragment copying may introduce namespace problems and security concerns. Most importantly the cherry-picking of transport syntax features would inhibit a transport independent object model, both on the client and the server side. More complex programming and testing would be inevitable.

2.2.2 Substituting the mixed Schema Attribute

Mixing sub-elements and text within a single element is a great advantage of XML. But when XML is applied for serializing an object model this 'markup language' feature is of little use. Other serialization syntaxes (like JSON) don't support such a feature. There is the need to substitute the '`mixed`' construct to become syntax independent. The substitution is done by removing the mixed attribute and introduce an additional '`value`' element to contain the textual content.

2.2.3 Introducing the `NsPrefixMappingType` Component

Namespaces are an outstanding feature of the XML world. A replacement is required for all syntaxes that don't such a feature. The use of naming conventions and prefixes are used to avoid naming collisions. A special challenge is the use of XPath-Expression as elements. The XPath expression itself is represented as a simple string. But the expression may depend on namespace/prefix mappings that are defined within the namespace context of the XML element. The `NsPrefixMappingType` component (see section 4.1.1) represents the required namespace/prefix mapping. It is recommended to use this element for XML syntax, too. This simplifies the handling on the consumer side and circumvents problems with namespace prefix assignments handled by web frameworks.

2.2.4 Imported XML schemes

A special challenge is imposed by the imported schemes, like the **[XMLDSIG]** scheme, that uses features not supportable by the mentioned 'multi-syntax' approach. For example, the **[XMLDSIG]** type 'Transform' is defined like this:

```
<xs:complexType name="TransformType" mixed="true">
  <xs:choice minOccurs="0" maxOccurs="unbounded">
    <xs:any namespace="##other" processContents="lax"/>
    <!-- (1,1) elements from (0,unbounded) namespaces -->
    <xs:element name="XPath" type="string"/>
  </xs:choice>
  <xs:attribute name="Algorithm" type="xs:anyURI" use="required"/>
</xs:complexType>
```

Most of the restrictions listed above do apply here:

- The `complexType` may contain mixed content (child elements **and** text). This concept is not supported by JSON. The workaround for this limitation is to drop the 'mixed' attribute and to introduce a 'value' element.
- The `choice` construct is mapped in an untyped way by Java's JAXB framework. Therefore, the `choice` element is changed to a `sequence`.
- The `any` type is replaced by a base64 encoded blob.
- The option to provide arbitrary namespace / prefix mappings to support the evaluation of XPath expression is not available in e.g. JSON syntax. Therefore, an element mapping prefixes to namespaces (of type `dsb:NsPrefixMappingType`) is added.

```
<xs:complexType name="TransformType">
  <xs:sequence>
    <xs:element maxOccurs="1" minOccurs="0" name="value" type="string"/>
    <xs:element maxOccurs="1" minOccurs="0" name="Base64Content"
                type="xs:base64Binary"/>
    <xs:element maxOccurs="unbounded" minOccurs="0" name="XPath"
                type="string"/>
    <xs:element maxOccurs="unbounded" minOccurs="0" name="NsPrefixMapping"
                type="dsb:NsPrefixMappingType"/>
  </xs:sequence>
  <xs:attribute name="Algorithm" type="xs:string" use="required"/>
</xs:complexType>
```

To apply the necessary changes to the imported schemes the XML schema language provides the `override` functionality to change existing schemes. But Java's JAXB framework's schema compiler does not support `override` so the adapted schemes are provided alongside DSS-X core schemes.

2.2.5 Syntax variants

This version of the DSS/X core document handles the representation of requests and response elements according to the JSON and XML syntax. The general semantics of the elements is discussed in the element's main section. Details of the JSON or XML formats are discussed in specific subsections

- Component – JSON Syntax
- Component – XML Syntax

2.2.6 JSON Syntax Extensions

JSON, as described in [RFC8259], defines a text format for serializing structured data. Objects are serialized as an unordered collection of name/value pairs.

JSON does not define any semantics around the name/value pairs that make up an object, nor does it define an extensibility mechanism for adding control information to a payload.

DSS's JSON format extends JSON by defining general conventions for name/value pairs that annotate a JSON object, property or array. DSS defines a set of canonical annotations for control information such as ids, types, and links, and custom annotations MAY be used to add domain-specific information to the payload.

Annotations are used in JSON to capture control information that cannot be predicted as well as a mechanism to provide values where a computed value would be wrong.

2.3 Construction Principles

2.3.1 Multi Syntax approach

In the years since DSS 1.0 became standard many other formats (like JSON) became popular for data interchange. Nevertheless, XML is still an important and commonly used format. To support these developments DSS 2.0 is taking a multi-syntax approach:

- For each structural component there is semantic section describing the elements, restrictions and relations to other components in a syntax-neutral way.
- Following the sematic definition there are syntax-specific sections describing the mapping of the given requirements to XML and JSON.
- Schemes are provided for XML and JSON.
- Element name mappings are given for JSON.

Subsequent versions of this protocol may define additional syntax mappings, e.g. for ASN.1 or CBOR.

The restriction of this approach is limitation to the common denominator of capabilities of the used transfer formats. The section 'Transforming DSS 1.0 into 2.0' targets these limitations. The imported schema files defined by other parties are also affected. An example is the 'Component Transform', that

was originally defined in [XMLDSIG] and the aspects described in 2.2.1 Circumventing xs:any, 2.2.2 Substituting the mixed Schema Attribute and 2.2.3 Introducing the NsPrefixMappingType Component apply.

2.4 Schema Organization and Namespaces

The structures described in this specification are contained in the schema files **[DSS2XSD], [DSBXSD]** and **[NSLXSD]**. All schema listings in the current document are excerpts from the schema files. In the case of a disagreement between the schema file and this document, the schema files shall take precedence.

This schema is associated with the following XML namespace

```
http://docs.oasis-open.org/dss-x/ns/nsList
```

,

```
http://docs.oasis-open.org/dss-x/ns/base
```

and

```
http://docs.oasis-open.org/dss-x/ns/core
```

If a future version of this specification is needed, it will use a different namespace.

Conventional XML namespace prefixes are used in the schema:

- The prefix `dss2:` stands for the DSS core version 2.0 namespace **[DSS2XSD]**.
- The prefix `dsb:` stands for the DSS base namespace **[DSBXSD].**
- The prefix `nsl:` stands for the DSS base namespace **[NSLXSD].**
- The prefix `ds-rw:` stands for a namespace of elements based on the W3C XML Signature **[XMLDSIG]**.
- The prefix `xs:` stands for the W3C XML Schema namespace **[Schema1]**.
- The prefix `saml2-rw:` stands for a namespace of elements based on the OASIS SAML 2 Schema namespace **[SAMLCore2.0]**.

Applications MAY use different namespace prefixes, and MAY use whatever namespace defaulting/scoping conventions they desire, as long as they are compliant with the Namespaces in XML specification **[XML-ns]**.

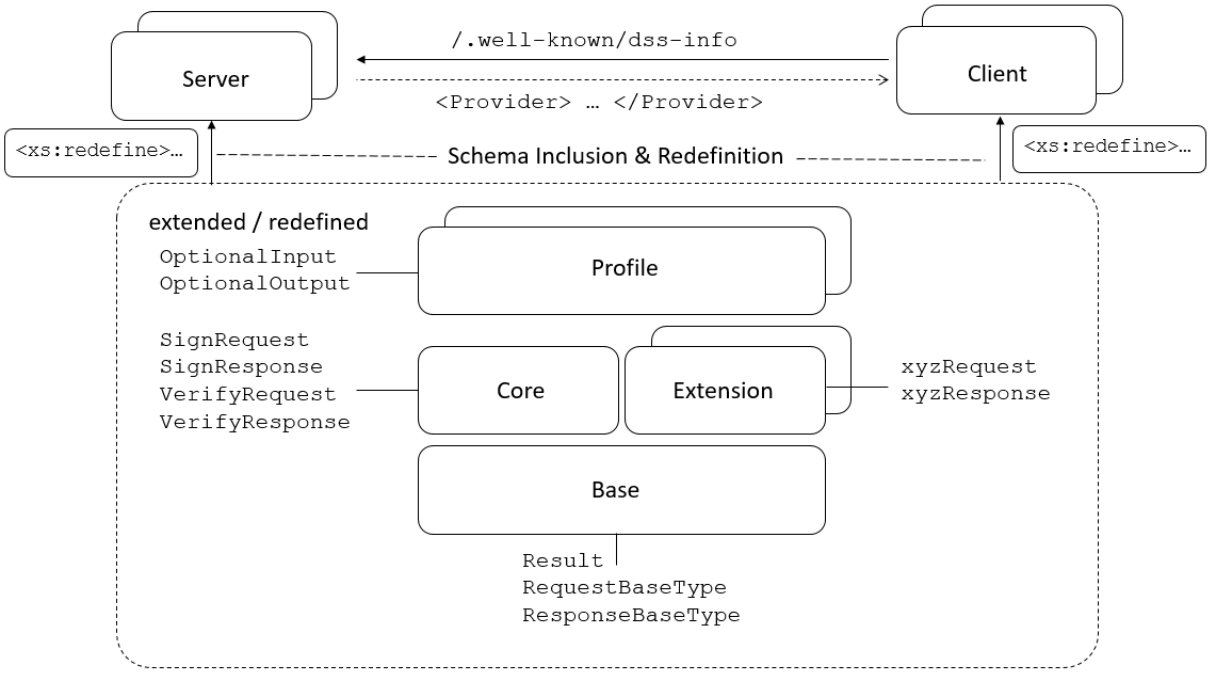
The following schema fragment defines the XML namespaces and other header information for the DSS core schema:

```
<xs:schema xmlns:dss2="http://docs.oasis-open.org/dss-x/ns/core"
    xmlns:dsb="http://docs.oasis-open.org/dss-x/ns/base"
    xmlns:ds-rw="http://docs.oasis-open.org/dss-x/ns/xmldsig/rewritten"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns:saml-rw="http://docs.oasis-open.org/dss-x/ns/SAML_1.0/assertion/rewritten"
    xmlns:saml2-rw="http://docs.oasis-open.org/dss-x/ns/saml2/rewritten"
    targetNamespace="http://docs.oasis-open.org/dss-x/ns/core"
    elementFormDefault="qualified"
    attributeFormDefault="unqualified">
<xs:annotation>
  <xs:documentation xml:lang="en">This Schema defines the Digital Signature Service Core
Protocols, Elements, and Bindings Committee Draft 1 for Public Review</xs:documentation>
</xs:annotation>
<xs:import namespace="http://docs.oasis-open.org/dss-x/ns/xmldsig/rewritten"
           schemaLocation=" xmldsig-core-schema-dss-rw.xsd"/>
<xs:import namespace="http://docs.oasis-open.org/dss-x/ns/SAML_1.0/assertion/rewritten"
           schemaLocation="oasis-sstc-saml-schema-protocol-1.1-dss-rw.xsd"/>
<xs:import namespace="http://docs.oasis-open.org/dss-x/ns/saml2/rewritten"
           schemaLocation="saml-schema-assertion-2.0-dss-rw.xsd"/>
<xs:import namespace="http://www.w3.org/XML/1998/namespace"
           schemaLocation="http://www.w3.org/2001/xml.xsd"/>
```

2.5 DSS Component Overview

The DSS core is designed to be extended by profiles to support additional functionalities. The DSS specification comes with a set of profiles (see https://www.oasis-open.org/standards#dssv1.0). With version 2.0 there will be extensions to augment the use cases beyond the sign and verify scope of the previous version. The extensions will define other requests and responses while using e.g. the `ResultType`. A sample for an extension is the ChipGateway Protocol (c.f. clause 3.4 of [CHPGW]). To support this approach, the DSS 2.0 schema is split into a generic 'base' and the more specific 'core' schema.

Figure 1:Component overview



The diagram above shows the relationship between the different building blocks.

2.5.1 Schema Extensions

Most profiles define additional `OptionalInputs` or `OptionalOutputs`. To support a type-safe extension of the set of optional elements it is recommended to use the XML schema `redefine` mechanism to extend the core schema and derive the related JSON schema from it:

```
<xs:redefine schemaLocation="core-schema.xsd">
  <xs:complexType name="dss:OptionalOutputsVerifyType">
    <xs:complexContent>
      <xs:extension base="dss:OptionalOutputsVerifyType">
        <xs:group ref="prf:optionalOutputGroup"/>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:redefine>
```

The snippet above extends the set of sub-components of `OptionalOutputsVerifyType` with the group of elements of the profile.

In a similar way extension of the core's JSON scheme can be performed by using the 'allOf' keyword:

```
"dss2-OptionalOutputsVerifyType": {
  "allOf": [
    {"$ref": "#/definitions/prf-OptionialElement"},
    {
      "type": "object",
      "properties": {
        "policy": {
          "type": "array",
          "items": {
            "type": "string"
          }
        },
      // [...]
      }
    }
  ]
}
```

With this mechanism it is possible to extend the core schema to specific requirements while preserving the advantage of type safety and tool / IDE support. This sample illustrates the use of ‘`extension`’. in the same way `restriction` can be applied. In more complex scenarios (e.g. multiple profiles apply, need for extending **and** restriction the core schema) the use of other techniques (e.g. XSLT) may be required.

It may be useful to process a profile (or a set of profiles) using a distinct endpoint. This enables the server instance to provide a specific WSDL including an appropriate schema with all profile-related elements.

3 Data Type Models

3.1 Boolean Model

The boolean data type is used to specify a true or false

3.2 Integer Model

The integer data type is used to specify a numeric value without a fractional component.

3.3 String Model

The string data type can represent characters, line feeds, carriage returns, and tab characters.

3.4 Binary Data Model

The base64Binary type holds Base64-encoded binary data

3.5 URI Model

Uniform Resource Identifier (URI) is a string of characters used to identify a resource

3.6 Unique Identifier Model

A unique identifier is a numeric or alphanumeric string that is associated with a single entity within a given system.

3.7 Date and Time Model

The specific concept of date and time used in this document is defined in this section and noted in subsequent usage as:

DateTime

« All date time values inside a DSS document MUST adhere to the ISO 8601 [ISO8601] basic or extended Format (as given there in section 4.3.2 “Complete representations” and with the addition of decimal fractions for seconds, similar to ibid. section 4.2.2.4 “Representations with decimal fraction” but with the full stop (.) being the preferred separator for DSS). » [DSS-3.7-1].

3.8 Lang Model

The specific concept of language used in this document is defined in this section and noted in subsequent usage as:

Language

« All language values inside a DSS document MUST adhere to the ISO 639-1 [ISO639-1] format (as given there in section 4 “Two-letter language code”. » [DSS-3.8-1].

4 Data Structure Models

4.1 Data Structure Models defined in this document

The XML elements of this section are defined in the XML namespace '`http://docs.oasis-open.org/dss-x/ns/nsList`'.

4.1.1 Component NsPrefixMapping

The `NsPrefixMapping` component defines the mapping of namespace URIs to namespace prefixes. This is required to evaluate XPath expression when using transport syntaxes that don't support namespace.

Below follows a list of the sub-components that constitute this component:

> The `NamespaceURI` element MUST contain one instance of a URI.
>
> The `NamespacePrefix` element MUST contain one instance of a string.

4.1.1.1 NsPrefixMapping – JSON Syntax

The `NsPrefixMappingType` JSON object SHALL implement in JSON syntax the requirements defined in the `NsPrefixMapping` component.

Properties of the JSON object SHALL implement the sub-components of `NsPrefixMapping` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
NamespaceURI	*uri*
NamespacePrefix	*pre*

The `NsPrefixMappingType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"nsl-NsPrefixMappingType": {
  "type": "object",
  "properties": {
    "uri": {
      "type": "string"
    },
    "pre": {
      "type": "string"
    }
  },
  "required": ["uri", "pre"]
}
```

4.1.1.2 NsPrefixMapping – XML Syntax

The XML type `NsPrefixMappingType` SHALL implement the requirements defined in the `NsPrefixMapping` component.

The `NsPrefixMappingType` XML element is defined in XML Schema [NSLXSD], and is copied below for information.

```
<xs:complexType name="NsPrefixMappingType">
  <xs:sequence>
    <xs:element name="NamespaceURI" type="xs:anyURI"/>
    <xs:element name="NamespacePrefix" type="xs:string"/>
  </xs:sequence>
</xs:complexType>
```

Each child element of `NsPrefixMappingType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.2 Data Structure Models defined in this document

The XML elements of this section are defined in the XML namespace '`http://docs.oasis-open.org/dss-x/ns/base`'.

4.2.1 Component InternationalString

This element attaches an element to a human-readable string to specify the string's language.

Below follows a list of the sub-components that constitute this component:

> The `value` element MUST contain one instance of a string. The human readable string. In non-XML representations the value element contains the textual content.
>
> The `lang` element MUST contain one instance of a ISO language descriptor. This element identifies the language of the `value` element.

4.2.1.1 InternationalString – JSON Syntax

The `InternationalStringType` JSON object SHALL implement in JSON syntax the requirements defined in the `InternationalString` component.

Properties of the JSON object SHALL implement the sub-components of `InternationalString` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
value	*value*
lang	*lang*

The `InternationalStringType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dsb-InternationalStringType": {
  "type": "object",
  "properties": {
    "value": {
      "type": "string"
    },
    "lang": {
      "type": "string"
    }
  },
  "required": ["lang"]
}
```

4.2.1.2 InternationalString – XML Syntax

The XML type `InternationalStringType` SHALL implement the requirements defined in the `InternationalString` component.

The `InternationalStringType` XML element is defined in XML Schema [DSBXSD], and is copied below for information.

```
<xs:complexType name="InternationalStringType">
  <xs:simpleContent>
    <xs:extension base="xs:string">
      <xs:attribute ref="xml:lang" use="required"/>
    </xs:extension>
  </xs:simpleContent>
</xs:complexType>
```

Each child element of `InternationalStringType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.2.2 Component DigestInfo

The `DigestInfo` component holds a digest value and an identification of the used digest algorithm. The `DigestMethod` isn't strongly typed intentionally to support a broad variety of identifiers.

Below follows a list of the sub-components that constitute this component:

> The `DigestMethod` element MUST contain one instance of a string. The string describes the digest algorithm in an appropriate way for the server side processing. Depending on the signature format this may be an OID (e.g. '2.16.840.1.101.3.4.2.1'), an URI (e.g. 'http://www.w3.org/2001/04/xmlenc#sha256') or a descriptive string ('SHA-256').
>
> The `DigestValue` element MUST contain one instance of base64 encoded binary data.

4.2.2.1 DigestInfo – JSON Syntax

The `DigestInfoType` JSON object SHALL implement in JSON syntax the requirements defined in the `DigestInfo` component.

Properties of the JSON object SHALL implement the sub-components of `DigestInfo` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`DigestMethod`	*`alg`*
`DigestValue`	*`val`*

The `DigestInfoType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dsb-DigestInfoType": {
  "type": "object",
  "properties": {
    "alg": {
      "type": "string"
    },
    "val": {
      "type": "string"
    }
  },
  "required": ["alg", "val"]
```

```
}
```

4.2.2.2 DigestInfo – XML Syntax

The XML type `DigestInfoType` SHALL implement the requirements defined in the `DigestInfo` component.

The `DigestInfoType` XML element is defined in XML Schema [DSBXSD], and is copied below for information.

```
<xs:complexType name="DigestInfoType">
  <xs:sequence>
    <xs:element name="DigestMethod" type="xs:string"/>
    <xs:element name="DigestValue" type="xs:base64Binary"/>
  </xs:sequence>
</xs:complexType>
```

Each child element of `DigestInfoType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.2.3 Component AttachmentReference

Applications MAY support SOAP 1.2 attachment feature **[SOAPAtt]** or other attachment specifications (e.g. **[SOAPMtom]**) to transmit documents.

Below follows a list of the sub-components that constitute this component:

> The OPTIONAL `DigestInfo` element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.2.2. An element of this type can be used to ensure the integrity of the attachment data. If these elements are supplied the server SHOULD compute a message digest using the algorithm given in `DigestMethod` over the binary data in the octet stream and compare it against the supplied `DigestValue`. If the comparison fails, then a `RequesterError` qualified by a `GeneralError` and an appropriate message containing the `AttRefURI` is returned.
>
> The `AttRefURI` element MUST contain one instance of a URI. SOAP 1.2 attachment feature [SOAPAtt] states that any secondary part ("attachment") can be referenced by a URI of any URI scheme. `AttRefURI` refers to such a secondary part ("attachment") and MUST resolve within the compound SOAP message. The default encapsulation mechanism is MIME as specified in the WS-I Attachments Profile [WS-I-Att] (cf. swaRef, http://www.ws-i.org/Profiles/AttachmentsProfile-1.0.html#Referencing_Attachments_from_the_SOAP_Envelope).

4.2.3.1 AttachmentReference – JSON Syntax

The `AttachmentReferenceType` JSON object SHALL implement in JSON syntax the requirements defined in the `AttachmentReference` component.

Properties of the JSON object SHALL implement the sub-components of `AttachmentReference` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
DigestInfo	*di*
AttRefURI	*attURI*

The `AttachmentReferenceType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dsb-AttachmentReferenceType": {
  "type": "object",
  "properties": {
    "di": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dsb-DigestInfoType"
      }
    },
    "attURI": {
      "type": "string"
    }
  },
  "required": ["attURI"]
}
```

4.2.3.2 AttachmentReference – XML Syntax

The XML type `AttachmentReferenceType` SHALL implement the requirements defined in the `AttachmentReference` component.

The `AttachmentReferenceType` XML element is defined in XML Schema [DSBXSD], and is copied below for information.

```
<xs:complexType name="AttachmentReferenceType">
  <xs:sequence>
    <xs:element name="DigestInfo" type="dsb:DigestInfoType"
maxOccurs="unbounded" minOccurs="0"/>
  </xs:sequence>
  <xs:attribute name="AttRefURI" type="xs:anyURI" use="required"/>
</xs:complexType>
```

Each child element of `AttachmentReferenceType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.2.4 Component Any

This element MAY hold a set of base64 encoded arbitrary data. To help the processing of the data it may be qualified by the mime type element.

This components extends the component 4.2.5. The inherited sub-components are not repeated here.

Below follows a list of the sub-components that constitute this component:

Non-normative Comment:

> This component was introduced in DSS core version 1.0 and is used as a placeholder for arbitrary data. In version 1.0 there were different ways defined to represent the data, e.g. as inline XML, encapsulated XML or base64 encoded. The expansion of the scope to different syntaxes limits the options to base64 encoded data or attachments as represented in `Base64Data`. In this version the component `Any` does not use additional subcomponents.

4.2.4.1 Any – JSON Syntax

The `AnyType` JSON object SHALL implement in JSON syntax the requirements defined in the `Any` component.

The `AnyType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dsb-AnyType": {
  "type": "object",
  "properties": {
    "ID": {
      "type": "string"
    },
    "val": {
      "type": "string"
    },
    "attRef": {
      "$ref": "#/definitions/dsb-AttachmentReferenceType"
    },
    "transforms": {
      "$ref": "#/definitions/dsigrw-TransformsType"
    },
    "mimeType": {
      "type": "string"
    },
    "idRef": {
      "type": "string"
    }
  }
}
```

4.2.4.2 Any – XML Syntax

The XML type `AnyType` SHALL implement the requirements defined in the `Any` component.

The `AnyType` XML element is defined in XML Schema [DSBXSD], and is copied below for information.

```
<xs:complexType name="AnyType">
  <xs:complexContent>
    <xs:extension base="dsb:Base64DataType"/>
  </xs:complexContent>
</xs:complexType>
```

Each child element of `AnyType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.2.5 Component Base64Data

The `Base64Data` component is a generic holder for arbitrary data. In addition to the data itself it also contains additional elements to qualify the MimeType of the data. It also offers an Id / Reference pair to implement a deduplication strategy, useful especially for bigger data blobs. The content is contained inside the mutually exclusive elements `Value` or `AttRefURI`.

Below follows a list of the sub-components that constitute this component:

The OPTIONAL `Value` element, if present, MUST contain one instance of base64 encoded binary data. This element holds an instance of generic content. This could be a document to be signed, a signature, a schema or other data.

The OPTIONAL `AttRef` element, if present, MUST contain one instance of a sub-component. This element MUST satisfy the requirements specified in this document in section 4.2.3. This element allows to reference content that is transferred in a non-inlined way. These mechanisms may take advantage of optimizations (e.g. optimized transfer encodings). The content of MAY be integrity-protected by a message digest.

The OPTIONAL `Transforms` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in section 4.6.2. This subcomponent can be used to specify additionally transformations of the data represented by this `Base64Data` component (after base64 decoding of the transport element, if necessary). For example, this may be a decryption step.

The OPTIONAL `MimeType` element, if present, MUST contain one instance of a string. This element is denoting the type of the arbitrary data in the value element or the referenced attachment.

The OPTIONAL `Id` element, if present, MUST contain one instance of a unique identifier. This identifier gives the binary data a unique label within a particular message. Using this identifier and the IdRef element it is possible to avoid redundant content.

The OPTIONAL `IdRef` element, if present, MUST contain one instance of a unique identifier reference. This element identifies another binary data element within a particular message. This enables the de-duplication of (possible big) data elements.

Non-normative Comment:

There are different standards defined for handling and referencing an attachment. Maybe there will be more to come. Therefore, the attachment reference mechanism is somehow generic here. Note: If MIME is used as encapsulation mechanism, the MIME content-type is available via a MIME header. However, the MIME headers may not be available to implementations and the SOAP 1.2 attachment feature is not restricted to MIME. Further the MIME header is not secured by the `AttachmentReference`'s `DigestInfo`, which is calculated over the binary attachment data (not including the MIME headers). Implementers may choose to annotate the `Value` element to take advantage of the mechanism defined in MTOM **[SOAPMtom]** for SOAP calls. This obsoletes the use of the `AttRef` element.

4.2.5.1 Base64Data – JSON Syntax

The `Base64DataType` JSON object SHALL implement in JSON syntax the requirements defined in the `Base64Data` component.

Properties of the JSON object SHALL implement the sub-components of `Base64Data` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
Value	*val*
AttRef	*attRef*
Transforms	*transforms*
MimeType	*mimeType*
Id	*ID*

IdRef	*idRef*

The `Base64DataType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dsb-Base64DataType": {
  "type": "object",
  "properties": {
    "ID": {
      "type": "string"
    },
    "val": {
      "type": "string"
    },
    "attRef": {
      "$ref": "#/definitions/dsb-AttachmentReferenceType"
    },
    "transforms": {
      "$ref": "#/definitions/dsigrw-TransformsType"
    },
    "mimeType": {
      "type": "string"
    },
    "idRef": {
      "type": "string"
    }
  }
}
```

4.2.5.2 Base64Data – XML Syntax

The XML type `Base64DataType` SHALL implement the requirements defined in the `Base64Data` component.

The `Base64DataType` XML element is defined in XML Schema [DSBXSD], and is copied below for information.

```
<xs:complexType name="Base64DataType">
  <xs:sequence>
    <xs:choice minOccurs="0">
      <xs:element name="Value" type="xs:base64Binary"/>
      <xs:element name="AttRef" type="dsb:AttachmentReferenceType"/>
    </xs:choice>
    <xs:element name="Transforms" type="ds-rw:TransformsType" minOccurs="0"/>
  </xs:sequence>
  <xs:attribute name="MimeType" type="xs:string" use="optional"/>
  <xs:attribute name="ID" type="xs:ID" use="optional"/>
  <xs:attribute name="IDREF" type="xs:IDREF" use="optional"/>
</xs:complexType>
```

Each child element of `Base64DataType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name. The elements ‘Id’ and ‘IdRef’ have slightly different names (‘ID’ and ‘IDREF’) within XML syntax to match the XML schema standards for unique identifiers and their reference.

4.2.6 Component SignaturePtr

The SignaturePtr component is used to point to a signature in an input (for a verify request) or output (for a sign response) data object. The signature may be enveloped in a document. There may be multiple signatures contained within a single object. The XPath element will identify a specific instance.

Below follows a list of the sub-components that constitute this component:

> The OPTIONAL NsPrefixMapping element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.1.1.
>
> The WhichData element MUST contain one instance of a unique identifier reference. This element identifies the Base64Data component holding the signature or the enveloping document.
>
> The OPTIONAL XPath element, if present, MUST contain one instance of a string. This element identifies the signature element being pointed at within the selected data object. Depending on the syntax specified in the XPathQualifier element the XPath expression is interpreted. In case of an XML XPath the XPath expression is evaluated from the root node (see section 5.1 of [XPATH]) of the XML document identified by WhichData. The context node for the XPath evaluation is the document's DocumentElement (see section 2.1 Well-Formed XML Documents [XML]). Regarding namespace declarations for the expression necessary for evaluation see section 1 of [XPATH].
>
> The OPTIONAL XPathQualifier element, if present, MUST contain one instance of a URI. Its default value is 'http://www.w3.org/TR/2010/REC-xpath20-20101214/'. The XPathQualifier element MAY be used to specify the details of how the XPath element is to be interpreted. If this element is missing, the default [XPATH-v2] is assumed. The present document explicitly specifies the following URIs and signature identification strategies:
> - http://www.w3.org/TR/1999/REC-xpath-19991116/ - is applicable for XML-based data objects and specifies that the XPath element is to be interpreted according to [XPATH-v1].
> - http://www.w3.org/TR/2010/REC-xpath20-20101214/ - is applicable for XML-based data objects and specifies that the XPath element is to be interpreted according to [XPATH-v2].
> - http://www.w3.org/TR/2014/REC-xpath-30-20140408/ - is applicable for XML-based data objects and specifies that the XPath element is to be interpreted according to [XPATH-v3].
> - https://www.w3.org/TR/2017/REC-xpath-31-20170321/ - is applicable for XML-based data objects and specifies that the XPath element is to be interpreted according to [XPATH-v3.1].
> - urn:iso:std:iso:32000:-1 - is applicable for PDF-based documents and specifies that the XPath element is to be interpreted as field name of the signature directory (see [ISO 32000-1], Table 252), which identifies a given PDF-signature.
> - urn:iso:std:iso:14533:-4:clause:D - is applicable for other types of data objects and specifies that the XPath element is to be interpreted as specified in Annex D of [ISO14533-4]. Note, that this element allows to identify signature objects (signatures, time-stamp tokens, evidence records etc.) embedded within ZIP-based containers and individual SignerInfo-structures within a CMS-based SignedData container according to [RFC5652].

4.2.6.1 SignaturePtr – JSON Syntax

The SignaturePtrType JSON object SHALL implement in JSON syntax the requirements defined in the SignaturePtr component.

Properties of the JSON object SHALL implement the sub-components of SignaturePtr using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***

NsPrefixMapping	*nsDecl*
WhichData	*whichData*
XPath	*xPath*
XPathQualifier	*xPathQual*

The `SignaturePtrType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dsb-SignaturePtrType": {
  "type": "object",
  "properties": {
    "xpath": {
      "type": "string"
    },
    "xpathQualifier": {
      "type": "string"
    },
    "nsDecl": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/nsl-NsPrefixMappingType"
      }
    },
    "whichData": {
      "type": "string"
    },
    "xPath": {
      "type": "string"
    },
    "xPathQual": {
      "type": "string",
      "default": "http://www.w3.org/TR/2010/REC-xpath20-20101214/"
    }
  },
  "required": ["whichData"]
}
```

4.2.6.2 SignaturePtr – XML Syntax

The XML type `SignaturePtrType` SHALL implement the requirements defined in the `SignaturePtr` component.

The `SignaturePtrType` XML element is defined in XML Schema [DSBXSD], and is copied below for information.

```
<xs:complexType name="SignaturePtrType">
  <xs:sequence>
    <xs:element name="NsPrefixMapping" type="nsl:NsPrefixMappingType"
maxOccurs="unbounded" minOccurs="0"/>
  </xs:sequence>
  <xs:attribute name="WhichData" type="xs:IDREF" use="required"/>
  <xs:attribute name="XPath" type="xs:string" use="optional"/>
  <xs:attribute name="XPathQualifier" type="xs:anyURI"
default="http://www.w3.org/TR/2010/REC-xpath20-20101214/" use="optional"/>
</xs:complexType>
```

Each child element of `SignaturePtrType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.2.7 Component Result

The `Result` element is returned with every response message.

Below follows a list of the sub-components that constitute this component:

> The `ResultMajor` element MUST contain one instance of a URI. Its value is limited to an item of the following set:
> urn:oasis:names:tc:dss:1.0:resultmajor:Success
> urn:oasis:names:tc:dss:1.0:resultmajor:RequesterError
> urn:oasis:names:tc:dss:1.0:resultmajor:ResponderError
> urn:oasis:names:tc:dss:1.0:resultmajor:InsufficientInformation
> urn:oasis:names:tc:dss:1.0:profiles:asynchronousprocessing:resultmajor:Pending
> The `ResultMajor` element describes the most significant component of the result code. The set values MAY be extended.
>
> The OPTIONAL `ResultMinor` element, if present, MUST contain a URI.
>
> The OPTIONAL `ResultMessage` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.2.1. It represents a message which MAY be returned to an operator, logged by the client, used for debugging, etc.
>
> The OPTIONAL `ProblemReference` element, if present, MUST contain a string. In the case of processing problems, the server may want to give a reference to processing details (e.g. for debugging purposes) but doesn't want to disclose sensitive information this element can be used. It may contain a random string that links the current request to internal logs, processing protocols or crash dumps.

4.2.7.1 Result – JSON Syntax

The `ResultType` JSON object SHALL implement in JSON syntax the requirements defined in the `Result` component.

Properties of the JSON object SHALL implement the sub-components of `Result` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
ResultMajor	*maj*
ResultMinor	*min*
ResultMessage	*msg*
ProblemReference	*pRef*

The `ResultType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dsb-ResultType": {
  "type": "object",
  "properties": {
    "maj": {
      "type": "string",
```

```
      "enum": ["urn:oasis:names:tc:dss:1.0:resultmajor:Success",
"urn:oasis:names:tc:dss:1.0:resultmajor:RequesterError",
"urn:oasis:names:tc:dss:1.0:resultmajor:ResponderError",
"urn:oasis:names:tc:dss:1.0:resultmajor:InsufficientInformation",
"urn:oasis:names:tc:dss:1.0:profiles:asynchronousprocessing:resultmajor:Pendin
g"]
    },
    "min": {
      "type": "string"
    },
    "msg": {
      "$ref": "#/definitions/dsb-InternationalStringType"
    },
    "pRef": {
      "type": "string"
    }
  },
  "required": ["maj"]
}
```

4.2.7.2 Result – XML Syntax

The XML type `ResultType` SHALL implement the requirements defined in the `Result` component.

The `ResultType` XML element is defined in XML Schema [DSBXSD], and is copied below for information.

```
<xs:complexType name="ResultType">
  <xs:sequence>
    <xs:element name="ResultMajor">
      <xs:simpleType>
        <xs:restriction base="xs:anyURI">
          <xs:enumeration
value="urn:oasis:names:tc:dss:1.0:resultmajor:Success"/>
          <xs:enumeration
value="urn:oasis:names:tc:dss:1.0:resultmajor:RequesterError"/>
          <xs:enumeration
value="urn:oasis:names:tc:dss:1.0:resultmajor:ResponderError"/>
          <xs:enumeration
value="urn:oasis:names:tc:dss:1.0:resultmajor:InsufficientInformation"/>
          <xs:enumeration
value="urn:oasis:names:tc:dss:1.0:profiles:asynchronousprocessing:resultmajor:
Pending"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:element>
    <xs:element name="ResultMinor" type="xs:anyURI" minOccurs="0"/>
    <xs:element name="ResultMessage" type="dsb:InternationalStringType"
minOccurs="0"/>
    <xs:element name="ProblemReference" type="xs:string" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
```

Each child element of `ResultType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.2.8 Component OptionalInputs

Below follows a list of the sub-components that constitute this component:

The OPTIONAL `ServicePolicy` element, if present, MAY occur zero or more times containing a URI. This element allows the client to define a set of policies under which the server MUST perform the requested operation. The policy may include information on the characteristics of the server that are not covered by the `Profile` element. The `ServicePolicy` element may be used to select a specific policy if a service supports multiple policies for a specific profile, or as a sanity-check to make sure the server implements the policy the client expects.

The OPTIONAL `Language` element, if present, MUST contain a ISO language descriptor. The Language element indicates which language the client would like to receive `InternationalString` values in. The server should return appropriately localized strings, if possible.

The OPTIONAL `Other` element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.2.4. The element `Other` may contain arbitrary content that may be specified in a profile and can be used to extend the Protocol.

4.2.8.1 OptionalInputs – JSON Syntax

The component `OptionalInputs` is used as a base type only, not as a JSON instance.

4.2.8.2 OptionalInputs – XML Syntax

The XML type `OptionalInputsType` SHALL implement the requirements defined in the `OptionalInputs` component.

The `OptionalInputsType` XML element is defined in XML Schema [DSBXSD], and is copied below for information.

```
<xs:complexType name="OptionalInputsType">
  <xs:sequence>
    <xs:element name="ServicePolicy" type="xs:anyURI" maxOccurs="unbounded"
minOccurs="0"/>
    <xs:element name="Language" type="xs:language" maxOccurs="1"
minOccurs="0"/>
    <xs:element name="Other" type="dsb:AnyType" maxOccurs="unbounded"
minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
```

Each child element of `OptionalInputsType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.2.9 Component OptionalOutputs

Below follows a list of the sub-components that constitute this component:

The OPTIONAL `AppliedPolicy` element, if present, MAY occur zero or more times containing a URI. This element lists the set of DSS policies used by the server.

The OPTIONAL `Other` element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.2.4. Other may contain arbitrary content that may be specified in a profile and can be used to extend the Protocol.

4.2.9.1 OptionalOutputs – JSON Syntax

The component `OptionalOutputs` is used as a base type only, not as a JSON instance.

4.2.9.2 OptionalOutputs – XML Syntax

The XML type `OptionalOutputsType` SHALL implement the requirements defined in the `OptionalOutputs` component.

The `OptionalOutputsType` XML element is defined in XML Schema [DSBXSD], and is copied below for information.

```
<xs:complexType name="OptionalOutputsType">
  <xs:sequence>
    <xs:element name="AppliedPolicy" type="xs:anyURI" maxOccurs="unbounded"
minOccurs="0"/>
    <xs:element name="Other" type="dsb:AnyType" maxOccurs="unbounded"
minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
```

Each child element of `OptionalOutputsType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.2.10 Component RequestBase

The `RequestBase` component is the base structure for request elements defined by the core protocol or profiles.

Below follows a list of the sub-components that constitute this component:

> The OPTIONAL `Profile` element, if present, MAY occur zero or more times containing a URI. This element indicates a set of DSS profiles. It is used by the client to select profiles the server supports.
>
> The OPTIONAL `RequestID` element, if present, MUST contain one instance of a string. The `RequestID` element is used to correlate requests with responses. When present in a request, the server MUST return it in the response.

4.2.10.1 RequestBase – JSON Syntax

The component `RequestBase` is abstract and therefore has no JSON definition.

4.2.10.2 RequestBase – XML Syntax

The XML type `RequestBaseType` SHALL implement the requirements defined in the `RequestBase` component.

The `RequestBaseType` XML element is defined in XML Schema [DSBXSD], and is copied below for information.

```
<xs:complexType name="RequestBaseType" abstract="true">
  <xs:sequence>
    <xs:element name="Profile" type="xs:anyURI" maxOccurs="unbounded"
minOccurs="0"/>
  </xs:sequence>
  <xs:attribute name="RequestID" type="xs:string" use="optional"/>
</xs:complexType>
```

Each child element of `RequestBaseType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.2.11 Component ResponseBase

The `ResponseBase` component is the base structure for response elements defined by the core protocol or profiles.

Below follows a list of the sub-components that constitute this component:

> The `Result` element MUST contain one instance of a sub-component. This element MUST satisfy the requirements specified in this document in section 4.2.7. This element represents the status of the request.
>
> The OPTIONAL `AppliedProfile` element, if present, MAY occur zero or more times containing a URI. This element lists the set of DSS profile applied by the server. This set MAY include the set of profiles requested by the client. But the server MAY use more comprehensive set of profiles and add additional profiles not requested by the client.
>
> The OPTIONAL `RequestID` element, if present, MUST contain one instance of a string. The `RequestID` element is used to correlate this response with its request.
>
> The OPTIONAL `ResponseID` element, if present, MUST contain one instance of a string. The `ResponseID` element is intended to correlate asynchronous calls (see section 7). The server fills this element with appropriate values.

4.2.11.1 ResponseBase – JSON Syntax

The `ResponseBaseType` JSON object SHALL implement in JSON syntax the requirements defined in the `ResponseBase` component.

Properties of the JSON object SHALL implement the sub-components of `ResponseBase` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`Result`	*`result`*
`AppliedProfile`	*`profile`*
`RequestID`	*`reqID`*
`ResponseID`	*`respID`*

The `ResponseBaseType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dsb-ResponseBaseType": {
  "type": "object",
  "properties": {
    "result": {
      "$ref": "#/definitions/dsb-ResultType"
    },
    "profile": {
      "type": "array",
      "items": {
        "type": "string"
      }
    },
    "reqID": {
      "type": "string"
    },
    "respID": {
      "type": "string"
```

```
    }
  },
  "required": ["result"]
}
```

4.2.11.2 ResponseBase – XML Syntax

The XML type `ResponseBaseType` SHALL implement the requirements defined in the `ResponseBase` component.

The `ResponseBaseType` XML element is defined in XML Schema [DSBXSD], and is copied below for information.

```
<xs:complexType name="ResponseBaseType" abstract="true">
  <xs:sequence>
    <xs:element name="Result" type="dsb:ResultType"/>
    <xs:element name="AppliedProfile" type="xs:anyURI" maxOccurs="unbounded"
minOccurs="0"/>
  </xs:sequence>
  <xs:attribute name="RequestID" type="xs:string" use="optional"/>
  <xs:attribute name="ResponseID" type="xs:string" use="optional"/>
</xs:complexType>
```

Each child element of `ResponseBaseType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.3 Operation requests and responses

The XML elements of this section are defined in the XML namespace '`http://docs.oasis-open.org/dss-x/ns/core`'.

4.3.1 Component SignRequest

The `SignRequest` component is sent by the client to request a signature or timestamp on some input documents.

This components extends the component 4.2.10. The inherited sub-components are not repeated here.

Below follows a list of the sub-components that constitute this component:

> The OPTIONAL `InputDocuments` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.5.1.
>
> The OPTIONAL `OptionalInputs` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.4. It is intended to transport additional input elements of the signing request.

4.3.1.1 SignRequest – JSON Syntax

The `SignRequestType` JSON object SHALL implement in JSON syntax the requirements defined in the `SignRequest` component.

Properties of the JSON object SHALL implement the sub-components of `SignRequest` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`InputDocuments`	*`inDocs`*

OptionalInputs	*optInp*

The `SignRequestType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-SignRequestType": {
  "type": "object",
  "properties": {
    "profile": {
      "type": "array",
      "items": {
        "type": "string"
      }
    },
    "reqID": {
      "type": "string"
    },
    "inDocs": {
      "$ref": "#/definitions/dss2-InputDocumentsType"
    },
    "optInp": {
      "$ref": "#/definitions/dss2-OptionalInputsSignType"
    }
  }
}
```

4.3.1.2 SignRequest – XML Syntax

The XML type `SignRequestType` SHALL implement the requirements defined in the `SignRequest` component.

The `SignRequestType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="SignRequestType">
  <xs:complexContent>
    <xs:extension base="dsb:RequestBaseType">
      <xs:sequence>
        <xs:element name="InputDocuments" type="dss2:InputDocumentsType"
minOccurs="0"/>
        <xs:element name="OptionalInputs" type="dss2:OptionalInputsSignType"
minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

Each child element of `SignRequestType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.3.2 Component SignResponse

The `SignResponse` component returns the requested signature or timestamp to the requestor.

This components extends the component 4.2.11. The inherited sub-components are not repeated here.

Below follows a list of the sub-components that constitute this component:

The OPTIONAL `OptionalOutputs` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.7. The `OptionalOutputs` element contains additional signing related outputs returned by the server.

The OPTIONAL `SignatureObject` element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.5.6. «For uses cases defined in this document the cardinality of this element MUST be zero or one. » [DSS-4.3.2-1]. Profiles MAY define processing rules how to handle unbounded cardinality. These profiles MUST define the semantics of signature processing for multiple SignatureObject elements.

4.3.2.1 SignResponse – JSON Syntax

The `SignResponseType` JSON object SHALL implement in JSON syntax the requirements defined in the `SignResponse` component.

Properties of the JSON object SHALL implement the sub-components of `SignResponse` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
OptionalOutputs	*optOutp*
SignatureObject	*sigObj*

The `SignResponseType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-SignResponseType": {
  "type": "object",
  "properties": {
    "result": {
      "$ref": "#/definitions/dsb-ResultType"
    },
    "profile": {
      "type": "array",
      "items": {
        "type": "string"
      }
    },
    "reqID": {
      "type": "string"
    },
    "respID": {
      "type": "string"
    },
    "optOutp": {
      "$ref": "#/definitions/dss2-OptionalOutputsSignType"
    },
    "sigObj": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-SignatureObjectType"
      }
    }
  }
}
```

4.3.2.2 SignResponse – XML Syntax

The XML type `SignResponseType` SHALL implement the requirements defined in the `SignResponse` component.

The `SignResponseType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="SignResponseType">
  <xs:complexContent>
    <xs:extension base="dsb:ResponseBaseType">
      <xs:sequence>
        <xs:element name="OptionalOutputs" type="dss2:OptionalOutputsSignType"
minOccurs="0"/>
        <xs:element name="SignatureObject" type="dss2:SignatureObjectType"
maxOccurs="unbounded" minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

Each child element of `SignResponseType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.3.3 Component VerifyRequest

The `VerifyRequest` component is sent by the client to verify a signature or timestamp on some input documents.

This components extends the component 4.2.10. The inherited sub-components are not repeated here.

Below follows a list of the sub-components that constitute this component:

> The OPTIONAL `InputDocuments` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.5.1.
>
> The OPTIONAL `OptionalInputs` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.5.
>
> The OPTIONAL `SignatureObject` element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.5.6. « For uses cases defined in this document the cardinality of this element MUST be zero or one. » [DSS-4.3.3-1]. Profiles MAY define processing rules how to handle unbounded cardinality. These profiles MUST define the semantics of verification for multiple `SignatureObject` elements. The `SignatureObject` element contains a signatures or timestamps, or else contains `SignaturePtrs` that points to an XML signature in an input documents.

4.3.3.1 VerifyRequest – JSON Syntax

The `VerifyRequestType` JSON object SHALL implement in JSON syntax the requirements defined in the `VerifyRequest` component.

Properties of the JSON object SHALL implement the sub-components of `VerifyRequest` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
InputDocuments	*inDocs*
OptionalInputs	*optInp*

SignatureObject	*sigObj*

The `VerifyRequestType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-VerifyRequestType": {
  "type": "object",
  "properties": {
    "profile": {
      "type": "array",
      "items": {
        "type": "string"
      }
    },
    "reqID": {
      "type": "string"
    },
    "inDocs": {
      "$ref": "#/definitions/dss2-InputDocumentsType"
    },
    "optInp": {
      "$ref": "#/definitions/dss2-OptionalInputsVerifyType"
    },
    "sigObj": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-SignatureObjectType"
      }
    }
  }
}
```

4.3.3.2 VerifyRequest – XML Syntax

The XML type `VerifyRequestType` SHALL implement the requirements defined in the `VerifyRequest` component.

The `VerifyRequestType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="VerifyRequestType">
  <xs:complexContent>
    <xs:extension base="dsb:RequestBaseType">
      <xs:sequence>
        <xs:element name="InputDocuments" type="dss2:InputDocumentsType"
minOccurs="0"/>
        <xs:element name="OptionalInputs" type="dss2:OptionalInputsVerifyType"
minOccurs="0"/>
        <xs:element name="SignatureObject" type="dss2:SignatureObjectType"
maxOccurs="unbounded" minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

Each child element of `VerifyRequestType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.3.4 Component VerifyResponse

The `VerifyResponse` component is returned by the server to provide the results of verification.

This components extends the component 4.2.11. The inherited sub-components are not repeated here.

Below follows a list of the sub-components that constitute this component:

> The OPTIONAL `OptionalOutputs` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.8.

4.3.4.1 VerifyResponse – JSON Syntax

The `VerifyResponseType` JSON object SHALL implement in JSON syntax the requirements defined in the `VerifyResponse` component.

Properties of the JSON object SHALL implement the sub-components of `VerifyResponse` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`OptionalOutputs`	*optOutp*

The `VerifyResponseType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-VerifyResponseType": {
  "type": "object",
  "properties": {
    "result": {
      "$ref": "#/definitions/dsb-ResultType"
    },
    "profile": {
      "type": "array",
      "items": {
        "type": "string"
      }
    },
    "reqID": {
      "type": "string"
    },
    "respID": {
      "type": "string"
    },
    "optOutp": {
      "$ref": "#/definitions/dss2-OptionalOutputsVerifyType"
    }
  }
}
```

4.3.4.2 VerifyResponse – XML Syntax

The XML type `VerifyResponseType` SHALL implement the requirements defined in the `VerifyResponse` component.

The `VerifyResponseType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

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

```
    <xs:extension base="dsb:ResponseBaseType">
      <xs:sequence>
        <xs:element name="OptionalOutputs"
type="dss2:OptionalOutputsVerifyType" minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

Each child element of `VerifyResponseType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.3.5 Component PendingRequest

The `PendingRequest` component is sent by the client to retrieve the result of a previous request. The client MUST provide the `ResponseID` received with the initial response. The `Profile` element MUST NOT be present as the profile selection was done with the initial request.

This components extends the component 4.2.10. The inherited sub-components are not repeated here.

Below follows a list of the sub-components that constitute this component:

> The OPTIONAL `ClaimedIdentity` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.9. This element allows the authentication of the requestor.

4.3.5.1 PendingRequest – JSON Syntax

The `PendingRequestType` JSON object SHALL implement in JSON syntax the requirements defined in the `PendingRequest` component.

Properties of the JSON object SHALL implement the sub-components of `PendingRequest` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`ClaimedIdentity`	*`claimedIdentity`*

The `PendingRequestType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-PendingRequestType": {
  "type": "object",
  "properties": {
    "profile": {
      "type": "array",
      "items": {
        "type": "string"
      }
    },
    "reqID": {
      "type": "string"
    },
    "claimedIdentity": {
      "$ref": "#/definitions/dss2-ClaimedIdentityType"
    }
  }
}
```

4.3.5.2 PendingRequest – XML Syntax

The XML type `PendingRequestType` SHALL implement the requirements defined in the `PendingRequest` component.

The `PendingRequestType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="PendingRequestType">
  <xs:complexContent>
    <xs:extension base="dsb:RequestBaseType">
      <xs:sequence>
        <xs:element name="ClaimedIdentity" type="dss2:ClaimedIdentityType"
maxOccurs="1" minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

Each child element of `PendingRequestType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4 Optional data structures defined in this document

The XML elements of this section are defined in the XML namespace '`http://docs.oasis-open.org/dss-x/ns/core`'.

4.4.1 Component RequestID

Below follows a list of the sub-components that constitute this component:

> The `value` element MUST contain one instance of a string.

4.4.1.1 RequestID – JSON Syntax

The component `RequestID` is derived from the string type.

4.4.1.2 RequestID – XML Syntax

The XML type `RequestID` SHALL implement the requirements defined in the `RequestID` component.

The `RequestID` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:simpleType name="RequestID">
  <xs:restriction base="xs:string"/>
</xs:simpleType>
```

Each child element of `RequestID` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.2 Component ResponseID

Below follows a list of the sub-components that constitute this component:

The `value` element MUST contain one instance of a string.

4.4.2.1 ResponseID – JSON Syntax

The component `ResponseID` is derived from the string type.

4.4.2.2 ResponseID – XML Syntax

The XML type `ResponseID` SHALL implement the requirements defined in the `ResponseID` component.

The `ResponseID` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:simpleType name="ResponseID">
  <xs:restriction base="xs:string"/>
</xs:simpleType>
```

Each child element of `ResponseID` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.3 Component OptionalInputsBase

The `OptionalInputsBase` contains a common set of additional inputs associated with the processing of the request. Profiles will specify the allowed optional inputs and their default values. If a server doesn't recognize or can't handle any optional input, it MUST reject the request with a `ResultMajor` code of `RequesterError` and a `ResultMinor` code of `NotSupported`. All request messages can contain an `OptionalInputSign` or `OptionalInputVerify` element depending on the method called. The `OptionalInputsBase` component defines the elements that are common to all optional inputs defined in this document. Several optional inputs are defined in this document, and profiles can define additional ones.

This components extends the component 4.2.8. The inherited sub-components are not repeated here.

Below follows a list of the sub-components that constitute this component:

The OPTIONAL `ClaimedIdentity` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.9. This element indicates the identity of the client who is making a request. The server may use this to parameterize any aspect of its processing. Profiles that make use of this element MUST define its semantics.

The OPTIONAL `Schemas` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.10. The `Schemas` element provides a mechanism for transporting XML schemas required for validating an XML document along with the request message.

The OPTIONAL `AddTimestamp` element, if present, MAY occur zero or more times containing a URI. The `AddTimestamp` element indicates that the client wishes the server to embed a timestamp token as a property or attribute of the resultant or the supplied signature. The timestamp token will be applied to the signature value in the case of CMS/PKCS7 signatures or the `<ds:SignatureValue>` element in the case of XML signatures. Note: Procedures for handling other forms of timestamp may be defined in profiles of the Core. In particular, the DSS AdES profile **[DSS-AdES-P]** defines procedures for generating timestamps over the content which is about to be signed (sometimes called content timestamps), and the DSS Timestamp profile **[DSS-TS-P]** defines procedures for handling standalone timestamps.

The OPTIONAL `EnforceAsynchronousProcessing` element, if present, MUST contain a boolean. Its default value is 'false'.

The OPTIONAL `Nonce` element, if present, MUST contain an integer. The Nonce element MAY be used to provide a large random number to enable the client correlate a timestamp request with the response.

4.4.3.1 OptionalInputsBase – JSON Syntax

The component `OptionalInputsBase` is abstract and therefore has no JSON definition.

4.4.3.2 OptionalInputsBase – XML Syntax

The XML type `OptionalInputsBaseType` SHALL implement the requirements defined in the `OptionalInputsBase` component.

The `OptionalInputsBaseType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="OptionalInputsBaseType" abstract="true">
  <xs:complexContent>
    <xs:extension base="dsb:OptionalInputsType">
      <xs:sequence>
        <xs:element name="ClaimedIdentity" type="dss2:ClaimedIdentityType"
maxOccurs="1" minOccurs="0"/>
        <xs:element name="Schemas" type="dss2:SchemasType" maxOccurs="1"
minOccurs="0"/>
        <xs:element name="AddTimestamp" type="xs:anyURI" maxOccurs="unbounded"
minOccurs="0"/>
        <xs:element name="EnforceAsynchronousProcessing" type="xs:boolean"
default="false" maxOccurs="1" minOccurs="0"/>
        <xs:element name="Nonce" type="xs:integer" maxOccurs="1"
minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

Each child element of `OptionalInputsBaseType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.4 Component OptionalInputsSign

The `OptionalInputsSign` component defines a set of additional inputs associated with the processing of a signing request. The `OptionalInputsSign` component contains additional inputs associated with the processing of a signing request. Profiles MAY specify the allowed optional inputs and their default values. The definition of an optional input MAY include a default value, so that a client may omit the `OptionalInputsSign` yet still get service from any profile-compliant DSS server. If a server doesn't recognize or can't handle any optional input, it MUST reject the request with a `ResultMajor` code of `RequesterError` and a `ResultMinor` code of `NotSupported`.

This components extends the component 4.4.3. The inherited sub-components are not repeated here.

Below follows a list of the sub-components that constitute this component:

The OPTIONAL `SignatureType` element, if present, MUST contain a URI. The `SignatureType` element indicates the type of signature or timestamp to produce (such as a XML signature, a XML timestamp, a RFC 3161 timestamp, a CMS signature, etc.). See section 7.1 for some URI references that MAY be used as the value of this element.

The OPTIONAL `IntendedAudience` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.11. This element gives a hint regarding the target audience of the requested signature.

The OPTIONAL `KeySelector` element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.4.12. The `KeySelector` provides details which key or sets of keys the client is expecting to be used.

The OPTIONAL `Properties` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.14. The `Properties` element is used to instruct the server to add certain signed or unsigned properties (aka “signature attributes”) into the signature. The client MAY send the server a particular value to use for each property, or leave the value up to the server to determine. The server MAY add additional properties, even if these aren’t requested by the client.

The OPTIONAL `IncludeObject` element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.4.17. The `IncludeObject` element is used to request the creation of an XMLDSig enveloping signature.

The OPTIONAL `IncludeEContent` element, if present, MUST contain a boolean. Its default value is 'false'. If the value of the `IncludeEContent` is `'true'` a CMS signature includes enveloped (or ‘encapsulated’) content.

The OPTIONAL `SignaturePlacement` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.18. The `SignaturePlacement` element is used to request the creation of an XMLDSig enveloped signature placed within a document. The resulting document with the enveloped signature is placed in the optional output `DocumentWithSignature`.

The OPTIONAL `SignedReferences` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.20. The `SignedReferences` element gives the client greater control over how the <ds:Reference> elements of a XMLDSig signature are formed.

The OPTIONAL `SignatureAlgorithm` element, if present, MUST contain a string. The `SignatureAlgorithm` element MAY be used to request a specific signing algorithm. This may be useful to narrow down the set of algorithms the server may apply. Support for specific signature algorithms may change over time and the use of other input elements, especially `Profile` and `ServicePolicy`. The use of the `SignatureAlgorithm` value is context specific, maybe different when requesting a CMS or XML signature.

The OPTIONAL `SignatureQualityLevel` element, if present, MUST contain a URI. Legal and regulatory frameworks distinguish signatures by their level of quality, where a higher level of quality usually implies stronger restrictions on holder identification, protection of private key and certification of signature creation device and software. A server MAY be able to generate signatures of different quality levels. This element allows the requester to define a minimum signature quality level. Values for this URI may be specified by profiles.

4.4.4.1 OptionalInputsSign – JSON Syntax

The `OptionalInputsSignType` JSON object SHALL implement in JSON syntax the requirements defined in the `OptionalInputsSign` component.

Properties of the JSON object SHALL implement the sub-components of `OptionalInputsSign` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
SignatureType	*sigType*
IntendedAudience	*aud*
KeySelector	*keySel*
Properties	*props*
IncludeObject	*incObj*
IncludeEContent	*incContent*
SignaturePlacement	*sigPlacement*
SignedReferences	*signedRefs*
SignatureAlgorithm	*sigAlgo*
SignatureQualityLevel	*quality*

The `OptionalInputsSignType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-OptionalInputsSignType": {
  "type": "object",
  "properties": {
    "policy": {
      "type": "array",
      "items": {
        "type": "string"
      }
    },
    "lang": {
      "type": "string"
    },
    "other": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dsb-AnyType"
      }
    },
    "claimedIdentity": {
      "$ref": "#/definitions/dss2-ClaimedIdentityType"
    },
    "schemas": {
      "$ref": "#/definitions/dss2-SchemasType"
    },
    "addTimestamp": {
      "type": "array",
      "items": {
        "type": "string"
      }
    },
```

```
    "enforceAsync": {
      "type": "boolean"
    },
    "nonce": {
      "type": "integer"
    },
    "sigType": {
      "type": "string"
    },
    "aud": {
      "$ref": "#/definitions/dss2-IntendedAudienceType"
    },
    "keySel": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-KeySelectorType"
      }
    },
    "props": {
      "$ref": "#/definitions/dss2-PropertiesHolderType"
    },
    "incObj": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-IncludeObjectType"
      }
    },
    "incContent": {
      "type": "boolean",
      "default": "false"
    },
    "sigPlacement": {
      "$ref": "#/definitions/dss2-SignaturePlacementType"
    },
    "signedRefs": {
      "$ref": "#/definitions/dss2-SignedReferencesType"
    },
    "sigAlgo": {
      "type": "string"
    },
    "quality": {
      "type": "string"
    }
  }
}
```

4.4.4.2 OptionalInputsSign – XML Syntax

The XML type `OptionalInputsSignType` SHALL implement the requirements defined in the `OptionalInputsSign` component.

The `OptionalInputsSignType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="OptionalInputsSignType">
  <xs:complexContent>
    <xs:extension base="dss2:OptionalInputsBaseType">
      <xs:sequence>
```

```
        <xs:element name="SignatureType" type="xs:anyURI" maxOccurs="1"
minOccurs="0"/>
        <xs:element name="IntendedAudience" type="dss2:IntendedAudienceType"
maxOccurs="1" minOccurs="0"/>
        <xs:element name="KeySelector" type="dss2:KeySelectorType"
maxOccurs="unbounded" minOccurs="0"/>
        <xs:element name="Properties" type="dss2:PropertiesHolderType"
maxOccurs="1" minOccurs="0"/>
        <xs:element name="IncludeObject" type="dss2:IncludeObjectType"
maxOccurs="unbounded" minOccurs="0"/>
        <xs:element name="IncludeEContent" type="xs:boolean" default="false"
maxOccurs="1" minOccurs="0"/>
        <xs:element name="SignaturePlacement"
type="dss2:SignaturePlacementType" maxOccurs="1" minOccurs="0"/>
        <xs:element name="SignedReferences" type="dss2:SignedReferencesType"
maxOccurs="1" minOccurs="0"/>
        <xs:element name="SignatureAlgorithm" type="xs:string" maxOccurs="1"
minOccurs="0"/>
        <xs:element name="SignatureQualityLevel" type="xs:anyURI"
maxOccurs="1" minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

Each child element of `OptionalInputsSignType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.5 Component OptionalInputsVerify

The `OptionalInputsVerify` component defines a set of additional inputs associated with the processing of a verification request. Profiles MAY specify the allowed optional inputs and their default values. The definition of an optional input MAY include a default value, so that a client may omit the OptionalInputsVerify yet still get service from any profile-compliant DSS server. If a server doesn't recognize or can't handle any optional input, it MUST reject the request with a `ResultMajor` code of `RequesterError` and a `ResultMinor` code of `NotSupported`.

This components extends the component 4.4.3. The inherited sub-components are not repeated here.

Below follows a list of the sub-components that constitute this component:

The OPTIONAL `UseVerificationTime` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.24. The `UseVerificationTime` element instructs the server to attempt to determine the signature's validity at the specified time, instead of a time determined by the server policy.

The OPTIONAL `ReturnVerificationTimeInfo` element, if present, MUST contain a boolean. Its default value is 'false'. This element cam be used by the client to obtain the time instant used by the server to validate the signature.

The OPTIONAL `AdditionalKeyInfo` element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.4.27. This element provides the server with additional data (such as certificates and CRLs) which it can use to validate the signature. These options are not allowed in multi-signature verification.

The OPTIONAL `ReturnProcessingDetails` element, if present, MUST contain a boolean. Its default value is 'false'. This element instructs the server to return a `ProcessingDetails` element. It is not allowed in multi-signature verification.

The OPTIONAL `ReturnSigningTimeInfo` element, if present, MUST contain a boolean. Its default value is 'false'. This element allows the client to instruct the server to return the time instant associated to the signature creation as a `SigningTimeInfo` element.

The OPTIONAL `ReturnSignerIdentity` element, if present, MUST contain a boolean. Its default value is 'false'.

The OPTIONAL `ReturnAugmentedSignature` element, if present, MUST contain a URI. This element allows the client to instruct the server to return an `Component` AugmentedSignature optional output component, containing an augmented signature. This document does not define values for this element, but profiles may provide a set of URIs.

The OPTIONAL `ReturnTimestampedSignature` element, if present, MAY occur zero or more times containing a URI. It indicates that the client wishes the server to update the signature after its verification by embedding a signature timestamp token as an unauthenticated attribute (see "`unauthAttrs`" in section 9.1 [RFC 3852]) or *`unsigned`* property (see section 6.2.5 "The UnsignedSignatureProperties element" and section 7.3 "The SignatureTimeStamp element" [XAdES]) of the supplied signature. The timestamp token will be on the signature value in the case of CMS/PKCS7signatures or the <ds:SignatureValue> element in the case of XML signatures.

The OPTIONAL `VerifyManifests` element, if present, MUST contain a boolean. Its default value is 'false'. This element is allowed in multi-signature verification requests.

4.4.5.1 OptionalInputsVerify – JSON Syntax

The `OptionalInputsVerifyType` JSON object SHALL implement in JSON syntax the requirements defined in the `OptionalInputsVerify` component.

Properties of the JSON object SHALL implement the sub-components of `OptionalInputsVerify` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`UseVerificationTime`	*`useVerificationTime`*
`ReturnVerificationTimeInfo`	*`returnVerificationTime`*
`AdditionalKeyInfo`	*`addKeyInfo`*
`ReturnProcessingDetails`	*`returnProcDetails`*

ReturnSigningTimeInfo	*returnSigningTime*
ReturnSignerIdentity	*returnSigner*
ReturnAugmentedSignature	*returnAugmented*
ReturnTimestampedSignature	*returnTimestamped*
VerifyManifests	*verifyManifests*

The `OptionalInputsVerifyType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-OptionalInputsVerifyType": {
  "type": "object",
  "properties": {
    "policy": {
      "type": "array",
      "items": {
        "type": "string"
      }
    },
    "lang": {
      "type": "string"
    },
    "other": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dsb-AnyType"
      }
    },
    "claimedIdentity": {
      "$ref": "#/definitions/dss2-ClaimedIdentityType"
    },
    "schemas": {
      "$ref": "#/definitions/dss2-SchemasType"
    },
    "addTimestamp": {
      "type": "array",
      "items": {
        "type": "string"
      }
    },
    "enforceAsync": {
      "type": "boolean"
    },
    "nonce": {
      "type": "integer"
    },
    "useVerificationTime": {
      "$ref": "#/definitions/dss2-UseVerificationTimeType"
    },
    "returnVerificationTime": {
      "type": "boolean",
      "default": "false"
    },
    "addKeyInfo": {
      "type": "array",
      "items": {
```

```
        "$ref": "#/definitions/dss2-AdditionalKeyInfoType"
      }
    },
    "returnProcDetails": {
      "type": "boolean",
      "default": "false"
    },
    "returnSigningTime": {
      "type": "boolean",
      "default": "false"
    },
    "returnSigner": {
      "type": "boolean",
      "default": "false"
    },
    "returnAugmented": {
      "type": "string"
    },
    "returnTimestamped": {
      "type": "array",
      "items": {
        "type": "string"
      }
    },
    "verifyManifests": {
      "type": "boolean",
      "default": "false"
    }
  }
}
```

4.4.5.2 OptionalInputsVerify – XML Syntax

The XML type `OptionalInputsVerifyType` SHALL implement the requirements defined in the `OptionalInputsVerify` component.

The `OptionalInputsVerifyType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="OptionalInputsVerifyType">
  <xs:complexContent>
    <xs:extension base="dss2:OptionalInputsBaseType">
      <xs:sequence>
        <xs:element name="UseVerificationTime"
type="dss2:UseVerificationTimeType" maxOccurs="1" minOccurs="0"/>
        <xs:element name="ReturnVerificationTimeInfo" type="xs:boolean"
default="false" maxOccurs="1" minOccurs="0"/>
        <xs:element name="AdditionalKeyInfo" type="dss2:AdditionalKeyInfoType"
maxOccurs="unbounded" minOccurs="0"/>
        <xs:element name="ReturnProcessingDetails" type="xs:boolean"
default="false" maxOccurs="1" minOccurs="0"/>
        <xs:element name="ReturnSigningTimeInfo" type="xs:boolean"
default="false" maxOccurs="1" minOccurs="0"/>
        <xs:element name="ReturnSignerIdentity" type="xs:boolean"
default="false" maxOccurs="1" minOccurs="0"/>
        <xs:element name="ReturnAugmentedSignature" type="xs:anyURI"
maxOccurs="1" minOccurs="0"/>
        <xs:element name="ReturnTimestampedSignature" type="xs:anyURI"
maxOccurs="unbounded" minOccurs="0"/>
```

```
        <xs:element name="VerifyManifests" type="xs:boolean" default="false"
maxOccurs="1" minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

Each child element of `OptionalInputsVerifyType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.6 Component OptionalOutputsBase

The `OptionalOutputsBase` contains a common set of additional outputs associated with the processing of the request. The client MAY request the server to respond with certain optional outputs by sending certain optional inputs. The server MAY also respond with outputs the client didn't request, depending on the server's profile and policy.

This components extends the component 4.2.9. The inherited sub-components are not repeated here.

Below follows a list of the sub-components that constitute this component:

> The OPTIONAL `Schemas` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.10. The `Schemas` element is typically used as an optional input in a `VerifyRequest`. However, there are situations where it may be used as an optional output. For example, a service that makes use of the `ReturnUpdatedSignature` mechanism may, after verifying a signature over an input document, generate a signature over a document of a different schema than the input document. In this case the `Schemas` element MAY be used to communicate the XML schemas required for validating a returned XML document.

4.4.6.1 OptionalOutputsBase – JSON Syntax

The component `OptionalOutputsBase` is abstract and therefore has no JSON definition.

4.4.6.2 OptionalOutputsBase – XML Syntax

The XML type `OptionalOutputsBaseType` SHALL implement the requirements defined in the `OptionalOutputsBase` component.

The `OptionalOutputsBaseType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="OptionalOutputsBaseType" abstract="true">
  <xs:complexContent>
    <xs:extension base="dsb:OptionalOutputsType">
      <xs:sequence>
        <xs:element name="Schemas" type="dss2:SchemasType" maxOccurs="1"
minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

Each child element of `OptionalOutputsBaseType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.7 Component OptionalOutputsSign

The `OptionalOutputsSignType` component defines a set of additional outputs associated with the processing of a signing request. This document does not define any additional outputs but profiles may extend the set of additional outputs.

This components extends the component 4.4.6. The inherited sub-components are not repeated here.

Below follows a list of the sub-components that constitute this component:

> The OPTIONAL `DocumentWithSignature` element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.4.19. The use cases described in this document assume zero or one document including a signature being returned by this element. Profiles may define processing rules how to handle unbounded cardinality.

4.4.7.1 OptionalOutputsSign – JSON Syntax

The `OptionalOutputsSignType` JSON object SHALL implement in JSON syntax the requirements defined in the `OptionalOutputsSign` component.

Properties of the JSON object SHALL implement the sub-components of `OptionalOutputsSign` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`DocumentWithSignature`	*`docWithSignature`*

The `OptionalOutputsSignType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-OptionalOutputsSignType": {
  "type": "object",
  "properties": {
    "policy": {
      "type": "array",
      "items": {
        "type": "string"
      }
    },
    "other": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dsb-AnyType"
      }
    },
    "schemas": {
      "$ref": "#/definitions/dss2-SchemasType"
    },
    "docWithSignature": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-DocumentWithSignatureType"
      }
    }
  }
}
```

4.4.7.2 OptionalOutputsSign – XML Syntax

The XML type `OptionalOutputsSignType` SHALL implement the requirements defined in the `OptionalOutputsSign` component.

The `OptionalOutputsSignType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="OptionalOutputsSignType">
  <xs:complexContent>
    <xs:extension base="dss2:OptionalOutputsBaseType">
      <xs:sequence>
        <xs:element name="DocumentWithSignature"
type="dss2:DocumentWithSignatureType" maxOccurs="unbounded" minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

Each child element of `OptionalOutputsSignType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.8 Component OptionalOutputsVerify

The `OptionalOutputsVerify` component defines a set of additional outputs associated with the processing of a verification request.

This components extends the component 4.4.6. The inherited sub-components are not repeated here.

Below follows a list of the sub-components that constitute this component:

The OPTIONAL `VerifyManifestResults` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.22.

The OPTIONAL `SigningTimeInfo` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.30. The `SigningTimeInfo` element returns the signature's creation date and time. When there's no way for the server to determine the signing time, the server MUST omit this element.

The OPTIONAL `VerificationTimeInfo` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.26. In addition to the verification time, the server MAY include in the `VerificationTimeInfo` element any other relevant time instants that may have been used when determining the verification time or that may be useful for its qualification.

The OPTIONAL `ProcessingDetails` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.28. The `ProcessingDetails` element elaborates on what signature verification steps succeeded or failed.

The OPTIONAL `SignerIdentity` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in section 4.6.1. The `SignerIdentity` element contains an indication of who performed the signature.

The OPTIONAL `AugmentedSignature` element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.4.32. This element contains the processed signature.

The OPTIONAL `TimestampedSignature` element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.4.32. The `TimestampedSignature` element contains the returned timestamped signature.

4.4.8.1 OptionalOutputsVerify – JSON Syntax

The `OptionalOutputsVerifyType` JSON object SHALL implement in JSON syntax the requirements defined in the `OptionalOutputsVerify` component.

Properties of the JSON object SHALL implement the sub-components of `OptionalOutputsVerify` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
VerifyManifestResults	*result*
SigningTimeInfo	*signingTimeInfo*
VerificationTimeInfo	*verificationTimeInfo*
ProcessingDetails	*procDetails*
SignerIdentity	*signerIdentity*
AugmentedSignature	*augSig*
TimestampedSignature	*timestampedSig*

The `OptionalOutputsVerifyType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-OptionalOutputsVerifyType": {
```

```
  "type": "object",
  "properties": {
    "policy": {
      "type": "array",
      "items": {
        "type": "string"
      }
    },
    "other": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dsb-AnyType"
      }
    },
    "schemas": {
      "$ref": "#/definitions/dss2-SchemasType"
    },
    "result": {
      "$ref": "#/definitions/dss2-VerifyManifestResultsType"
    },
    "signingTimeInfo": {
      "$ref": "#/definitions/dss2-SigningTimeInfoType"
    },
    "verificationTimeInfo": {
      "$ref": "#/definitions/dss2-VerificationTimeInfoType"
    },
    "procDetails": {
      "$ref": "#/definitions/dss2-ProcessingDetailsType"
    },
    "signerIdentity": {
      "$ref": "#/definitions/saml2rw-NameIDType"
    },
    "augSig": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-AugmentedSignatureType"
      }
    },
    "timestampedSig": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-AugmentedSignatureType"
      }
    }
  }
}
```

4.4.8.2 OptionalOutputsVerify – XML Syntax

The XML type `OptionalOutputsVerifyType` SHALL implement the requirements defined in the `OptionalOutputsVerify` component.

The `OptionalOutputsVerifyType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="OptionalOutputsVerifyType">
  <xs:complexContent>
    <xs:extension base="dss2:OptionalOutputsBaseType">
      <xs:sequence>
```

```
        <xs:element name="VerifyManifestResults"
type="dss2:VerifyManifestResultsType" maxOccurs="1" minOccurs="0"/>
        <xs:element name="SigningTimeInfo" type="dss2:SigningTimeInfoType"
maxOccurs="1" minOccurs="0"/>
        <xs:element name="VerificationTimeInfo"
type="dss2:VerificationTimeInfoType" maxOccurs="1" minOccurs="0"/>
        <xs:element name="ProcessingDetails" type="dss2:ProcessingDetailsType"
maxOccurs="1" minOccurs="0"/>
        <xs:element name="SignerIdentity" type="saml2-rw:NameIDType"
maxOccurs="1" minOccurs="0"/>
        <xs:element name="AugmentedSignature"
type="dss2:AugmentedSignatureType" maxOccurs="unbounded" minOccurs="0"/>
        <xs:element name="TimestampedSignature"
type="dss2:AugmentedSignatureType" maxOccurs="unbounded" minOccurs="0"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

Each child element of `OptionalOutputsVerifyType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.9 Component ClaimedIdentity

This element indicates the identity of the client who is making a request. The server may use this to parameterize any aspect of its processing. Profiles that make use of this element MUST define its semantics.

Below follows a list of the sub-components that constitute this component:

> The `Name` element MUST contain one instance of a sub-component. This element MUST satisfy the requirements specified in section 4.6.1. The claimed identity may be authenticated using the security binding, according to section 6, or using authentication data provided in the `SupportingInfo` element. The server MUST check that the asserted `Name` is authenticated before relying upon the `Name`.
>
> The OPTIONAL `SupportingInfo` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.2.4. The `SupportingInfo` element can be used by profiles to carry information related to the claimed identity. One possible use of `SupportingInfo` is to carry authentication data that authenticates the request as originating from the claimed identity (examples of authentication data include a password or SAML Assertion, a signature or MAC calculated over the request using a client key).

4.4.9.1 ClaimedIdentity – JSON Syntax

The `ClaimedIdentityType` JSON object SHALL implement in JSON syntax the requirements defined in the `ClaimedIdentity` component.

Properties of the JSON object SHALL implement the sub-components of `ClaimedIdentity` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
Name	*name*
SupportingInfo	*suppInfo*

The `ClaimedIdentityType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-ClaimedIdentityType": {
  "type": "object",
  "properties": {
    "name": {
      "$ref": "#/definitions/saml2rw-NameIDType"
    },
    "suppInfo": {
      "$ref": "#/definitions/dsb-AnyType"
    }
  },
  "required": ["name"]
}
```

4.4.9.2 ClaimedIdentity – XML Syntax

The XML type `ClaimedIdentityType` SHALL implement the requirements defined in the `ClaimedIdentity` component.

The `ClaimedIdentityType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="ClaimedIdentityType">
  <xs:sequence>
    <xs:element name="Name" type="saml2-rw:NameIDType"/>
    <xs:element name="SupportingInfo" type="dsb:AnyType" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
```

Each child element of `ClaimedIdentityType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.10 Component Schemas

The `Schemas` component provides an in band mechanism for communicating XML schemas required for validating an XML document.

Below follows a list of the sub-components that constitute this component:

> The `Schema` element MUST occur 1 or more times containing a sub-component. Each instance MUST satisfy the requirements specified in this document in section 4.5.3.

Non-normative Comment:

> Note: It is recommended to use `xml:id` as defined in [xml:id] as id in the payload being referenced by a `<ds:Reference>`, because the schema then does not have to be supplied for identifying the `Id` elements.

4.4.10.1 Schemas – JSON Syntax

The `SchemasType` JSON object SHALL implement in JSON syntax the requirements defined in the `Schemas` component.

Properties of the JSON object SHALL implement the sub-components of `Schemas` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
Schema	*schema*

The SchemasType JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-SchemasType": {
  "type": "object",
  "properties": {
    "schema": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-DocumentType"
      }
    }
  },
  "required": ["schema"]
}
```

4.4.10.2 Schemas – XML Syntax

The XML type SchemasType SHALL implement the requirements defined in the Schemas component.

The SchemasType XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="SchemasType">
  <xs:sequence>
    <xs:element name="Schema" type="dss2:DocumentType" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
```

Each child element of SchemasType XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.11 Component IntendedAudience

The IntendedAudience element tells the server who the target audience of this signature is. The server MAY use this to parameterize any aspect of its processing (for example, the server MAY choose to sign with a key that it knows a particular recipient trusts).

Below follows a list of the sub-components that constitute this component:

> The Recipient element MUST occur 1 or more times containing a sub-component. Each instance MUST satisfy the requirements specified in section 4.6.1.

4.4.11.1 IntendedAudience – JSON Syntax

The IntendedAudienceType JSON object SHALL implement in JSON syntax the requirements defined in the IntendedAudience component.

Properties of the JSON object SHALL implement the sub-components of IntendedAudience using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
Recipient	*recipient*

The IntendedAudienceType JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-IntendedAudienceType": {
  "type": "object",
```

```
  "properties": {
    "recipient": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/saml2rw-NameIDType"
      }
    }
  },
  "required": ["recipient"]
}
```

4.4.11.2 IntendedAudience – XML Syntax

The XML type `IntendedAudienceType` SHALL implement the requirements defined in the `IntendedAudience` component.

The `IntendedAudienceType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="IntendedAudienceType">
  <xs:sequence>
    <xs:element name="Recipient" type="saml2-rw:NameIDType"
maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
```

Each child element of `IntendedAudienceType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.12 Component KeySelector

The `KeySelector` component holds data that selects a specific key or certificate or group of certificates. Only one of its sub-components MUST be present. But a `KeySelector` component can occur multiple times as a sub-component in the `OptionalInputsSign` component

Below follows a list of the sub-components that constitute this component:

The OPTIONAL `X509Digest` element, if present, MUST contain one instance of a sub-component. This element MUST satisfy the requirements specified in this document in section 4.4.13.

The OPTIONAL `X509SubjectName` element, if present, MUST contain one instance of a string. The `X509SubjectName` element contains an X.509 subject distinguished name that SHOULD be represented as a string that complies with section 3 of RFC4514 [LDAP-DN].

The OPTIONAL `X509SKI` element, if present, MUST contain one instance of base64 encoded binary data. The `X509SKI` element contains the base64 encoded plain (i.e. non-DER-encoded) value of a X509 V.3 SubjectKeyIdentifier extension.

The OPTIONAL `X509Certificate` element, if present, MUST contain one instance of base64 encoded binary data. The `X509Certificate` element contains a base64-encoded [X509V3] certificate.

The OPTIONAL `KeyName` element, if present, MUST contain one instance of a string. It selects a key to be used for signing in a generic way. Usually the client knows about the valid values for `KeyName`.

4.4.12.1 KeySelector – JSON Syntax

The `KeySelectorType` JSON object SHALL implement in JSON syntax the requirements defined in the `KeySelector` component.

Properties of the JSON object SHALL implement the sub-components of `KeySelector` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
X509Digest	*x509Digest*
X509SubjectName	*sub*
X509SKI	*ski*
X509Certificate	*cert*
KeyName	*name*

The `KeySelectorType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-KeySelectorType": {
  "type": "object",
  "properties": {
    "x509Digest": {
      "$ref": "#/definitions/dss2-X509DigestType"
    },
    "sub": {
      "type": "string"
    },
    "ski": {
      "type": "string"
    },
    "cert": {
      "type": "string"
    },
    "name": {
      "type": "string"
```

```
    }
  },
  "minProperties": 1,
  "maxProperties": 1
}
```

4.4.12.2 KeySelector – XML Syntax

The XML type `KeySelectorType` SHALL implement the requirements defined in the `KeySelector` component.

The `KeySelectorType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="KeySelectorType">
  <xs:choice>
    <xs:element name="X509Digest" type="dss2:X509DigestType"/>
    <xs:element name="X509SubjectName" type="xs:string"/>
    <xs:element name="X509SKI" type="xs:base64Binary"/>
    <xs:element name="X509Certificate" type="xs:base64Binary"/>
    <xs:element name="KeyName" type="xs:string"/>
  </xs:choice>
</xs:complexType>
```

Each child element of `KeySelectorType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.13 Component X509Digest

The `X509Digest` component contains a base64-encoded digest of a certificate. The digest algorithm URI is identified with a required Algorithm element. The input to the digest MUST be the raw octets that would be base64-encoded of a X509Certificate.

Below follows a list of the sub-components that constitute this component:

> The `value` element MUST contain one instance of base64 encoded binary data.
>
> The `Algorithm` element MUST contain one instance of a string. The string describes the digest algorithm in an appropriate way for the server side processing. Depending on the signature format this may be an OID (e.g. '2.16.840.1.101.3.4.2.1'), an URI (e.g. 'http://www.w3.org/2001/04/xmlenc#sha256') or a descriptive string ('SHA-256').

4.4.13.1 X509Digest – JSON Syntax

The `X509DigestType` JSON object SHALL implement in JSON syntax the requirements defined in the `X509Digest` component.

Properties of the JSON object SHALL implement the sub-components of `X509Digest` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
value	*value*
Algorithm	*alg*

The `X509DigestType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-X509DigestType": {
```

```
  "type": "object",
  "properties": {
    "value": {
      "type": "string"
    },
    "alg": {
      "type": "string"
    }
  },
  "required": ["alg"]
}
```

4.4.13.2 X509Digest – XML Syntax

The XML type `X509DigestType` SHALL implement the requirements defined in the `X509Digest` component.

The `X509DigestType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="X509DigestType">
  <xs:simpleContent>
    <xs:extension base="xs:base64Binary">
      <xs:attribute name="Algorithm" type="xs:string" use="required"/>
    </xs:extension>
  </xs:simpleContent>
</xs:complexType>
```

Each child element of `X509DigestType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.14 Component PropertiesHolder

The `PropertiesHolder` component is used to request that the server add certain signed or unsigned properties (aka “signature attributes”) into the signature. The client can send the server a particular value to use for each property, or leave the value up to the server to determine. The server can add additional properties, even if these aren’t requested by the client.

Below follows a list of the sub-components that constitute this component:

> The OPTIONAL `SignedProperties` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.15. These properties will be covered by the signature.
>
> The OPTIONAL `UnsignedProperties` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.15. These properties will **not** be covered by the signature.

4.4.14.1 PropertiesHolder – JSON Syntax

The `PropertiesHolderType` JSON object SHALL implement in JSON syntax the requirements defined in the `PropertiesHolder` component.

Properties of the JSON object SHALL implement the sub-components of `PropertiesHolder` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`SignedProperties`	*`signedProps`*

UnsignedProperties	*unsignedProps*

The `PropertiesHolderType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-PropertiesHolderType": {
  "type": "object",
  "properties": {
    "signedProps": {
      "$ref": "#/definitions/dss2-PropertiesType"
    },
    "unsignedProps": {
      "$ref": "#/definitions/dss2-PropertiesType"
    }
  }
}
```

4.4.14.2 PropertiesHolder – XML Syntax

The XML type `PropertiesHolderType` SHALL implement the requirements defined in the `PropertiesHolder` component.

The `PropertiesHolderType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="PropertiesHolderType">
  <xs:sequence>
    <xs:element name="SignedProperties" type="dss2:PropertiesType"
minOccurs="0"/>
    <xs:element name="UnsignedProperties" type="dss2:PropertiesType"
minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
```

Each child element of `PropertiesHolderType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.15 Component Properties

Below follows a list of the sub-components that constitute this component:

> The `Property` element MUST occur 1 or more times containing a sub-component. Each instance MUST satisfy the requirements specified in this document in section 4.4.16.

4.4.15.1 Properties – JSON Syntax

The `PropertiesType` JSON object SHALL implement in JSON syntax the requirements defined in the `Properties` component.

Properties of the JSON object SHALL implement the sub-components of `Properties` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
Property	*prop*

The `PropertiesType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-PropertiesType": {
  "type": "object",
  "properties": {
    "prop": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-PropertyType"
      }
    }
  },
  "required": ["prop"]
}
```

4.4.15.2 Properties – XML Syntax

The XML type `PropertiesType` SHALL implement the requirements defined in the `Properties` component.

The `PropertiesType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="PropertiesType">
  <xs:sequence>
    <xs:element name="Property" type="dss2:PropertyType"
maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
```

Each child element of `PropertiesType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.16 Component Property

Below follows a list of the sub-components that constitute this component:

> The `Identifier` element MUST contain one instance of a string.
>
> The OPTIONAL `Value` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.2.4. The `Value` element contains arbitrary content wrapped in an `Any` component.

4.4.16.1 Property – JSON Syntax

The `PropertyType` JSON object SHALL implement in JSON syntax the requirements defined in the `Property` component.

Properties of the JSON object SHALL implement the sub-components of `Property` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`Identifier`	*`id`*
`Value`	*`val`*

The `PropertyType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-PropertyType": {
  "type": "object",
  "properties": {
    "id": {
      "type": "string"
    },
    "val": {
      "$ref": "#/definitions/dsb-AnyType"
    }
  },
  "required": ["id"]
}
```

4.4.16.2 Property – XML Syntax

The XML type `PropertyType` SHALL implement the requirements defined in the `Property` component.

The `PropertyType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="PropertyType">
  <xs:sequence>
    <xs:element name="Identifier" type="xs:string"/>
    <xs:element name="Value" type="dsb:AnyType" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
```

Each child element of `PropertyType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name. . Therefore it occurs in the XML schema, too.

4.4.17 Component IncludeObject

The `IncludeObject` component is used to request the creation of an XMLDSig enveloping signature. Multiple occurrences of this optional input can be present in a single `SignRequest` message. Each occurrence will cause the inclusion of an object inside the signature being created.

Below follows a list of the sub-components that constitute this component:

The OPTIONAL `WhichData` element, if present, MUST contain one instance of a unique identifier reference. This element identifies the input `Base64Data` component which will be inserted into the returned signature.

The OPTIONAL `HasObjectTagsAndAttributesSet` element, if present, MUST contain one instance of a boolean. Its default value is 'false'.

The OPTIONAL `ObjId` element, if present, MUST contain one instance of a string. It sets the `Id` attribute on the returned `<ds:Object>`.

The OPTIONAL `createReference` element, if present, MUST contain one instance of a boolean. Its default value is 'true'. If the `createReference` element is set to false inhibits the creation of the `<ds:Reference>` associated to the `RefURI` element of the input document referred by the `WhichData` element, effectively allowing clients to include `<ds:Object>` elements not covered/protected by the signature being created.

4.4.17.1 IncludeObject – JSON Syntax

The `IncludeObjectType` JSON object SHALL implement in JSON syntax the requirements defined in the `IncludeObject` component.

Properties of the JSON object SHALL implement the sub-components of `IncludeObject` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
WhichData	*whichData*
HasObjectTagsAndAttributesSet	*hasObjectTagsAndAttributesSet*
ObjId	*objId*
createReference	*createRef*

The `IncludeObjectType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-IncludeObjectType": {
  "type": "object",
  "properties": {
    "whichData": {
      "type": "string"
    },
    "hasObjectTagsAndAttributesSet": {
      "type": "boolean",
      "default": "false"
    },
    "objId": {
      "type": "string"
    },
    "createRef": {
      "type": "boolean",
      "default": "true"
    }
  }
}
```

4.4.17.2 IncludeObject – XML Syntax

The XML type `IncludeObjectType` SHALL implement the requirements defined in the `IncludeObject` component.

The `IncludeObjectType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="IncludeObjectType">
  <xs:attribute name="WhichData" type="xs:IDREF"/>
  <xs:attribute name="HasObjectTagsAndAttributesSet" type="xs:boolean"
default="false"/>
  <xs:attribute name="ObjId" type="xs:string" use="optional"/>
  <xs:attribute name="createReference" type="xs:boolean" default="true"
use="optional"/>
</xs:complexType>
```

Each child element of `IncludeObjectType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.18 Component SignaturePlacement

The `SignaturePlacement` component is used to request the creation of an XMLDSig enveloped signature placed within an input document. The resulting document with the enveloped signature is placed in the optional output `DocumentWithSignature` element. The server places the signature in the document identified using the `WhichData` element. In the case of a non-XML input document then the server will return an error unless alternative procedures are defined by a profile or in the server policy for handling such a situation.

Below follows a list of the sub-components that constitute this component:

> The OPTIONAL `XPathAfter` element, if present, MUST contain one instance of a string. This element holds an XPath expression which identifies an element, inside the XML input document, after which the signature will be inserted.
>
> The OPTIONAL `XPathFirstChildOf` element, if present, MUST contain one instance of a string. This element holds an XPath expression which identifies an element, in the XML input document, which the signature will be inserted as the first child of.
>
> The OPTIONAL `NsPrefixMapping` element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.1.1.
>
> The OPTIONAL `WhichData` element, if present, MUST contain one instance of a unique identifier reference. The `WhichData` element identifies the input `Base64Data` component containing the document the signature will be inserted into.
>
> The OPTIONAL `CreateEnvelopedSignature` element, if present, MUST contain one instance of a boolean. Its default value is 'true'. If the `CreateEnvelopedSignature` element is set to true a reference having an enveloped signature transform is created.

4.4.18.1 SignaturePlacement – JSON Syntax

The `SignaturePlacementType` JSON object SHALL implement in JSON syntax the requirements defined in the `SignaturePlacement` component.

Properties of the JSON object SHALL implement the sub-components of `SignaturePlacement` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`XPathAfter`	*`xPathAfter`*

XPathFirstChildOf	*xPathFirstChildOf*
NsPrefixMapping	*nsDecl*
WhichData	*whichData*
CreateEnvelopedSignature	*createEnvelopedSignature*

The `SignaturePlacementType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-SignaturePlacementType": {
  "type": "object",
  "properties": {
    "xpathAfter": {
      "type": "string"
    },
    "xpathFirstChildOf": {
      "type": "string"
    },
    "xPathAfter": {
      "type": "string"
    },
    "xPathFirstChildOf": {
      "type": "string"
    },
    "nsDecl": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/nsl-NsPrefixMappingType"
      }
    },
    "whichData": {
      "type": "string"
    },
    "createEnvelopedSignature": {
      "type": "boolean",
      "default": "true"
    }
  }
}
```

4.4.18.2 SignaturePlacement – XML Syntax

The XML type `SignaturePlacementType` SHALL implement the requirements defined in the `SignaturePlacement` component.

The `SignaturePlacementType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="SignaturePlacementType">
  <xs:sequence>
    <xs:choice>
      <xs:element name="XPathAfter" type="xs:string"/>
      <xs:element name="XPathFirstChildOf" type="xs:string"/>
    </xs:choice>
    <xs:element name="NsPrefixMapping" type="nsl:NsPrefixMappingType"
maxOccurs="unbounded" minOccurs="0"/>
```

```
  </xs:sequence>
  <xs:attribute name="WhichData" type="xs:IDREF"/>
  <xs:attribute name="CreateEnvelopedSignature" type="xs:boolean"
default="true"/>
</xs:complexType>
```

Each child element of `SignaturePlacementType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.19 Component DocumentWithSignature

The `DocumentWithSignature` component contains a `Document` with the signature inserted as requested with the `SignaturePlacement` component.

Below follows a list of the sub-components that constitute this component:

> The `Document` element MUST contain one instance of a sub-component. This element MUST satisfy the requirements specified in this document in section 4.5.3. This contains the input document with a signature inserted in some fashion.
>
> The OPTIONAL `WhichDoc` element, if present, MUST contain one instance of a URI.

4.4.19.1 DocumentWithSignature – JSON Syntax

The `DocumentWithSignatureType` JSON object SHALL implement in JSON syntax the requirements defined in the `DocumentWithSignature` component.

Properties of the JSON object SHALL implement the sub-components of `DocumentWithSignature` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`Document`	*doc*
`WhichDoc`	*whichDoc*

The `DocumentWithSignatureType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-DocumentWithSignatureType": {
  "type": "object",
  "properties": {
    "doc": {
      "$ref": "#/definitions/dss2-DocumentType"
    },
    "whichDoc": {
      "type": "string"
    }
  },
  "required": ["doc"]
}
```

4.4.19.2 DocumentWithSignature – XML Syntax

The XML type `DocumentWithSignatureType` SHALL implement the requirements defined in the `DocumentWithSignature` component.

The `DocumentWithSignatureType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="DocumentWithSignatureType">
  <xs:sequence>
    <xs:element name="Document" type="dss2:DocumentType"/>
  </xs:sequence>
  <xs:attribute name="WhichDoc" type="xs:anyURI" use="optional"/>
</xs:complexType>
```

Each child element of `DocumentWithSignatureType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.20 Component SignedReferences

The `SignedReferences` component gives the client greater control over how the <ds:Reference> elements are formed.

Below follows a list of the sub-components that constitute this component:

> The `SignedReference` element MUST occur 1 or more times containing a sub-component. Each instance MUST satisfy the requirements specified in this document in section 4.4.21.

4.4.20.1 SignedReferences – JSON Syntax

The `SignedReferencesType` JSON object SHALL implement in JSON syntax the requirements defined in the `SignedReferences` component.

Properties of the JSON object SHALL implement the sub-components of `SignedReferences` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`SignedReference`	*`signedRef`*

The `SignedReferencesType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-SignedReferencesType": {
  "type": "object",
  "properties": {
    "signedRef": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-SignedReferenceType"
      }
    }
  },
  "required": ["signedRef"]
}
```

4.4.20.2 SignedReferences – XML Syntax

The XML type `SignedReferencesType` SHALL implement the requirements defined in the `SignedReferences` component.

The `SignedReferencesType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

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

```
    <xs:element name="SignedReference" type="dss2:SignedReferenceType"
maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
```

Each child element of `SignedReferencesType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.21 Component SignedReference

Each `SignedReference` component refers to an input `DocumentBase` component and allows multiple `<ds:Reference>` elements to be based on a single or multiple input documents. Furthermore, the client can request additional transforms to be applied to each `<ds:Reference>`, and can set each `<ds:Reference>` element's `Id` or `URI` attribute. These aspects of the `<ds:Reference>` can only be set through the `SignedReference` component; they cannot be set through the input documents, since they are aspects of the reference to the input document, not the input document itself.

Below follows a list of the sub-components that constitute this component:

> The OPTIONAL `Transforms` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in section 4.6.2. The `Transforms` element requests the server to perform additional transforms on this reference.
>
> The `WhichDocument` element MUST contain one instance of a unique identifier reference. This defines which input `DocumentBase` component this reference refers to.
>
> The OPTIONAL `RefURI` element, if present, MUST contain one instance of a URI. If this element is present, the corresponding `<ds:Reference>` element's `URI` attribute is set to its value. If it is not present, the `URI` attribute is omitted in the corresponding `<ds:Reference>`.
>
> The OPTIONAL `RefId` element, if present, MUST contain one instance of a string. This element sets the `Id` attribute of the corresponding `<ds:Reference>`.

4.4.21.1 SignedReference – JSON Syntax

The `SignedReferenceType` JSON object SHALL implement in JSON syntax the requirements defined in the `SignedReference` component.

Properties of the JSON object SHALL implement the sub-components of `SignedReference` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
Transforms	*transforms*
WhichDocument	*whichDoc*
RefURI	*refURI*
RefId	*refId*

The `SignedReferenceType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-SignedReferenceType": {
  "type": "object",
  "properties": {
    "transforms": {
      "$ref": "#/definitions/dsigrw-TransformsType"
    },
    "whichDoc": {
```

```
      "type": "string"
    },
    "refURI": {
      "type": "string"
    },
    "refId": {
      "type": "string"
    }
  },
  "required": ["whichDoc"]
}
```

4.4.21.2 SignedReference – XML Syntax

The XML type `SignedReferenceType` SHALL implement the requirements defined in the `SignedReference` component.

The `SignedReferenceType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="SignedReferenceType">
  <xs:sequence>
    <xs:element name="Transforms" type="ds-rw:TransformsType" minOccurs="0"/>
  </xs:sequence>
  <xs:attribute name="WhichDocument" type="xs:IDREF" use="required"/>
  <xs:attribute name="RefURI" type="xs:anyURI" use="optional"/>
  <xs:attribute name="RefId" type="xs:string" use="optional"/>
</xs:complexType>
```

Each child element of `SignedReferenceType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.22 Component VerifyManifestResults

The results of verifying individual `<ds:Reference>`'s within a `<ds:Manifest>` are returned in the `VerifyManifestResults` component.

Below follows a list of the sub-components that constitute this component:

> The `ManifestResult` element MUST occur 1 or more times containing a sub-component. Each instance MUST satisfy the requirements specified in this document in section 4.4.23.

4.4.22.1 VerifyManifestResults – JSON Syntax

The `VerifyManifestResultsType` JSON object SHALL implement in JSON syntax the requirements defined in the `VerifyManifestResults` component.

Properties of the JSON object SHALL implement the sub-components of `VerifyManifestResults` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`ManifestResult`	*`result`*

The `VerifyManifestResultsType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-VerifyManifestResultsType": {
  "type": "object",
  "properties": {
```

```
    "result": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-ManifestResultType"
      }
    }
  },
  "required": ["result"]
}
```

4.4.22.2 VerifyManifestResults – XML Syntax

The XML type `VerifyManifestResultsType` SHALL implement the requirements defined in the `VerifyManifestResults` component.

The `VerifyManifestResultsType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="VerifyManifestResultsType">
  <xs:sequence>
    <xs:element name="ManifestResult" type="dss2:ManifestResultType"
maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>
```

Each child element of `VerifyManifestResultsType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.23 Component ManifestResult

The `VerifyManifestResults` component is comprised of one or more `ManifestResult`

Below follows a list of the sub-components that constitute this component:

> The `ReferenceXpath` element MUST contain one instance of a string. This element identifies the manifest reference, in the XML signature, to which this result pertains.
>
> The `Status` element MUST contain one instance of a URI. Its value is limited to an item of the following set:
> urn:oasis:names:tc:dss:1.0:manifeststatus:Valid
> urn:oasis:names:tc:dss:1.0:manifeststatus:Invalid
> This element indicates the manifest validation outcome.
>
> The OPTIONAL `NsPrefixMapping` element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.1.1.

4.4.23.1 ManifestResult – JSON Syntax

The `ManifestResultType` JSON object SHALL implement in JSON syntax the requirements defined in the `ManifestResult` component.

Properties of the JSON object SHALL implement the sub-components of `ManifestResult` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
ReferenceXpath	*xPath*
Status	*status*

NsPrefixMapping	*nsDecl*

The `ManifestResultType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-ManifestResultType": {
  "type": "object",
  "properties": {
    "xPath": {
      "type": "string"
    },
    "status": {
      "type": "string",
      "enum": ["urn:oasis:names:tc:dss:1.0:manifeststatus:Valid",
"urn:oasis:names:tc:dss:1.0:manifeststatus:Invalid"]
    },
    "nsDecl": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/nsl-NsPrefixMappingType"
      }
    }
  },
  "required": ["xPath", "status"]
}
```

4.4.23.2 ManifestResult – XML Syntax

The XML type `ManifestResultType` SHALL implement the requirements defined in the `ManifestResult` component.

The `ManifestResultType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="ManifestResultType">
  <xs:sequence>
    <xs:element name="ReferenceXpath" type="xs:string"/>
    <xs:element name="Status">
      <xs:simpleType>
        <xs:restriction base="xs:anyURI">
          <xs:enumeration
value="urn:oasis:names:tc:dss:1.0:manifeststatus:Valid"/>
          <xs:enumeration
value="urn:oasis:names:tc:dss:1.0:manifeststatus:Invalid"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:element>
    <xs:element name="NsPrefixMapping" type="nsl:NsPrefixMappingType"
maxOccurs="unbounded" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
```

Each child element of `ManifestResultType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.24 Component UseVerificationTime

This `UseVerificationTime` component instructs the server to attempt to determine the signature's validity at the specified time, instead of a time determined by the server policy.

Below follows a list of the sub-components that constitute this component:

> The OPTIONAL `CurrentTime` element, if present, MUST contain one instance of a boolean. Its default value is 'false'. This element instructs the server to use its current time (normally the time associated with the server-side request processing).
>
> The OPTIONAL `SpecificTime` element, if present, MUST contain one instance of a date/time value. The `SpecificTime` element allows the client to manage manually the time instant used in the verification process. It SHOULD be expressed as UTC time (Coordinated Universal Time) to reduce confusion with the local time zone use.
>
> The OPTIONAL `Base64Content` element, if present, MUST contain base64 encoded binary data. The `Base64Content` element allows the provision of additional date/time data.

4.4.24.1 UseVerificationTime – JSON Syntax

The `UseVerificationTimeType` JSON object SHALL implement in JSON syntax the requirements defined in the `UseVerificationTime` component.

Properties of the JSON object SHALL implement the sub-components of `UseVerificationTime` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`CurrentTime`	*`currTime`*
`SpecificTime`	*`specTime`*
`Base64Content`	*`b64Content`*

The `UseVerificationTimeType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-UseVerificationTimeType": {
  "type": "object",
  "properties": {
    "currTime": {
      "type": "boolean",
      "default": "false"
    },
    "specTime": {
      "type": "integer",
      "format": "utc-millisec"
    },
    "b64Content": {
      "type": "string"
    }
  },
  "minProperties": 1,
  "maxProperties": 1
}
```

4.4.24.2 UseVerificationTime – XML Syntax

The XML type `UseVerificationTimeType` SHALL implement the requirements defined in the `UseVerificationTime` component.

The `UseVerificationTimeType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="UseVerificationTimeType">
  <xs:choice>
    <xs:element name="CurrentTime" type="xs:boolean" default="false"/>
    <xs:element name="SpecificTime" type="xs:dateTime"/>
    <xs:element name="Base64Content" type="xs:base64Binary" maxOccurs="1"
minOccurs="0"/>
  </xs:choice>
</xs:complexType>
```

Each child element of `UseVerificationTimeType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.25 Component AdditionalTimeInfo

The `AdditionalTimeInfo` component contains other time instant(s) relevant in the context of the verification time determination.

Below follows a list of the sub-components that constitute this component:

> The `value` element MUST contain one instance of a date/time value.
>
> The `Type` element MUST contain one instance of a URI. Its value is limited to an item of the following set:
> urn:oasis:names:tc:dss:1.0:additionaltimeinfo:signatureTimestamp
> urn:oasis:names:tc:dss:1.0:additionaltimeinfo:signatureTimemark
> urn:oasis:names:tc:dss:1.0:additionaltimeinfo:signedObjectTimestamp
> urn:oasis:names:tc:dss:1.0:additionaltimeinfo:claimedSigningTime
> The `Type` attribute qualifies the kind of time information included in the response. This specification defines the listed types, whose values MUST satisfy the format defined as `xs:dateTime` and SHOULD be expressed as UTC time (Coordinated Universal Time). Profiles MAY include and define new values for the `Type` attribute.
>
> The OPTIONAL `Ref` element, if present, MUST contain one instance of a string. It allows to establish references to the source of the time information, and SHOULD be used when there is a need to disambiguate several `AdditionalTimeInfo` components with the same `Type` attribute.

4.4.25.1 AdditionalTimeInfo – JSON Syntax

The `AdditionalTimeInfoType` JSON object SHALL implement in JSON syntax the requirements defined in the `AdditionalTimeInfo` component.

Properties of the JSON object SHALL implement the sub-components of `AdditionalTimeInfo` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
value	*value*
Type	*type*
Ref	*ref*

The `AdditionalTimeInfoType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-AdditionalTimeInfoType": {
  "type": "object",
  "properties": {
    "value": {
      "type": "integer",
```

```
      "format": "utc-millisec"
    },
    "type": {
      "type": "string",
      "format": "uri"
    },
    "ref": {
      "type": "string"
    }
  },
  "required": ["type"]
}
```

4.4.25.2 AdditionalTimeInfo – XML Syntax

The XML type `AdditionalTimeInfoType` SHALL implement the requirements defined in the `AdditionalTimeInfo` component.

The `AdditionalTimeInfoType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="AdditionalTimeInfoType">
  <xs:simpleContent>
    <xs:extension base="xs:dateTime">
      <xs:attribute name="Type" use="required">
        <xs:simpleType>
          <xs:restriction base="xs:anyURI">
            <xs:enumeration
value="urn:oasis:names:tc:dss:1.0:additionaltimeinfo:signatureTimestamp"/>
            <xs:enumeration
value="urn:oasis:names:tc:dss:1.0:additionaltimeinfo:signatureTimemark"/>
            <xs:enumeration
value="urn:oasis:names:tc:dss:1.0:additionaltimeinfo:signedObjectTimestamp"/>
            <xs:enumeration
value="urn:oasis:names:tc:dss:1.0:additionaltimeinfo:claimedSigningTime"/>
          </xs:restriction>
        </xs:simpleType>
      </xs:attribute>
      <xs:attribute name="Ref" type="xs:string" use="optional"/>
    </xs:extension>
  </xs:simpleContent>
</xs:complexType>
```

Each child element of `AdditionalTimeInfoType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.26 Component VerificationTimeInfo

The `VerificationTimeInfo` component allows the client to obtain the time instant used by the server to validate the signature.

Below follows a list of the sub-components that constitute this component:

The VerificationTime element MUST contain one instance of a date/time value. This time instant used by the server when verifying the signature. It SHOULD be expressed as UTC time (Coordinated Universal Time) to reduce confusion with the local time zone use.

The OPTIONAL AdditionalTimeInfo element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.4.25. The AdditionalTimeInfo element can contain any other time instant(s) relevant in the context of the verification time determination.

4.4.26.1 VerificationTimeInfo – JSON Syntax

The VerificationTimeInfoType JSON object SHALL implement in JSON syntax the requirements defined in the VerificationTimeInfo component.

Properties of the JSON object SHALL implement the sub-components of VerificationTimeInfo using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
VerificationTime	*verificationTime*
AdditionalTimeInfo	*additionalTimeInfo*

The VerificationTimeInfoType JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-VerificationTimeInfoType": {
  "type": "object",
  "properties": {
    "verificationTime": {
      "type": "integer",
      "format": "utc-millisec"
    },
    "additionalTimeInfo": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-AdditionalTimeInfoType"
      }
    }
  },
  "required": ["verificationTime"]
}
```

4.4.26.2 VerificationTimeInfo – XML Syntax

The XML type VerificationTimeInfoType SHALL implement the requirements defined in the VerificationTimeInfo component.

The VerificationTimeInfoType XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="VerificationTimeInfoType">
  <xs:sequence>
    <xs:element name="VerificationTime" type="xs:dateTime"/>
    <xs:element name="AdditionalTimeInfo" type="dss2:AdditionalTimeInfoType"
maxOccurs="unbounded" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
```

Each child element of `VerificationTimeInfoType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.27 Component AdditionalKeyInfo

The `AdditionalKeyInfo` component provides the server with additional data (such as certificates and CRLs) which it can use to validate the signature.

Below follows a list of the sub-components that constitute this component:

> The OPTIONAL `X509Digest` element, if present, MUST contain one instance of a sub-component. This element MUST satisfy the requirements specified in this document in section 4.4.13. This element contains a base64-encoded digest of a certificate.
>
> The OPTIONAL `X509SubjectName` element, if present, MUST contain one instance of a string. This element contains an X.509 subject distinguished name that is represented as a string.
>
> The OPTIONAL `X509SKI` element, if present, MUST contain one instance of base64 encoded binary data. This element contains the base64 encoded value of a X509 V.3 SubjectKeyIdentifier.
>
> The OPTIONAL `X509Certificate` element, if present, MUST contain one instance of a sub-component. This element MUST satisfy the requirements specified in this document in section 4.2.5. This element MAY contain certificates useful to build a certificate chain.
>
> The OPTIONAL `KeyName` element, if present, MUST contain one instance of a string. It contains a string value to identify the key.
>
> The OPTIONAL `X509CRL` element, if present, MUST contain one instance of a sub-component. This element MUST satisfy the requirements specified in this document in section 4.2.5. The `X509CRL` element holds a CRL useful for validation.
>
> The OPTIONAL `OCSPResponse` element, if present, MUST contain one instance of a sub-component. This element MUST satisfy the requirements specified in this document in section 4.2.5. This element can be used by the client to provide available OCSP information. The server MAY consider this information.
>
> The OPTIONAL `PoE` element, if present, MUST contain one instance of a sub-component. This element MUST satisfy the requirements specified in this document in section 4.2.5. This element can be used by the client to provide 'Proof of Existence' data. Valid information MAY be considered within the validation process.

4.4.27.1 AdditionalKeyInfo – JSON Syntax

The `AdditionalKeyInfoType` JSON object SHALL implement in JSON syntax the requirements defined in the `AdditionalKeyInfo` component.

Properties of the JSON object SHALL implement the sub-components of `AdditionalKeyInfo` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
X509Digest	*x509Digest*
X509SubjectName	*sub*
X509SKI	*ski*
X509Certificate	*cert*
KeyName	*name*

X509CRL	*crl*
OCSPResponse	*ocsp*
PoE	*poe*

The `AdditionalKeyInfoType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-AdditionalKeyInfoType": {
  "type": "object",
  "properties": {
    "ocspresponse": {
      "$ref": "#/definitions/dsb-Base64DataType"
    },
    "x509Digest": {
      "$ref": "#/definitions/dss2-X509DigestType"
    },
    "sub": {
      "type": "string"
    },
    "ski": {
      "type": "string"
    },
    "cert": {
      "$ref": "#/definitions/dsb-Base64DataType"
    },
    "name": {
      "type": "string"
    },
    "crl": {
      "$ref": "#/definitions/dsb-Base64DataType"
    },
    "ocsp": {
      "$ref": "#/definitions/dsb-Base64DataType"
    },
    "poe": {
      "$ref": "#/definitions/dsb-Base64DataType"
    }
  },
  "minProperties": 1,
  "maxProperties": 1
}
```

4.4.27.2 AdditionalKeyInfo – XML Syntax

The XML type `AdditionalKeyInfoType` SHALL implement the requirements defined in the `AdditionalKeyInfo` component.

The `AdditionalKeyInfoType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="AdditionalKeyInfoType">
  <xs:choice>
    <xs:element name="X509Digest" type="dss2:X509DigestType"/>
    <xs:element name="X509SubjectName" type="xs:string"/>
    <xs:element name="X509SKI" type="xs:base64Binary"/>
    <xs:element name="X509Certificate" type="dsb:Base64DataType"/>
```

```
    <xs:element name="KeyName" type="xs:string"/>
    <xs:element name="X509CRL" type="dsb:Base64DataType"/>
    <xs:element name="OCSPResponse" type="dsb:Base64DataType"/>
    <xs:element name="PoE" type="dsb:Base64DataType"/>
  </xs:choice>
</xs:complexType>
```

Each child element of `AdditionalKeyInfoType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.28 Component ProcessingDetails

The `ProcessingDetails` component elaborates on what signature verification steps succeeded or failed.

Below follows a list of the sub-components that constitute this component:

> The OPTIONAL `ValidDetail` element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.4.29. The `ValidDetail` element holds verification details that were evaluated and found to be valid.
>
> The OPTIONAL `IndeterminateDetail` element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.4.29. The `IndeterminateDetail` element holds verification details that could not be evaluated or were evaluated and returned an indeterminate result.
>
> The OPTIONAL `InvalidDetail` element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.4.29. The optional `InvalidDetail` element holds verification details that were evaluated and found to be invalid.

4.4.28.1 ProcessingDetails – JSON Syntax

The `ProcessingDetailsType` JSON object SHALL implement in JSON syntax the requirements defined in the `ProcessingDetails` component.

Properties of the JSON object SHALL implement the sub-components of `ProcessingDetails` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`ValidDetail`	*`valid`*
`IndeterminateDetail`	*`indeterminate`*
`InvalidDetail`	*`invalid`*

The `ProcessingDetailsType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-ProcessingDetailsType": {
  "type": "object",
  "properties": {
    "valid": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-DetailType"
      }
    },
    "indeterminate": {
```

```
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-DetailType"
      }
    },
    "invalid": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-DetailType"
      }
    }
  }
}
```

4.4.28.2 ProcessingDetails – XML Syntax

The XML type `ProcessingDetailsType` SHALL implement the requirements defined in the `ProcessingDetails` component.

The `ProcessingDetailsType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="ProcessingDetailsType">
  <xs:sequence>
    <xs:element name="ValidDetail" type="dss2:DetailType"
maxOccurs="unbounded" minOccurs="0"/>
    <xs:element name="IndeterminateDetail" type="dss2:DetailType"
maxOccurs="unbounded" minOccurs="0"/>
    <xs:element name="InvalidDetail" type="dss2:DetailType"
maxOccurs="unbounded" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
```

Each child element of `ProcessingDetailsType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.29 Component Detail

Below follows a list of the sub-components that constitute this component:

The OPTIONAL `Code` element, if present, MUST contain a URI. This URI which more precisely specifies why this detail is valid, invalid, or indeterminate. It must be a value defined by some other specification, since this specification defines no values for this element.

The OPTIONAL `Message` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.2.1. This is a human-readable message which MAY be logged, used for debugging, etc.

The OPTIONAL `Base64Content` element, if present, MUST contain base64 encoded binary data.

The `Type` element MUST contain one instance of a URI. The `Type` URI identifies the detail. It may be a value defined by this specification, or a value defined by some other specification. Multiple detail elements of the same `Type` may appear in a single `ProcessingDetails` component. For example, when a signature contains a certificate chain that certifies the signing key, there may be details of the same `Type` present for each certificate in the chain, describing how each certificate was processed.

Non-normative Comment:

Multiple detail elements of the same `Type` may appear in a single `ProcessingDetails`. For example, when a signature contains a certificate chain that certifies the signing key, there may be details of the same `Type` present for each certificate in the chain, describing how each certificate was processed.

4.4.29.1 Detail – JSON Syntax

The `DetailType` JSON object SHALL implement in JSON syntax the requirements defined in the `Detail` component.

Properties of the JSON object SHALL implement the sub-components of `Detail` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`Code`	*`code`*
`Message`	*`msg`*
`Base64Content`	*`b64Content`*
`Type`	*`type`*

The `DetailType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-DetailType": {
  "type": "object",
  "properties": {
    "code": {
      "type": "string"
    },
    "msg": {
      "$ref": "#/definitions/dsb-InternationalStringType"
    },
    "b64Content": {
      "type": "string"
    },
    "type": {
      "type": "string",
      "format": "uri"
```

```
    }
  },
  "required": ["type"]
}
```

4.4.29.2 Detail – XML Syntax

The XML type `DetailType` SHALL implement the requirements defined in the `Detail` component.

The `DetailType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="DetailType">
  <xs:sequence>
    <xs:element name="Code" type="xs:anyURI" minOccurs="0"/>
    <xs:element name="Message" type="dsb:InternationalStringType"
minOccurs="0"/>
    <xs:element name="Base64Content" type="xs:base64Binary" maxOccurs="1"
minOccurs="0"/>
  </xs:sequence>
  <xs:attribute name="Type" type="xs:anyURI" use="required"/>
</xs:complexType>
```

Each child element of `DetailType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.30 Component SigningTimeInfo

This `SigningTimeInfo` component allows the client to obtain the time instant associated to the signature creation.

Below follows a list of the sub-components that constitute this component:

> The `SigningTime` element MUST contain one instance of a date/time value. This element returns the time value considered by the server to be the signature creation time.
>
> The OPTIONAL `SigningTimeBoundaries` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in this document in section 4.4.31. This element returns the trusted time values considered as lower and upper limits for the signing time.

4.4.30.1 SigningTimeInfo – JSON Syntax

The `SigningTimeInfoType` JSON object SHALL implement in JSON syntax the requirements defined in the `SigningTimeInfo` component.

Properties of the JSON object SHALL implement the sub-components of `SigningTimeInfo` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
SigningTime	*signingTime*
SigningTimeBoundaries	*bounds*

The `SigningTimeInfoType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-SigningTimeInfoType": {
  "type": "object",
```

```
  "properties": {
    "signingTime": {
      "type": "integer",
      "format": "utc-millisec"
    },
    "bounds": {
      "$ref": "#/definitions/dss2-SigningTimeBoundariesType"
    }
  },
  "required": ["signingTime"]
}
```

4.4.30.2 SigningTimeInfo – XML Syntax

The XML type `SigningTimeInfoType` SHALL implement the requirements defined in the `SigningTimeInfo` component.

The `SigningTimeInfoType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="SigningTimeInfoType">
  <xs:sequence>
    <xs:element name="SigningTime" type="xs:dateTime"/>
    <xs:element name="SigningTimeBoundaries"
type="dss2:SigningTimeBoundariesType" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
```

Each child element of `SigningTimeInfoType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.31 Component SigningTimeBoundaries

This element returns the trusted time values considered as lower and upper limits for the signing time.

Below follows a list of the sub-components that constitute this component:

> The OPTIONAL `LowerBoundary` element, if present, MUST contain a date/time value.
>
> The OPTIONAL `UpperBoundary` element, if present, MUST contain a date/time value.

4.4.31.1 SigningTimeBoundaries – JSON Syntax

The `SigningTimeBoundariesType` JSON object SHALL implement in JSON syntax the requirements defined in the `SigningTimeBoundaries` component.

Properties of the JSON object SHALL implement the sub-components of `SigningTimeBoundaries` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`LowerBoundary`	*`lowerBound`*
`UpperBoundary`	*`upperBound`*

The `SigningTimeBoundariesType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-SigningTimeBoundariesType": {
  "type": "object",
```

```
  "properties": {
    "lowerBound": {
      "type": "integer",
      "format": "utc-millisec"
    },
    "upperBound": {
      "type": "integer",
      "format": "utc-millisec"
    }
  }
}
```

4.4.31.2 SigningTimeBoundaries – XML Syntax

The XML type `SigningTimeBoundariesType` SHALL implement the requirements defined in the `SigningTimeBoundaries` component.

The `SigningTimeBoundariesType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="SigningTimeBoundariesType">
  <xs:sequence>
    <xs:element name="LowerBoundary" type="xs:dateTime" minOccurs="0"/>
    <xs:element name="UpperBoundary" type="xs:dateTime" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
```

Each child element of `SigningTimeBoundariesType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.32 Component AugmentedSignature

The `AugmentedSignature` component contains the resulting augmented signature or timestamp or, in the case of a signature being enveloped in an output document, a pointer to the signature. The `DocumentWithSignature` element is available to hold an enveloping signature.

Below follows a list of the sub-components that constitute this component:

> The OPTIONAL `SignatureObject` element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.5.6. This element contains an augmented signature or timestamp or points to a signature enveloped in another document. The use cases described in this document assume zero or one augmented or timestamped signature being included within this element. Profiles may define processing rules how to handle unbounded cardinality.
>
> The OPTIONAL `DocumentWithSignature` element, if present, MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.4.19. This element serves as a holder for documents enveloping the augmented signature. The use cases described in this document assume zero or one document including a signature being returned by this element. Profiles may define processing rules how to handle unbounded cardinality.
>
> The OPTIONAL `Type` element, if present, MUST contain one instance of a URI. The URI defines what type of 'augmentation' was applied to the signature.

4.4.32.1 AugmentedSignature – JSON Syntax

The `AugmentedSignatureType` JSON object SHALL implement in JSON syntax the requirements defined in the `AugmentedSignature` component.

Properties of the JSON object SHALL implement the sub-components of `AugmentedSignature` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
SignatureObject	*sigObj*
DocumentWithSignature	*docWithSignature*
Type	*type*

The `AugmentedSignatureType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-AugmentedSignatureType": {
  "type": "object",
  "properties": {
    "sigObj": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-SignatureObjectType"
      }
    },
    "docWithSignature": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-DocumentWithSignatureType"
      }
    },
    "type": {
      "type": "string",
      "format": "uri"
    }
  }
}
```

4.4.32.2 AugmentedSignature – XML Syntax

The XML type `AugmentedSignatureType` SHALL implement the requirements defined in the `AugmentedSignature` component.

The `AugmentedSignatureType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="AugmentedSignatureType">
  <xs:sequence>
    <xs:element name="SignatureObject" type="dss2:SignatureObjectType"
maxOccurs="unbounded" minOccurs="0"/>
    <xs:element name="DocumentWithSignature"
type="dss2:DocumentWithSignatureType" maxOccurs="unbounded" minOccurs="0"/>
  </xs:sequence>
  <xs:attribute name="Type" type="xs:anyURI" use="optional"/>
</xs:complexType>
```

Each child element of `AugmentedSignatureType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.33 Component ReturnTransformedDocument

The `ReturnTransformedDocument` component instructs the server to return an input document to which the XML signature transforms specified by a particular `<ds:Reference>` have been applied. The `<ds:Reference>` is indicated by the zero-based `WhichReference` attribute (0 means the first `<ds:Reference>` in the signature, 1 means the second, and so on). Multiple occurrences of this optional input can be present in a single verify request message. Each occurrence will generate a corresponding optional output.

Below follows a list of the sub-components that constitute this component:

> The `WhichReference` element MUST contain one instance of an integer. To match outputs to inputs, each `TransformedDocument` will contain a `WhichReference` attribute which matches the corresponding optional input.

4.4.33.1 ReturnTransformedDocument – JSON Syntax

The component `ReturnTransformedDocument` is not used as JSON object directly.

4.4.33.2 ReturnTransformedDocument – XML Syntax

The XML type `ReturnTransformedDocumentType` SHALL implement the requirements defined in the `ReturnTransformedDocument` component.

The `ReturnTransformedDocumentType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="ReturnTransformedDocumentType">
  <xs:attribute name="WhichReference" type="xs:integer" use="required"/>
</xs:complexType>
```

Each child element of `ReturnTransformedDocumentType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.4.34 Component TransformedDocument

The `TransformedDocument` component contains a document corresponding to the specified `<ds:Reference>`, after all the transforms in the reference have been applied.

Below follows a list of the sub-components that constitute this component:

> The `Document` element MUST contain one instance of a sub-component. This element MUST satisfy the requirements specified in this document in section 4.5.3. This element contains the transformed document.
>
> The `WhichReference` element MUST contain one instance of an integer. To match outputs to inputs, each `TransformedDocument` will contain a `WhichReference` element which matches the corresponding optional input.

4.4.34.1 TransformedDocument – JSON Syntax

The component `TransformedDocument` is not used as JSON object directly.

4.4.34.2 TransformedDocument – XML Syntax

The XML type `TransformedDocumentType` SHALL implement the requirements defined in the `TransformedDocument` component.

The `TransformedDocumentType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="TransformedDocumentType">
  <xs:sequence>
    <xs:element name="Document" type="dss2:DocumentType"/>
  </xs:sequence>
  <xs:attribute name="WhichReference" type="xs:integer" use="required"/>
</xs:complexType>
```

Each child element of `TransformedDocumentType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.5 Request/Response related data structures defined in this document

The XML elements of this section are defined in the XML namespace '`http://docs.oasis-open.org/dss-x/ns/core`'.

4.5.1 Component InputDocuments

This element is used to send input documents to a DSS server, whether for signing or verifying. An input document can be any piece of data that can be used as input to a signature or timestamp calculation. An input document can even be a signature or timestamp (for example, a pre-existing signature can be counter-signed or timestamped). An input document could also be a <ds:Manifest>, allowing the client to handle manifest creation while using the server to create the rest of the signature. Manifest validation is supported by an optional input / output.

Below follows a list of the sub-components that constitute this component:

> The `Document` element MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.5.3.
>
> The `TransformedData` element MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.5.4. It contains the binary output of a chain of transforms applied by a client.
>
> The `DocumentHash` element MAY occur zero or more times containing a sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.5.5. It contains a set of digest algorithm and the corresponding hashes. It will be processed on the result of the required transformation steps.

4.5.1.1 InputDocuments – JSON Syntax

The `InputDocumentsType` JSON object SHALL implement in JSON syntax the requirements defined in the `InputDocuments` component.

Properties of the JSON object SHALL implement the sub-components of `InputDocuments` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`Document`	*`doc`*
`TransformedData`	*`transformed`*
`DocumentHash`	*`docHash`*

The `InputDocumentsType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-InputDocumentsType": {
  "type": "object",
  "properties": {
    "doc": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-DocumentType"
      }
    },
    "transformed": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-TransformedDataType"
      }
    },
    "docHash": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-DocumentHashType"
      }
    }
  }
}
```

4.5.1.2 InputDocuments – XML Syntax

The XML type `InputDocumentsType` SHALL implement the requirements defined in the `InputDocuments` component.

The `InputDocumentsType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="InputDocumentsType">
  <xs:sequence>
    <xs:sequence maxOccurs="unbounded" minOccurs="0">
      <xs:element name="Document" type="dss2:DocumentType"/>
    </xs:sequence>
    <xs:sequence maxOccurs="unbounded" minOccurs="0">
      <xs:element name="TransformedData" type="dss2:TransformedDataType"/>
    </xs:sequence>
    <xs:sequence maxOccurs="unbounded" minOccurs="0">
      <xs:element name="DocumentHash" type="dss2:DocumentHashType"/>
    </xs:sequence>
  </xs:sequence>
</xs:complexType>
```

Each child element of `InputDocumentsType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.5.2 Component DocumentBase

The `DocumentBaseType` forwards its elements to the components DocumentType, TransformedDataType and DocumentHashType. The DocumentBaseType contains the basic information shared by the inheriting components and remaining persistent during the process from input document retrieval until digest calculation for the relevant document.

Below follows a list of the sub-components that constitute this component:

The OPTIONAL `Id` element, if present, MUST contain one instance of a unique identifier. This identifier gives the input document a unique label within a particular request message. Through this identifier, an optional input can refer to a single input document. Using this identifier and the IdRef element it is possible to avoid redundant content.

The OPTIONAL `RefURI` element, if present, MUST contain one instance of a URI. This specifies the value for a <ds:Reference> element's URI attribute when referring to this input document. The RefURI element SHOULD be specified. Not more than one RefURI element may be omitted in a single signing request.

The OPTIONAL `RefType` element, if present, MUST contain one instance of a URI. This specifies the value for a <ds:Reference> element's Type attribute when referring to this input document.

The OPTIONAL `SchemaRefs` element, if present, MUST contain one instance of a unique identifier reference. The identified schemas are to be used to process the Id element during parsing and for XPath evaluation. If anything else but `Schema` are referred to, the server MUST report an error. If a referred to `Schema` is not used by the XML document instance this MAY be ignored or reported to the client in the subcomponent ResultMessage. The Document is assumed to be valid against the first `Schema` referred to by `SchemaRefs`. If a `Schemas` element is referred to first by `SchemaRefs` the document is assumed to be valid against the first `Schema` inside `SchemaRefs`. In both cases, the remaining schemas may occur in any order and are used either directly or indirectly by the first schema. If present, the server MUST use the schemas to identify the `Id` element and MAY also perform complete validation against the schemas.

Non-normative Comment:

It is recommended to use `xml:id` as defined in [xml:id] as id in the payload being referenced by a `<ds:Reference>`, because the schema then does not have to be supplied for identifying the `ID` attributes.

4.5.2.1 DocumentBase – JSON Syntax

The `DocumentBaseType` JSON object SHALL implement in JSON syntax the requirements defined in the `DocumentBase` component.

Properties of the JSON object SHALL implement the sub-components of `DocumentBase` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
Id	*ID*
RefURI	*refURI*
RefType	*refType*
SchemaRefs	*schemaRefs*

The `DocumentBaseType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-DocumentBaseType": {
  "type": "object",
  "properties": {
    "ID": {
      "type": "string"
    },
    "refURI": {
```

```
      "type": "string"
    },
    "refType": {
      "type": "string"
    },
    "schemaRefs": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-DocumentType"
      }
    }
  }
}
```

4.5.2.2 DocumentBase – XML Syntax

The XML type `DocumentBaseType` SHALL implement the requirements defined in the `DocumentBase` component.

The `DocumentBaseType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="DocumentBaseType" abstract="true">
  <xs:attribute name="ID" type="xs:ID" use="optional"/>
  <xs:attribute name="RefURI" type="xs:anyURI" use="optional"/>
  <xs:attribute name="RefType" type="xs:anyURI" use="optional"/>
  <xs:attribute name="SchemaRefs" type="xs:IDREFS" use="optional"/>
</xs:complexType>
```

Each child element of `DocumentBaseType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.5.3 Component Document

The `Document` component contains input data for DSS processing.

This components extends the component 4.5.2. The inherited sub-components are not repeated here.

Below follows a list of the sub-components that constitute this component:

> The `Base64Data` element MUST contain one instance of a sub-component. This element MUST satisfy the requirements specified in this document in section 4.2.5.

4.5.3.1 Document – JSON Syntax

The `DocumentType` JSON object SHALL implement in JSON syntax the requirements defined in the `Document` component.

Properties of the JSON object SHALL implement the sub-components of `Document` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`Base64Data`	*`b64Data`*

The `DocumentType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-DocumentType": {
  "type": "object",
```

```
  "properties": {
    "ID": {
      "type": "string"
    },
    "refURI": {
      "type": "string"
    },
    "refType": {
      "type": "string"
    },
    "schemaRefs": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-DocumentType"
      }
    },
    "b64Data": {
      "$ref": "#/definitions/dsb-Base64DataType"
    }
  },
  "required": ["b64Data"]
}
```

4.5.3.2 Document – XML Syntax

The XML type `DocumentType` SHALL implement the requirements defined in the `Document` component.

The `DocumentType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="DocumentType">
  <xs:complexContent>
    <xs:extension base="dss2:DocumentBaseType">
      <xs:sequence>
        <xs:element name="Base64Data" type="dsb:Base64DataType" maxOccurs="1"
minOccurs="1"/>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

Each child element of `DocumentType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.5.4 Component TransformedData

This components extends the component 4.5.2. The inherited sub-components are not repeated here.

Below follows a list of the sub-components that constitute this component:

The OPTIONAL `Transforms` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in section 4.6.2. This is the sequence of transforms applied by the client. It specifies the value for a <ds:Reference> element's <ds:Transforms> child element. In other words, this specifies transforms that the client has already applied to the input document before the server will hash it. This component is required on a SignRequest, optional on a VerifyRequest.

The `Base64Data` element MUST contain one instance of a sub-component. This element MUST satisfy the requirements specified in this document in section 4.2.5. This element gives the binary output of a sequence of transforms to be hashed at the server side.

The OPTIONAL `WhichReference` element, if present, MUST contain one instance of an integer. As there may be multiple `TransformedDataType` / `DocumentHashType` components of the same document having the same URI [RFC 2396] and `RefType` on a `SignRequest` or `VerifyRequest` - their correspondence to an already existing `<ds:Reference>` however needs to be established on a VerifyRequest only. There is a need to disambiguate such cases. This element hence offers a way to clearly identify the `<ds:Reference>` when URI and `RefType` match multiple components. The corresponding `<ds:Reference>` is indicated by this zero-based `WhichReference` element (0 means the first <ds:Reference> in the signature, 1 means the second, and so on). This component is ignored on a SignRequest, optional on a VerifyRequest.

Non-normative Comment:

It may be possible to establish the <ds:References> / `TransformedDataType` / `DocumentHashType` correspondence by comparing the optionally supplied chain of transforms to those of the <ds:References> having the same URI and `RefType` in the supplied `<ds:Signature>` if this chain of transform has been supplied. This can be quite expensive and even outnumber the advantages of `TransformedDataType` / `DocumentHashType`.

4.5.4.1 TransformedData – JSON Syntax

The `TransformedDataType` JSON object SHALL implement in JSON syntax the requirements defined in the `TransformedData` component.

Properties of the JSON object SHALL implement the sub-components of `TransformedData` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`Transforms`	*`transforms`*
`Base64Data`	*`b64Data`*
`WhichReference`	*`whichRef`*

The `TransformedDataType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-TransformedDataType": {
  "type": "object",
  "properties": {
    "ID": {
      "type": "string"
    },
    "refURI": {
      "type": "string"
    },
    "refType": {
```

```
      "type": "string"
    },
    "schemaRefs": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-DocumentType"
      }
    },
    "transforms": {
      "$ref": "#/definitions/dsigrw-TransformsType"
    },
    "b64Data": {
      "$ref": "#/definitions/dsb-Base64DataType"
    },
    "whichRef": {
      "type": "integer"
    }
  },
  "required": ["b64Data"]
}
```

4.5.4.2 TransformedData – XML Syntax

The XML type `TransformedDataType` SHALL implement the requirements defined in the `TransformedData` component.

The `TransformedDataType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="TransformedDataType">
  <xs:complexContent>
    <xs:extension base="dss2:DocumentBaseType">
      <xs:sequence>
        <xs:element name="Transforms" type="ds-rw:TransformsType"
minOccurs="0"/>
        <xs:element name="Base64Data" type="dsb:Base64DataType"/>
      </xs:sequence>
      <xs:attribute name="WhichReference" type="xs:integer" use="optional"/>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

Each child element of `TransformedDataType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.5.5 Component DocumentHash

The `DocumentHash` component represents a document that will not be transported to the server but just the calculated digest of it. This may be useful to limit the amount of data transferred or to ensure privacy of the document.

This components extends the component 4.5.2. The inherited sub-components are not repeated here.

Below follows a list of the sub-components that constitute this component:

The OPTIONAL `Transforms` element, if present, MUST contain a sub-component. A given element MUST satisfy the requirements specified in section 4.6.2. It specifies the value for a `<ds:Reference>` element's `<ds:Transforms>` child element when referring to this document hash. In other words, this specifies transforms that the client has already applied to the input document before hashing it. This component is required on a SignRequest, optional on a VerifyRequest. This component is required on a SignRequest, optional on a VerifyRequest.

The `DigestInfos` element MUST occur 1 or more times containing a sub-component. Each instance MUST satisfy the requirements specified in this document in section 4.2.2. This element MAY contain more than one `DigestInfo` sub-component to represent the digest values calculated with different digest algorithms. This may be useful when a requestor doesn't know upfront which digest algorithms are supported / accepted by the server for signing. In the case of a verification request the client may not be able to parse the signature and instead calculate the digest for a comprehensive set of digest algorithms.

The OPTIONAL `WhichReference` element, if present, MUST contain one instance of an integer. As there may be multiple `TransformedDataType` / `DocumentHashType` components of the same document having the same `URI` [RFC 2396] and `RefType` on a `SignRequest` or `VerifyRequest` - their correspondence to an already existing `<ds:Reference>` however needs to be established on a VerifyRequest only. There is a need to disambiguate such cases. This element hence offers a way to clearly identify the `<ds:Reference>` when `URI` and `RefType` match multiple components. The corresponding `<ds:Reference>` is indicated by this zero-based `WhichReference` element (0 means the first `<ds:Reference>` in the signature, 1 means the second, and so on).

4.5.5.1 DocumentHash – JSON Syntax

The `DocumentHashType` JSON object SHALL implement in JSON syntax the requirements defined in the `DocumentHash` component.

Properties of the JSON object SHALL implement the sub-components of `DocumentHash` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
Transforms	*transforms*
DigestInfos	*dis*
WhichReference	*whichRef*

The `DocumentHashType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-DocumentHashType": {
  "type": "object",
  "properties": {
    "ID": {
      "type": "string"
    },
    "refURI": {
      "type": "string"
    },
    "refType": {
      "type": "string"
    },
    "schemaRefs": {
      "type": "array",
      "items": {
```

```
        "$ref": "#/definitions/dss2-DocumentType"
      }
    },
    "transforms": {
      "$ref": "#/definitions/dsigrw-TransformsType"
    },
    "dis": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dsb-DigestInfoType"
      }
    },
    "whichRef": {
      "type": "integer"
    }
  },
  "required": ["dis"]
}
```

4.5.5.2 DocumentHash – XML Syntax

The XML type `DocumentHashType` SHALL implement the requirements defined in the `DocumentHash` component.

The `DocumentHashType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="DocumentHashType">
  <xs:complexContent>
    <xs:extension base="dss2:DocumentBaseType">
      <xs:sequence>
        <xs:element name="Transforms" type="ds-rw:TransformsType"
minOccurs="0"/>
        <xs:element name="DigestInfos" type="dsb:DigestInfoType"
maxOccurs="unbounded" minOccurs="1"/>
      </xs:sequence>
      <xs:attribute name="WhichReference" type="xs:integer" use="optional"/>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

Each child element of `DocumentHashType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.5.6 Component SignatureObject

The `SignatureObject` component contains a signature or timestamp of some sort. This element is returned in a sign response message, and sent in a verify request message.

Below follows a list of the sub-components that constitute this component:

The OPTIONAL `Base64Signature` element, if present, MUST contain one instance of a sub-component. This element MUST satisfy the requirements specified in this document in section 4.2.5. A base64 encoding of some arbitrary signature, such as a XML signature [XMLDSIG], PGP [RFC 2440] or CMS [RFC 5652] signature or a RFC 3161 timestamp [RFC 3161]. The type of signature is specified by the `MimeType` element of the `Base64DataType` component. Profiles MAY define the handling of additional types.

The OPTIONAL `SignaturePtr` element, if present, MUST contain one instance of a sub-component. This element MUST satisfy the requirements specified in this document in section 4.2.6. This element is used to point to an XML signature in an input (for a verify request) or output (for a sign response) document in which a signature is enveloped.

The OPTIONAL `SchemaRefs` element, if present, MUST contain one instance of a unique identifier reference. The identified schemas are to be used to process the Id elements during parsing and for XPath evaluation. If anything else but <Schema> are referred to, the server MUST report an error. If a referred to <Schema> is not used by the XML document instance this MAY be ignored or reported to the client in the subcomponent ResultMessage (for the definition of Schemas subcomponent (see section 4.4.10)

The OPTIONAL `WhichDoc` element, if present, MUST contain one instance of a URI. The use cases described in this document assume exactly one signature (or timestamp) being created by a signing request. Profiles may define processing rules how to create multiple signature as a response to a single request. For these use case this element provides a way to link a created signature back to an input document within the signing request. As the input document does not reside within the same document the use of the ID / IDREF mechanism is not possible. Therefore, this element is an instance of a URI. Profiles using this element MUST define the way how the value is constructed.

Non-normative Comment:

Proposed format of the `WhichDoc` element: scheme ‘dssReq’, the path contains the value of the value of the `RequestId`, the fragment contains the ID element of the referenced `Document`. An example is ‘dssReq:req-12234#doc-3’.

4.5.6.1 SignatureObject – JSON Syntax

The `SignatureObjectType` JSON object SHALL implement in JSON syntax the requirements defined in the `SignatureObject` component.

Properties of the JSON object SHALL implement the sub-components of `SignatureObject` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
Base64Signature	*b64Sig*
SignaturePtr	*sigPtr*
SchemaRefs	*schemaRefs*
WhichDoc	*whichDoc*

The `SignatureObjectType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dss2-SignatureObjectType": {
  "type": "object",
  "properties": {
    "b64Sig": {
      "$ref": "#/definitions/dsb-Base64DataType"
```

```
    },
    "sigPtr": {
      "$ref": "#/definitions/dsb-SignaturePtrType"
    },
    "schemaRefs": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dss2-DocumentBaseType"
      }
    },
    "whichDoc": {
      "type": "string"
    }
  },
  "minProperties": 1
}
```

4.5.6.2 SignatureObject – XML Syntax

The XML type `SignatureObjectType` SHALL implement the requirements defined in the `SignatureObject` component.

The `SignatureObjectType` XML element is defined in XML Schema [DSS2XSD], and is copied below for information.

```
<xs:complexType name="SignatureObjectType">
  <xs:choice>
    <xs:element name="Base64Signature" type="dsb:Base64DataType"/>
    <xs:element name="SignaturePtr" type="dsb:SignaturePtrType"/>
  </xs:choice>
  <xs:attribute name="SchemaRefs" type="xs:IDREFS" use="optional"/>
  <xs:attribute name="WhichDoc" type="xs:anyURI" use="optional"/>
</xs:complexType>
```

Each child element of `SignatureObjectType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.6 Referenced Data Structure Models from other documents

4.6.1 Component NameID

The `NameID` component is used when an element serves to represent an entity by a string-valued name. This component reflects the structure 'NameID' defined in the SAML2 specification [CLAUSE FOR LINK TO THE SAML2 SPEC]. This section provides the definition required to support the DSS-X 2.0 multi-syntax approach.

Below follows a list of the sub-components that constitute this component:

The `value` element MUST contain one instance of a string. In non-XML representations the `value` element contains the actual identifier

The OPTIONAL `Format` element, if present, MUST contain one instance of a URI. The `Format` element represents the classification of string-based identifier information.

The OPTIONAL `SPProvidedID` element, if present, MUST contain one instance of a string. The `SPProvidedID` element defines the alternative identifier of the principal most recently set by the service provider or affiliation, if any

The OPTIONAL `NameQualifier` element, if present, MUST contain one instance of a string. The `NameQualifier` element contains the security or administrative domain that qualifies the name. This attribute provides a means to federate names from disparate user stores without collision.

The OPTIONAL `SPNameQualifier` element, if present, MUST contain one instance of a string. The `SPNameQualifier` element further qualifies a name with the name of a service provider or affiliation of providers. This attribute provides an additional means to federate names on the basis of the relying party or parties.

4.6.1.1 NameID – JSON Syntax

The `NameIDType` JSON object SHALL implement in JSON syntax the requirements defined in the `NameID` component.

Properties of the JSON object SHALL implement the sub-components of `NameID` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
value	*value*
Format	*format*
SPProvidedID	*provId*
NameQualifier	*nameQual*
SPNameQualifier	*spNameQual*

The `NameIDType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"saml2rw-NameIDType": {
  "type": "object",
  "properties": {
    "spprovidedID": {
      "type": "string"
    },
    "spnameQualifier": {
      "type": "string"
    },
    "value": {
      "type": "string"
    },
    "format": {
      "type": "string"
    },
    "provId": {
      "type": "string"
```

```
    },
    "nameQual": {
      "type": "string"
    },
    "spNameQual": {
      "type": "string"
    }
  }
}
```

4.6.1.2 NameID – XML Syntax

The XML element is defined in the XML namespace '`http://docs.oasis-open.org/dss-x/ns/saml2/rewritten`' .The XML type `NameIDType` SHALL implement the requirements defined in the `NameID` component.

The `NameIDType` XML element is defined in XML Schema [SAML2RWXSD], and is copied below for information.

```
<complexType name="NameIDType">
  <simpleContent>
    <extension base="string">
      <attributeGroup ref="saml2-rw:IDNameQualifiers"/>
      <xs:attribute name="Format" type="anyURI" use="optional"/>
      <xs:attribute name="SPProvidedID" type="string" use="optional"/>
    </extension>
  </simpleContent>
</complexType>
```

Each child element of `NameIDType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name. The element 'value' is represented by the component's XML tag text content.

4.6.2 Component Transforms

This component reflects the structure ‘Transforms’ defined in the XMLDSig specification [CLAUSE FOR LINK TO THE XMLDSig SPEC]. This section provides the definition required to support the DSS-X 2.0 multi-syntax approach.

Below follows a list of the sub-components that constitute this component:

> The `Transform` element MUST occur 1 or more times containing sub-component. Each instance MUST satisfy the requirements specified in section 4.6.3.

4.6.2.1 Transforms – JSON Syntax

The `TransformsType` JSON object SHALL implement in JSON syntax the requirements defined in the `Transforms` component.

Properties of the JSON object SHALL implement the sub-components of `Transforms` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
`Transform`	*`transform`*

The `TransformsType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dsigrw-TransformsType": {
```

```
  "type": "object",
  "properties": {
    "transform": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/dsigrw-TransformType"
      }
    }
  },
  "required": ["transform"]
}
```

4.6.2.2 Transforms – XML Syntax

The XML element is defined in the XML namespace 'http://docs.oasis-open.org/dss-x/ns/xmldsig/rewritten' .The XML type TransformsType SHALL implement the requirements defined in the Transforms component.

The TransformsType XML element is defined in XML Schema [DSIGRWXSD], and is copied below for information.

```
<complexType name="TransformsType">
  <sequence>
    <xs:element name="Transform" type="ds-rw:TransformType"
maxOccurs="unbounded"/>
  </sequence>
</complexType>
```

Each child element of TransformsType XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.6.3 Component Transform

This component reflects the structure 'Transforms' defined in the XMLDSig specification [CLAUSE FOR LINK TO THE XMLDSig SPEC]. This section provides the definition required to support the DSS-X 2.0 multi-syntax approach. See section 'Transforming DSS 1.0 into 2.0' for a detailed discussion of the applied changes.

Below follows a list of the sub-components that constitute this component:

> The OPTIONAL value element, if present, MUST contain a string. This string holds the text content part of a 'mixed' XML element.
>
> The OPTIONAL Base64Content element, if present, MUST contain base64 encoded binary data.
>
> The OPTIONAL XPath element, if present, MAY occur zero or more times containing a string.
>
> The OPTIONAL NsPrefixMapping element, if present, MAY occur zero or more times containing sub-component. If present each instance MUST satisfy the requirements specified in this document in section 4.1.1. This list has no direct correspondence in the XMLDSig schema definition. It is used to represent the XML namespace prefix definitions in other syntaxes than XML.
>
> The Algorithm element MUST contain one instance of a URI.

4.6.3.1 Transform – JSON Syntax

The TransformType JSON object SHALL implement in JSON syntax the requirements defined in the Transform component.

Properties of the JSON object SHALL implement the sub-components of `Transform` using JSON-specific names mapped as shown in the table below.

Element	***Implementing JSON member name***
value	*val*
Base64Content	*b64Content*
XPath	*xPath*
NsPrefixMapping	*nsDecl*
Algorithm	*alg*

The `TransformType` JSON object is defined in the JSON schema [NSLJSON] and is provided below as a service to the reader.

```
"dsigrw-TransformType": {
  "type": "object",
  "properties": {
    "xpath": {
      "type": "array",
      "items": {
        "type": "string"
      }
    },
    "val": {
      "type": "string"
    },
    "b64Content": {
      "type": "string"
    },
    "xPath": {
      "type": "array",
      "items": {
        "type": "string"
      }
    },
    "nsDecl": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/nsl-NsPrefixMappingType"
      }
    },
    "alg": {
      "type": "string"
    }
  },
  "required": ["alg"]
}
```

4.6.3.2 Transform – XML Syntax

The XML element is defined in the XML namespace '`http://docs.oasis-open.org/dss-x/ns/xmldsig/rewritten`' . The original definition of this element uses the 'mixed' content attribute. To support non-XML syntax using a common object model the attribute is dropped and a 'value'

component is introduced.The XML type `TransformType` SHALL implement the requirements defined in the `Transform` component.

The `TransformType` XML element is defined in XML Schema [DSIGRWXSD], and is copied below for information.

```
<xs:complexType name="TransformType">
  <xs:sequence>
    <xs:element name="value" type="string" maxOccurs="1" minOccurs="0"/>
    <xs:element name="Base64Content" type="xs:base64Binary" maxOccurs="1"
minOccurs="0"/>
    <xs:element name="XPath" type="string" maxOccurs="unbounded"
minOccurs="0"/>
    <xs:element name="NsPrefixMapping" type="nsl:NsPrefixMappingType"
maxOccurs="unbounded" minOccurs="0"/>
  </xs:sequence>
  <xs:attribute name="Algorithm" type="xs:anyURI" use="required"/>
</xs:complexType>
```

Each child element of `TransformType` XML element SHALL implement in XML syntax the sub-component that has a name equal to its local name.

4.7 Element / JSON name lookup tables

The subsequent table allows to find the names of a component's element for a given JSON member name.

JSON member name	***mapped from element name***
additionalTimeInfo	*AdditionalTimeInfo*
addKeyInfo	*AdditionalKeyInfo*
alg	*Algorithm* *DigestMethod*
attRef	*AttRef*
attURI	*AttRefURI*
aud	*IntendedAudience*
augSig	*AugmentedSignature*
b64Content	*Base64Content*
b64Data	*Base64Data*
b64Sig	*Base64Signature*
bounds	*SigningTimeBoundaries*
cert	*X509Certificate*
claimedIdentity	*ClaimedIdentity*
code	*Code*
createEnvelopedSignature	*CreateEnvelopedSignature*

createRef	*createReference*
crl	*X509CRL*
currTime	*CurrentTime*
di	*DigestInfo*
dis	*DigestInfos*
doc	*Document*
docWithSignature	*DocumentWithSignature*
format	*Format*
hasObjectTagsAndAttributesSet	*HasObjectTagsAndAttributesSet*
ID	*Id*
id	*Identifier*
idRef	*IdRef*
incContent	*IncludeEContent*
incObj	*IncludeObject*
indeterminate	*IndeterminateDetail*
inDocs	*InputDocuments*
invalid	*InvalidDetail*
keySel	*KeySelector*
lowerBound	*LowerBoundary*
maj	*ResultMajor*
mimeType	*MimeType*
min	*ResultMinor*
msg	*ResultMessage* *Message*
name	*Name* *KeyName*
nsDecl	*NsPrefixMapping*
objId	*ObjId*
ocsp	*OCSPResponse*

optInp	*OptionalInputs*
optOutp	*OptionalOutputs*
poe	*PoE*
pre	*NamespacePrefix*
pRef	*ProblemReference*
procDetails	*ProcessingDetails*
profile	*AppliedProfile*
prop	*Property*
props	*Properties*
provId	*SPProvidedID*
quality	*SignatureQualityLevel*
recipient	*Recipient*
ref	*Ref*
refId	*RefId*
refType	*RefType*
refURI	*RefURI*
reqID	*RequestID*
respID	*ResponseID*
result	*Result* *VerifyManifestResults* *ManifestResult*
returnAugmented	*ReturnAugmentedSignature*
returnProcDetails	*ReturnProcessingDetails*
returnSigner	*ReturnSignerIdentity*
returnSigningTime	*ReturnSigningTimeInfo*
returnTimestamped	*ReturnTimestampedSignature*
returnVerificationTime	*ReturnVerificationTimeInfo*
schema	*Schema*
schemaRefs	*SchemaRefs*

sigAlgo	*SignatureAlgorithm*
signedProps	*SignedProperties*
signedRef	*SignedReference*
signedRefs	*SignedReferences*
signerIdentity	*SignerIdentity*
signingTime	*SigningTime*
signingTimeInfo	*SigningTimeInfo*
sigObj	*SignatureObject*
sigPlacement	*SignaturePlacement*
sigPtr	*SignaturePtr*
sigType	*SignatureType*
ski	*X509SKI*
specTime	*SpecificTime*
status	*Status*
sub	*X509SubjectName*
suppInfo	*SupportingInfo*
timestampedSig	*TimestampedSignature*
transform	*Transform*
transforms	*Transforms*
type	*Type*
unsignedProps	*UnsignedProperties*
upperBound	*UpperBoundary*
uri	*NamespaceURI*
useVerificationTime	*UseVerificationTime*
val	*value* *DigestValue* *Value*
valid	*ValidDetail*
verificationTime	*VerificationTime*

verificationTimeInfo	*VerificationTimeInfo*
verifyManifests	*VerifyManifests*
whichData	*WhichData*
whichDoc	*WhichDoc* *WhichDocument*
whichRef	*WhichReference*
x509Digest	*X509Digest*
xPath	*XPath* *ReferenceXpath*
xPathAfter	*XPathAfter*
xPathFirstChildOf	*XPathFirstChildOf*
xPathQual	*XPathQualifier*

The subsequent table allows to find the abbreviated JSON member names for a given element name.

Element	***Implementing JSON member name***
AdditionalKeyInfo	*addKeyInfo*
AdditionalTimeInfo	*additionalTimeInfo*
Algorithm	*alg*
AppliedProfile	*profile*
AttRef	*attRef*
AttRefURI	*attURI*
AugmentedSignature	*augSig*
Base64Content	*b64Content*
Base64Data	*b64Data*
Base64Signature	*b64Sig*
ClaimedIdentity	*claimedIdentity*
Code	*code*
CreateEnvelopedSignature	*createEnvelopedSignature*
createReference	*createRef*

CurrentTime	*currTime*
DigestInfo	*di*
DigestInfos	*dis*
DigestMethod	*alg*
DigestValue	*val*
Document	*doc*
DocumentWithSignature	*docWithSignature*
Format	*format*
HasObjectTagsAndAttributesSet	*hasObjectTagsAndAttributesSet*
Id	*ID*
Identifier	*id*
IdRef	*idRef*
IncludeEContent	*incContent*
IncludeObject	*incObj*
IndeterminateDetail	*indeterminate*
InputDocuments	*inDocs*
IntendedAudience	*aud*
InvalidDetail	*invalid*
KeyName	*name*
KeySelector	*keySel*
LowerBoundary	*lowerBound*
ManifestResult	*result*
Message	*msg*
MimeType	*mimeType*
Name	*name*
NamespacePrefix	*pre*
NamespaceURI	*uri*
NsPrefixMapping	*nsDecl*
ObjId	*objId*

OCSPResponse	*ocsp*
OptionalInputs	*optInp*
OptionalOutputs	*optOutp*
PoE	*poe*
ProblemReference	*pRef*
ProcessingDetails	*procDetails*
Properties	*props*
Property	*prop*
Recipient	*recipient*
Ref	*ref*
ReferenceXpath	*xPath*
RefId	*refId*
RefType	*refType*
RefURI	*refURI*
RequestID	*reqID*
ResponseID	*respID*
Result	*result*
ResultMajor	*maj*
ResultMessage	*msg*
ResultMinor	*min*
ReturnAugmentedSignature	*returnAugmented*
ReturnProcessingDetails	*returnProcDetails*
ReturnSignerIdentity	*returnSigner*
ReturnSigningTimeInfo	*returnSigningTime*
ReturnTimestampedSignature	*returnTimestamped*
ReturnVerificationTimeInfo	*returnVerificationTime*
Schema	*schema*
SchemaRefs	*schemaRefs*
SignatureAlgorithm	*sigAlgo*

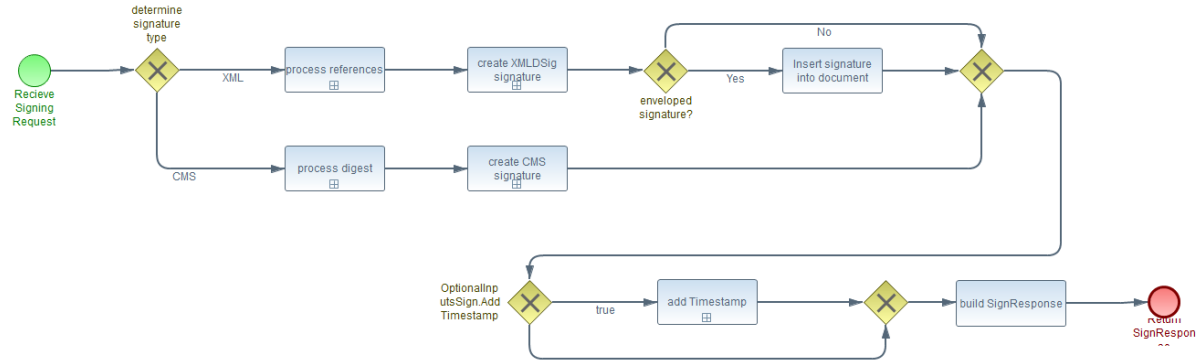
SignatureObject	*sigObj*
SignaturePlacement	*sigPlacement*
SignaturePtr	*sigPtr*
SignatureQualityLevel	*quality*
SignatureType	*sigType*
SignedProperties	*signedProps*
SignedReference	*signedRef*
SignedReferences	*signedRefs*
SignerIdentity	*signerIdentity*
SigningTime	*signingTime*
SigningTimeBoundaries	*bounds*
SigningTimeInfo	*signingTimeInfo*
SpecificTime	*specTime*
SPProvidedID	*provId*
Status	*status*
SupportingInfo	*suppInfo*
TimestampedSignature	*timestampedSig*
Transform	*transform*
Transforms	*transforms*
Type	*type*
UnsignedProperties	*unsignedProps*
UpperBoundary	*upperBound*
UseVerificationTime	*useVerificationTime*
ValidDetail	*valid*
value	*val*
Value	*val*
VerificationTime	*verificationTime*
VerificationTimeInfo	*verificationTimeInfo*
VerifyManifestResults	*result*

VerifyManifests	*verifyManifests*
WhichData	*whichData*
WhichDoc	*whichDoc*
WhichDocument	*whichDoc*
WhichReference	*whichRef*
X509Certificate	*cert*
X509CRL	*crl*
X509Digest	*x509Digest*
X509SKI	*ski*
X509SubjectName	*sub*
XPath	*xPath*
XPathAfter	*xPathAfter*
XPathFirstChildOf	*xPathFirstChildOf*
XPathQualifier	*xPathQual*

5 Data Processing Model for Signing

The following process diagram illustrates the major buildings blocks of the processing of a signing request. The sub processes are described in the next chapters.

Figure 2: Signing Overview



The workflow splits into the sections for XMLDSig and CMS signature processing. The input component for a signing request is `SignRequest` (see section 4.3.1). The signature will be selected by the server considering a given `SignatureType` element of `OptionalInputsSign` and its configuration and policies. « Profiles MAY introduce additional signature types and thus MUST define the adequate processing steps. » [DSS-5-1]

If the element `AddTimestamp` of `OptionalInputsSign` is set to '`true`' the sub-process '`add Timestamp`' adds a timestamp to the signature.

The task of building the `SignResponse` component is shared between all signature formats.

5.1 Processing for XML Signatures

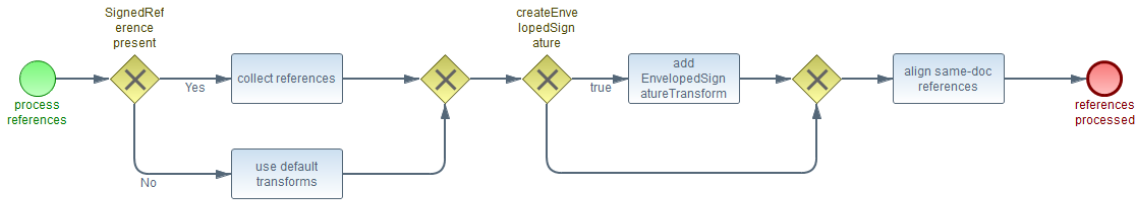
The first sub-process '`process references`' of the XML signature creation is the processing of the references. The second sub-process handles the creation of the XML signature. These two sub-processes are described in detail below.

If the element `CreateEnvelopedSignature` of `SignaturePlacement` is set to `true` the signature will be inserted into the document and location selected by `SignaturePlacement`.

5.1.1 Sub process '`process references`'

The following process diagram illustrates the processing steps for the assembly of references.

Figure 3: Process References



The input documents are read from the `Base64Data` element of the referred `Document` component into an octet stream. « This data MUST be a well-formed XML Document as defined in [XML] section 2.1. » [DSS-5.1.1-1]

If the optional input `SignedReferences` is present each `SignedReference` element controls the creation of a corresponding `<ds:Reference>`. The task '`collect references`' handles the `SignedReferences`.

Otherwise there will be a `<ds:Reference>` element for each given input document. The set of transforms and their parameter will be selected by the server. The task '`use default transforms`' select this set of `<ds:Reference>`.

Note: Transforms can be applied as a server implementation MAY choose to increase robustness of the Signatures created. These Transforms may reflect idiosyncrasies of different parsers or solve encoding issues or the like. Servers MAY choose not to apply transforms in basic processing and extract the binary data for direct hashing or canonicalize the data directly if certain optional inputs are not to be implemented.

If the element `CreateEnvelopedSignature` of `SignaturePlacement` is set to `true` the list of transforms will be prepended with an `EnvelopedSignatureTransform` entry. The task '`add EnvelopedSignatureTransform`' processes the corresponding `<ds:Reference>`.

« The `RefURI` attribute of `<ds:Reference>` element MUST be set to include a "same-document" URI which references either:

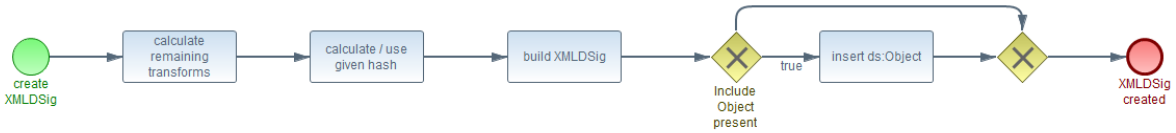
- The whole `Document` containing the signature (by using a `RefURI`="")
- The relevant parts of the `Document` to be covered/protected by the signature (by using a "same-document" `RefURI` attribute having a value starting with "#", like `RefURI`="#some-id", `RefURI`="#xpointer(/)", `RefURI`="#xpointer(/DocumentElement/ToBeSignedElement)" or the like).
  If the result of evaluating the expression included in the `RefURI` attribute doesn't fit in any of the options described above, the server MUST reject the request using a `ResultMajor RequesterError` which MAY be qualified by a `ResultMinor urn:oasis:names:tc:dss:1.0:resultminor:InvalidRefURI`.

» [DSS-5.1.1-2]

This alignment will be performed by the task 'align same-doc references'.

5.1.2 Sub process '`create XML signature`'

Figure 4: Create XML Signature



The first task ('`calculate remaining transforms`') of this section applies the given set of transforms. If a `TransformedData` element is provided by the client these calculations MUST be respected and just the remaining set of transforms must be processed by the server. « The case of a `Document` as base for a reference processing all transform steps MUST be applied. » [DSS-5.1.2-1]

Note: « As required in **[XMLDSIG]** if the end result is an XML node set, the server MUST attempt to convert the node set back into an octet stream using Canonical XML **[XML-C14N]**. » [DSS-5.1.2-2]

The '`calculate / use given hash`' task computes the digest upon the transformation output. If a `DocumentHash` element is provided by the client the hash values are used as input for the following steps. The `DocumentHash` MAY contain digests of different algorithms. The server selects the appropriate hash algorithm. If no appropriate algorithms (according to policy or technical restrictions of the server) is supplied by the client the server rejects the request with a `ResultMajor` code of `RequesterError` and a `ResultMinor` code of `InappropriateHashAlgorithm`.

Performing the task '`build XMLDSig`' the server forms a set of `<ds:Reference>` with the elements and attributes set as follows:

- If the `Document` has a `RefURI` attribute, the `<ds:Reference>` element's `URI` attribute is set to the value of the `RefURI` attribute, else this attribute is omitted.
  « A signature MUST NOT be created if more than one `RefURI` is omitted in the set of input documents and the server MUST report a RequesterError by setting `ResultMajor` `RequesterError` qualified by a `ResultMinor`. » [DSS-5.1.2-3]
- If the `Document` has a `RefType` attribute, the `<ds:Reference>` element's `Type` attribute is set to the value of the `RefType` attribute, else this attribute is omitted.
- The `<ds:DigestMethod>` element is set to the hash method used.
- The `<ds:DigestValue>` element is set to the hash value that is to be calculated as per **[XMLDSIG]**.
- The `<ds:Transforms>` element is set to the sequence of transforms applied by the server in step b. « This sequence MUST describe the effective transform as a reproducible procedure from parsing until hash. » [DSS-5.1.2-4]
- « References resulting from processing of optional inputs MUST be included. » [DSS-5.1.2-5] In doing so, the server MAY reflect the ordering of the `Document` elements.

The server creates an XML signature using these `<ds:Reference>` elements according to the processing rules in **[XMLDSIG]**.

The last task '`insert ds:Object`' handles the creation of an enveloping signature. If one or more optional input elements `IncludeObject` are present they will cause the inclusion of an object inside the signature being created.

5.1.2.1 XML Signatures Variant Optional Input `IncludeObject`

An enveloping signature is a signature having `<ds:Object>`s which are referenced by `<ds:Reference>`s having a same-document URI.

For each <IncludeObject> the server creates a new `<ds:Object>` element containing the document, as identified using the `WhichData` element, as its child. This object is carried within the enveloping signature. The ordering of the <IncludeObject> optional inputs MAY be ignored by the server.

« This <Document> MUST include a “same-document” RefURI attribute (having a value starting with “#”) which references either:

- The whole newly-created <ds:Object>.
- The relevant parts of the newly-created <ds:Object>’s contents to be covered/protected by the signature.

» [DSS-5.1.2.1-1] « f the result of evaluating the expression included in the RefURI element doesn’t fit in any of the options described above, the server MUST reject the request using a ResultMajor RequesterError which MAY be qualified by a ResultMinor

urn:oasis:names:tc:dss:1.0:resultminor:InvalidRefURI » [DSS-5.1.2.1-2]

Note: If the server does not support the ordering of <ds:Object>, it is recommended either to use ID-based referencing to the <ds:Object> (using the client-generated ID included in the ObjId attribute) or to rely on expressions based on <ds:Object>'s contents that allow to unambiguously refer to the included object or their relevant parts.

The URI in the RefURI element of this <Document> should at least reference the relevant parts of the Object to be included in the calculation for the corresponding reference. « Clients MUST generate requests in a way that some <ds:Reference>’s URI values actually will reference the <ds:Object> generated by the server once this element will have been included in the <ds:Signature> produced by the server. » [DSS-5.1.2.1-3]

« For each IncludeObject the server MUST carry out the following steps before performing Basic Processing:

1. The server identifies the Base64Data component that is to be placed into a <ds:Object> as indicated by the WhichData element.
2. The data to be carried in the enveloping signature is extracted and decoded.
3. if the hasObjectTagsAndAttributesSet element is false or not present the server builds the <ds:Object> as follows:
    a. The server generates the new <ds:Object> and sets its Id attribute to the value indicated in ObjId element of the optional input if present.
    b. The WhichData element points to a Base64Data component. The <ds:Object>('s) MIME Type is to be set to the value of Base64Data('s) MIME Type value and the Encoding is to be set to http://www.w3.org/TR/xmlschema-2/#base64Binary
4. The server splices the to-be-enveloped documents as <ds:Object>(s) into the <ds:Signature>, which is to be returned.
5. If CreateReference is set to true generate a ds:Reference element referencing the spliced <ds:Object> and exclude this <Document> from the set of <Document>s ready for further processing. Otherwise just exclude this <Document> from the set of <Document>s ready for further processing.

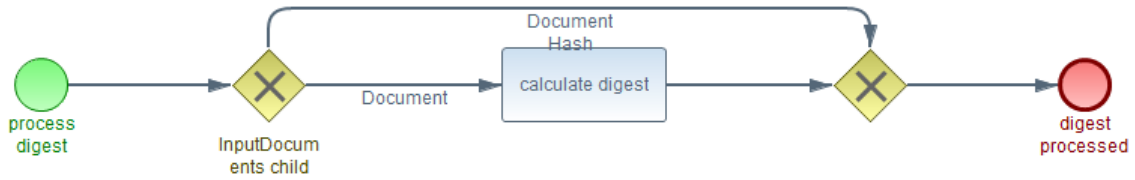
» [DSS-5.1.2.1-4]

5.2 Processing for CMS Signatures

5.2.1 Sub process ‘process digest’

The following process diagram illustrates the processing steps required to calculate the digest for a CMS signature.

Figure 5: Process Digest



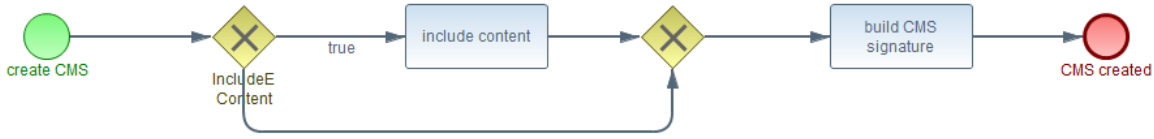
The `SignRequest` component MUST contain either a single `Document` (not having `RefURI` or `RefType` set) or a single `DocumentHash` component not having `RefURI, RefType, Transforms`.

If the `InputDocuments` component contains a `Document` element, the server hashes the octet stream represented by the `Document`. This is performed by the task `'calculate digest'` If the `InputDocuments` component contains a `DocumentHash` element, the server uses the hash values as an input for the following steps. The `DocumentHash` MAY contain digests of different algorithms. The server selects the appropriate hash algorithm. If no appropriate algorithms (according to policy or technical restrictions of the server) is supplied by the client the server rejects the request with a `ResultMajor` code of `RequesterError` and a `ResultMinor` code of `InappropriateHashAlgorithm`.

5.2.2 Sub process '`create CMS signature`'

The following process diagram illustrates the processing steps to create a CMS signature.

Figure 6: Create CMS signature



If the `InputDocuments` component contains a `Document` element and the `IncludeEContent` element of the `OptionalInputsSign` component is set to `true`, then the task '`include content`' creates a CMS structure with the document enveloped within the signature. For CMS details in this context please refer to [RFC 3852] sections 5.1 "SignedData Type" and 5.2 "EncapsulatedContentInfo Type".

« Otherwise the resulting signature MUST be detached (aka. external or "without eContent"). » [DSS-5.2.2-1]

The following task '`build CMS signature`' builds a `SignedData` structure containing the `SignerInfo` computed as follows:

The server forms a `SignerInfo` structure based on the input document. The components of the `SignerInfo` are set as follows:

- The `digestAlgorithm` field is set to the OID value for the hash method that was used in the previous processing step.
- The `signedAttributes` field's `message-digest` attribute contains the hash value that was calculated / provided in previous processing step. Other `signedAttributes` MAY be added by the server, according to its profile or policy, or according to the `Properties` optional input.

- The remaining fields (`sid`, `signatureAlgorithm`, and `signature`) are filled in as per a normal CMS signature.

5.3 General Processing

5.3.1 Multi-Signature Creation

This specification focuses on the use cases that produce one signature or timestamp as a result of one signing request. There are use cases where the processing of multiple documents in a single signing request to produce multiple signature for these documents. This may be useful especially when a user interaction is involved in signature creation, e.g. by requesting a PIN entry only once to sign more than one document. On the other hand, there are several restrictions that apply to this approach:

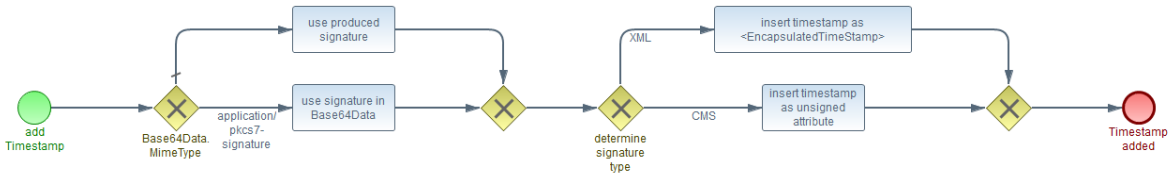
- All signatures MUST be of the same type and produced with the same set of optional inputs and profiles
- There MUST be a clear relationship between a single input document and the corresponding signature
- The handling of processing errors requires additional description, especially in the case of partial processing
- The asynchronous processing model described in this document (see section 7) cannot be used to return partial results

This document enables profiles to define required processing step by extending the maximum cardinality of the `SignatureObject` and `DocumentWithSignature` elements to 'unbounded' and adding a `WhichDoc` element to the corresponding components.

5.3.2 Sub process '`add Timestamp`'

The following process diagram illustrates the processing steps to insert a timestamp.

Figure 7: Add Timestamp



The `AddTimestamp` element of `OptionalInputsSign` indicates that the client wishes the server to embed a timestamp token as a property or attribute of the resultant or the supplied signature. The timestamp token will be applied to the signature value in the case of CMS/PKCS7 signatures or the `<ds:SignatureValue>` element in the case of XML signatures.

Note: Procedures for handling other forms of timestamp may be defined in profiles of the Core. In particular, the DSS AdES profile [DSS-AdES-P] defines procedures for generating timestamps over the content which is about to be signed (sometimes called content timestamps), and the DSS Timestamp profile [DSS-TS-P] defines procedures for handling standalone timestamps.

The `Type` element, if present, indicates what type of timestamp to apply. « Profiles that use this optional input MUST define the allowed values, and the default value, for the Type attribute (unless only a single type of timestamp is supported, in which case the Type attribute can be omitted). » [DSS-5.3.1-1]

Two scenarios for the timestamping of both CMS and XML signatures are supported by this Optional Input. They are as follows:

- Create and embed a timestamp token into the signature being created as part of this `SignRequest`.
- Create and embed a timestamp token into an existing signature, without verification, which is passed in the `InputDocuments` element of this `SignRequest`.

The following subsections specify the use of RFC 3161 timestamps with CMS signatures and the use of XML Timestamps or RFC 3161 timestamps with XML Signature. These subsections address both scenarios.

Note: The server SHOULD not verify the incoming signature before adding the timestamp. If a client wishes that its signatures be verified as a condition of time stamping, the client SHOULD use the `AddTimestamp` optional input of the Verify protocol.

5.3.2.1 Processing for CMS signatures time-stamping

If the `MimeType` element of the `Base64Data` component is set to '`application/pkcs7-signature`' a timestamp token is created and embedded into the existing signature, without verification, which is passed in the `InputDocuments` component of this `SignRequest`. Otherwise a timestamp token is created and embedded into the signature being created as part of the processing of this `SignRequest`.

« In both scenarios, the timestamp token created by the server SHALL be created according to [RFC 3161]. » [DSS-5.3.1.1-1] The `MessageImprint` field within the `TstInfo` structure of the timestamp token will be derived from the signature value of the just-created or incoming signature depending on the scenario. « The timestamp SHALL be embedded in the CMS signature as an unsigned attribute with the object identifier (see Appendix A of [RFC 3161]):

`{iso(1) member-body(2) us(840) rsadsi(113549) pkcs(1) pkcs-9(9) smime(16) id-aa(2) 14}` » [DSS-5.3.1.1-2]

The signature and its embedded timestamp is returned as the first element in the `SignatureObject` list of the `SignResponse` component.

5.3.2.2 Processing for XML Timestamps on XML signatures

« If the type attribute in the optional input `AddTimestamp` is `urn:oasis:names:tc:dss:1.0:core:schema:XMLTimeStampToken`

and signature being timestamped is an XML signature, then the XML signature MUST contain `<dss:timestamp>` as defined in [DSS1Core] section 5.1, placed in a `<xades:XMLTimestamp>` within a `<xades:SignatureTimeStamp>` as defined in [XAdES]. » [DSS-5.3.1.2-1]

« The `<dss:timestamp>` MUST contain `<ds:Signature>` with at least two `<ds:Reference>` elements:

- One with the `Type` attribute set to `urn:oasis:names:tc:dss:1.0:core:schema:XMLTimeStampToken` and referencing a `<ds:Object>` element whose content is a `<TSTInfo>` element.
- The other referencing the `<ds:SignatureValue>` being timestamped.

» [DSS-5.3.1.2-2]

The present specification defines a format for XML timestamp tokens. In addition, XAdES defines a mechanism for incorporating signature timestamps in XML signatures. « The present document mandates that signature timestamps in XML format MUST follow the syntax defined in [DSS1Core] section 5.1. » [DSS-5.3.1.2-3] « These time-stamp tokens MUST be added to XML signatures as specified by XAdES. » [DSS-5.3.1.2-4]

« The signature and its embedded timestamp SHALL be returned as the first element in the `SignatureObject` list of the `SignResponse`. » [DSS-5.3.1.2-5]

5.3.2.3 Processing for RFC 3161 Timestamps on XML signatures

« If the type attribute in this optional input `AddTimestamp` is

`urn:ietf:rfc:3161`

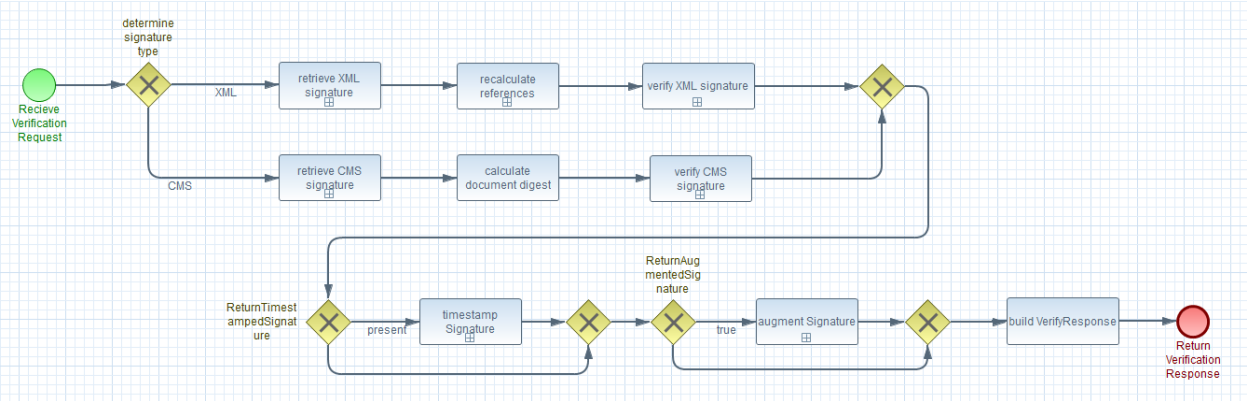
and signature being timestamped is an XML signature then the XML signature MUST contain an RFC 3161, placed in a `<xades:EncapsulatedTimeStamp>` within a `<xades:SignatureTimeStamp>` as defined in [XAdES]. » [DSS-5.3.1.3-1]

6 Data Processing Model for Verification

A DSS server that verifies XML signatures SHOULD perform the following steps, upon receiving a verification with the top-level component `VerifyRequest` (see section 4.3.3). These steps may be changed or overridden by the optional inputs, or by the profile or policy the server is operating under. The results of the verification process are return to the caller within a VerifyResponse component (see section 4.3.4). For more details on multi-signature verification, see section 6.3.1 Multi-Signature Verification.

The following process diagram illustrates the major buildings blocks of the processing of a verification request. The sub processes are described in the following sub-chapters.

Figure 8: Verification Overview



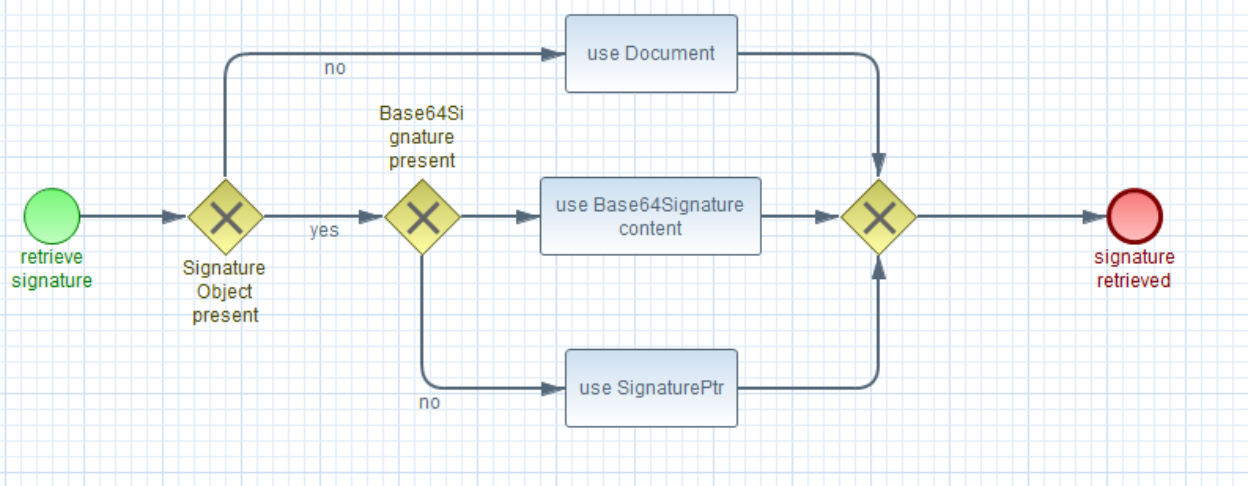
The workflow splits into the sections for XMLDSig and CMS signature processing. « The processing path will be selected by the server considering a given `SignatureType` element of `OptionalInputsVerify` and its configuration and policies. » [DSS-6-1] Profiles may introduce additional signature types and MUST define the adequate processing steps.

- If the element `ReturnTimestampedSignature` of `OptionalInputsVerify` is present, the sub-process '`timestamp Signature`' adds a timestamp to the signature.
- If the element `ReturnAugmentedSignature` of `OptionalInputsVerify` is 'true' the sub-process '`augment Signature`' inserts the augmented signature into the `OptionalOutputsVerify`.

6.1 Processing for XML Signature Verification

6.1.1 Sub process 'retrieve XML signature'

Figure 9: Retrieve XML Signature



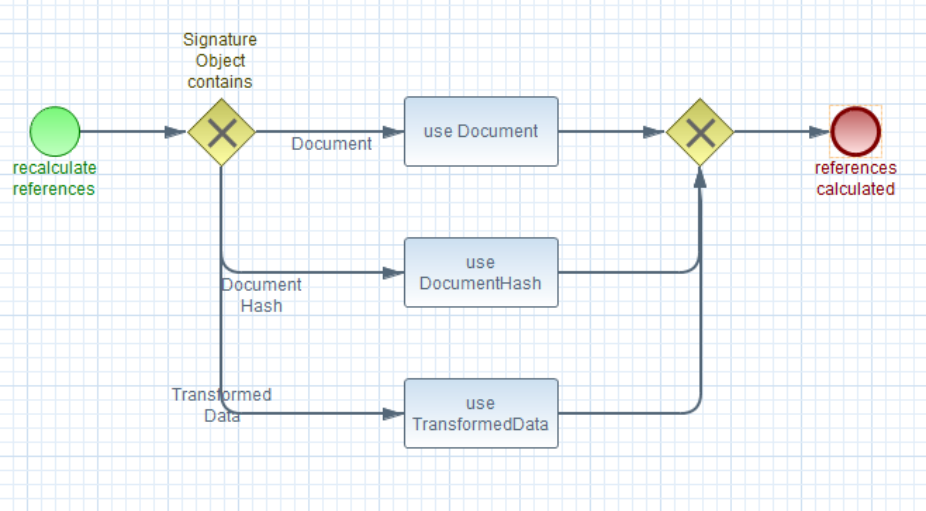
This document describes use cases for zero or one signature. Nevertheless, this sub process describes the retrieval process for an unlimited number of signatures as it may be required by specific profiles.

The server retrieves one or more `<ds:Signature>` objects as follows:

- For all instances of `SignatureObject` that are present, the server retrieves either the `<ds:Signature>` that is a child element of the `SignatureObject` (see: Note at the end of this section), or those `<ds:Signature>` objects which are pointed to by the `SignaturePtr` in the `SignatureObject`.
- If the `SignaturePtr` points to an input document but not a specific element in that document, the pointed-to input document must be a `Document` element containing XML.
- « If the `SignatureObject` is omitted, there MUST be only a single `Document` element. » [DSS-6.1.1-1] This case is handled as if a `SignaturePtr` pointing to the single `Document` was present: the server will search and find every `<ds:Signature>` element in this input document and verify each `<ds:Signature>` according to the steps below.

6.1.2 Sub process 'recalculate references'

Figure 10: Recalculate References

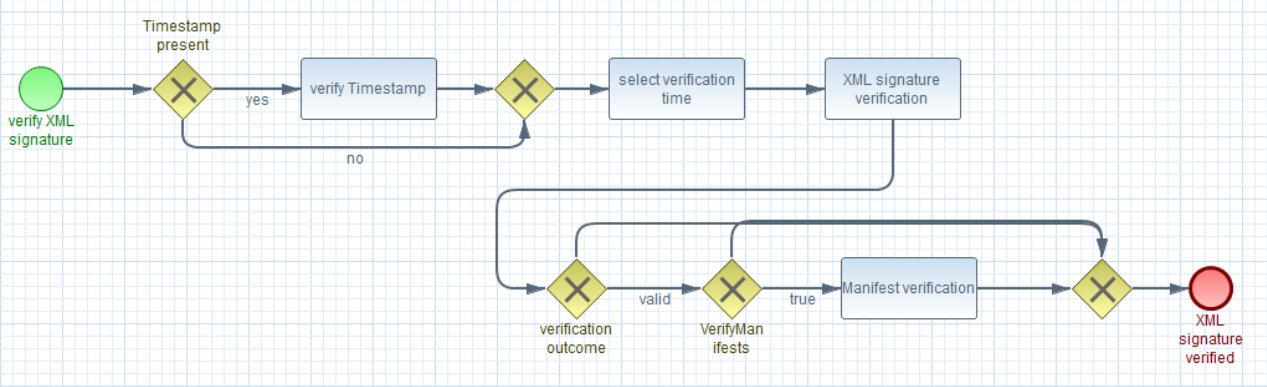


For each <ds:Reference> in the <ds:Signature>, the server finds the input document with matching RefURI and RefType values (omitted attributes match omitted attributes).

- If the <ds:Reference> uses a same-document URI, the XPointer should be evaluated against the input document the <ds:Signature> is contained within, or against the <ds:Signature> itself if it is contained within a SignatureObject element.
- The SchemaRef element or optional input Schema of the input document or SignatureObject will be used, if present, to identify ID attributes when evaluating the XPointer expression.
- If the <ds:Reference> uses an external URI and the corresponding input document is not present, the server will skip the <ds:Reference>, and later return a result code such as ReferencedDocumentNotPresent to indicate this. The RefURI MAY be omitted in at most one of the set of Input documents.
- If the input document is a Document, the server extracts and decodes as described in component Document (see section 4.5.3) depending of the form of the input document).
- If the input document is a TransformedData, the server MAY check that the <ds:Transforms> (if supplied) match between the TransformedData and the <ds:Reference> and then hashes the resultant data object according to <ds:DigestMethod>. « The server MUST check that the result matches <ds:DigestValue>. » [DSS-6.1.2-1]
- If the input document is a DocumentHash, the server MAY check that the <ds:Transforms>, <ds:DigestMethod> (if supplied) and <ds:DigestValue> elements match between the DocumentHash and the <ds:Reference>. If no appropriate algorithms (according to policy or technical restrictions of the server) is supplied by the client the server rejects the request with a ResultMajor code of RequesterError and a ResultMinor code of InappropriateHashAlgorithm.
- « If the combination of RefURI and RefType matches more than one input document all of them MUST be either a TransformedData or a DocumentHash otherwise a RequesterError is issued qualified by result minor of ReferencedDocumentNotPresent. » [DSS-6.1.2-2] Only one of them is allowed to have a WhichReference value that matches the order of the <ds:Reference> within the <ds:SignedInfo> in question otherwise a RequesterError is issued qualified by result minor of ReferencedDocumentNotPresent.

6.1.3 Sub process 'verify XML signature'

Figure 11: Verify XML Signature



« If one or more timestamps are present on the given signature this / these timestamps MUST be verified. » [DSS-6.1.3-1] The 'time of existence' asserted by the timestamp MAY be used to decide the verification time. For details see the following sections.

The server verifies the validity of the signature at a particular time (i.e. current time, assumed signing time or other time), depending on the server policy. This behaviour MAY be altered by using the optional input `UseVerificationTime`.

If the `VerifyManifests` element of `OptionalInputsVerify` is set to 'true' the server validates the manifests in an XML signature. In accordance with [XMLDSIG] section 5.1, DSS Manifest validation does not affect a signature's core validation. The results of verifying individual `<ds:Reference>`'s within a `<ds:Manifest>` are returned in the `VerifyManifestResults` within the `OptionalOutputsVerify`. If the optional input `VerifyManifests` is set to 'true' and the XMLDSig core validation succeeds, then the returned `ResultMinor` is

`urn:oasis:names:tc:dss:1.0:resultminor:valid:hasManifestResults`

In case of a negative XMLDSig core validation no attempt is made to verify manifests.

If the signature validates correctly, the server returns one of the first two `ResultMinor` codes listed in section 9.2, depending on the relationship of the signature to the input documents (not including the relationship of the signature to those XML elements that were resolved through XPointer evaluation; the client will have to inspect those relationships manually). If the signature fails to validate correctly, the server returns some other code; either one defined in section 9.2 of this specification, or one defined by some profile of this specification.

6.1.3.1 Processing for RFC 3161 timestamp tokens on XML Signatures

The present section describes the processing rules for verifying an RFC 3161 timestamp token embedded within an XML signature as an unsigned property. This XML signature may be passed in on a Verify call within an instance of `SignatureObject` or embedded within a `Document`'s child.

The server shall verify the timestamp token performing the steps detailed below. If any one of them results in failure, then the timestamp token SHOULD be rejected.

1. Extract the timestamp token embedded in the incoming signature as defined in 5.3.2.2 Processing for XML Timestamps on XML signatures.
2. Verify that the token's public verification certificate is authorized for time stamping by examining the Extended Key Usage field for the presence of the time stamping OID "1.3.6.1.5.5.7.3.8".
3. Process the signature timestamp as defined in **[XAdES]** Annex G.2.2.16.1.3.
4. Verify that the public verification certificate conforms to all relevant aspects of the relying-party's policy including algorithm usage, policy OIDs, time accuracy tolerances, and the Nonce value.
5. Set the `Result` element as appropriate. `urn:oasis:names:tc:dss:1.0:resultminor:valid:signature:InvalidSignatureTimestamp` MAY be used to indicate that the signature is valid but the timestamp against that signature is invalid.

6.1.3.2 Processing for XML timestamp tokens on XML signatures

The present section describes the processing rules for verifying and XML Signature timestamp token embedded within an XML signature using the incorporation mechanisms specified in XAdES (i.e., in the `<xades:XMLTimeStamp>` `<xades:SignatureTimeStamp>` element's child). This XML signature may be passed in on a Verify call within an instance of `SignatureObject` or embedded within a `Document`'s child.

The server shall verify the timestamp token performing the steps detailed below. If any one of them results in failure, then the timestamp token SHOULD be rejected.

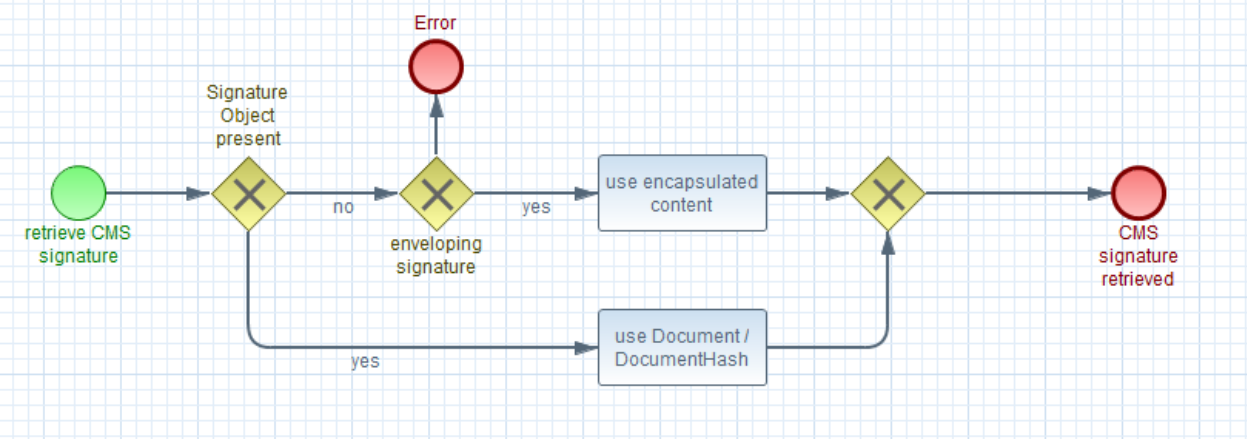
6. Extract the timestamp token embedded in the incoming signature as defined in 5.3.2.2 Processing for XML Timestamps on XML signatures.
7. Verify that the verification key and algorithms used conforms to all relevant aspects of the applicable policy. Should this key come within a public certificate, verify that the certificate conforms to all relevant aspects of the applicable policy including algorithm usage, policy OIDs, and time accuracy tolerances.
8. Verify that the aforementioned verification key is consistent with the `ds:SignedInfo/SignatureMethod/@Algorithm` attribute value.
9. Verify the timestamp token signature in accordance with the rules defined in **[XMLDSIG]**.
10. Verify that the `<ds:SignedInfo>` element contains at least two `<ds:Reference>` elements.
11. Verify that one of the `<ds:Reference>` elements has its Type attribute set to "`urn:oasis:names:tc:dss:1.0:core:schema:XMLTimeStampToken`". Take this one and proceed as indicated below:
    a. Retrieve the referenced data object. Verify that it references a `<ds:Object>` element, which in turn envelopes a `<TSTInfo>` element.
    b. Verify that the `<TSTInfo>` element has a valid layout as per the present specification.
    c. Extract the digest value and associated algorithm from its `<ds:DigestValue>` and `<ds:DigestMethod>` elements respectively.
    d. Recalculate the digest of the retrieved data object as specified by **[XMLDSIG]** with the digest algorithm indicated in `<ds:DigestMethod>`, and compare this result with the contents of `<ds:DigestValue>`.
12. Take each of the other `<ds:Reference>` elements and for each validate the hash as specified in **[XMLDSIG]**.
13. Check that for one of the `<ds:Reference>` elements the retrieved data object is actually the `<ds:SignatureValue>` element and that it contains its digest after canonicalization.
14. Set the `Result` element as appropriate. Minor Error `urn:oasis:names:tc:dss:1.0:resultminor:valid:signature:InvalidSignatureTimestamp` MAY be used to indicate that the signature is valid but the timestamp against that signature is invalid.

6.2 Processing for CMS Signature Verification

A DSS server that verifies CMS signatures SHOULD perform the following steps, upon receiving a `VerifyRequest`. These steps may be changed or overridden by the optional inputs, or by the profile or policy the server is operating under.

6.2.1 Sub process '`retrieve CMS signature`'

Figure 12: Retrieve CMS Signature

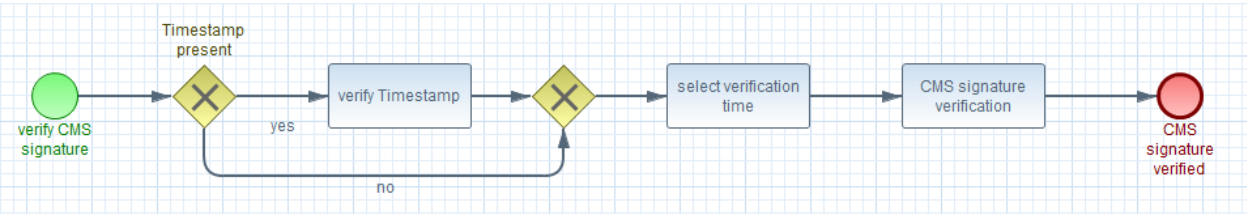


This document describes use cases for zero or one signature. Nevertheless, this sub process describes the retrieval process for an unlimited number of signatures as it may be required by specific profiles.

1. The server retrieves the CMS signature by decoding the `Base64Signature` children of all instances of `SignatureObject`.
2. The server retrieves the input data. « If the CMS signature is detached, there MUST be a single input document: i.e. a single `Document` or `DocumentHash` element. » [DSS-6.2.1-1] « Otherwise, if the CMS signature is enveloping, it contains its own input data and there MUST NOT be any input documents present. » [DSS-6.2.1-2]
3. The CMS signature and input data are verified in the conventional way (see **[RFC 5652]** for details).
4. If the signature validates correctly, the server returns the first `ResultMinor` code listed in section 9.2. If the signature fails to validate correctly, the server returns some other code; either one defined in section 9.2 of this specification, or one defined by some profile of this specification.

6.2.2 Sub process 'verify CMS signature'

Figure 13: Verify CMS Signature



« If one or more timestamps are present on the given signature this / these timestamps MUST be verified. » [DSS-6.2.2-1] The 'time of existence' asserted by the timestamp MAY be used to decide the verification time. For details see the following section.

The server verifies the validity of the signature at a particular time (i.e. current time, assumed signing time or other time), depending on the server policy. This behaviour MAY be altered by using the optional input `UseVerificationTime`.

If the signature validates correctly, the server returns one of the first three `ResultMinor` codes listed in section 4.2.7. If the signature fails to validate correctly, the server returns some other code; either one defined in section 4.2.7 of this specification, or one defined by some profile of this specification.

6.2.2.1 Processing for RFC 3161 Timestamp tokens on CMS Signatures.

The present section describes the processing rules for verifying a CMS RFC3161 timestamp token passed in on a Verify call within an element `SignatureObject` of the `VerifyRequest` component. In

the CMS case, since the "signature timestamp" is embedded in the signature as an unsigned attribute, only the time stamped signature is required for verification processing. As such, no additional input is required.

The processing by the server is broken down into the following steps:

15. The signature timestamp is embedded in the incoming signature as an unsigned attribute whose object identifier is 1.2.840.11359.1.9.16.2.14. Extract and verify the timestamp token.
16. Verify that the token's public verification certificate is authorized for time stamping by examining the Extended Key Usage field for the presence of the time stamping OID "1.3.6.1.5.5.7.3.8".
17. Validate that the `TstInfo` structure has a valid layout as defined in **[RFC 3161]**.
18. Extract the `MessageImprint` hash value and associated algorithm from the `TstInfo` structure which will be compared against the hash value derived in the next step.
19. Recalculate the hash of the signature value field of the signature in which the timestamp is embedded.
20. Compare the hash values from the two previous steps, and if they are equivalent, then this timestamp is valid for the signature that was time stamped.
21. Verify that the public verification certificate conforms to all relevant aspects of the relying-party's policy including algorithm usage, policy OIDs, time accuracy tolerances, and the Nonce value.
22. Set the `Result` element as defined in this specification. Minor Error `urn:oasis:names:tc:dss:1.0:resultminor:valid:signature:InvalidSignatureTimestamp` MAY be used to indicate that the signature is valid but the timestamp against that signature is invalid.

6.3 General Processing

The following processing is shared between all signature types.

6.3.1 Multi-Signature Verification

« If a client requests verification of an entire input document, either using a `SignaturePtr` without an `XPath` or a missing `SignaturePtr`, then the server MUST determine whether the input document contains zero, one, or more than one signature elements. » [DSS-6.3.1-1] If zero, the server SHOULD return a `ResultMajor` code of `RequesterError`.

« If more than one signature element is present, the server MUST either reject the request with a `ResultMajor` code of `RequesterError` and a `ResultMinor` code of `NotSupported`, or accept the request and verify all signatures. » [DSS-6.3.1-2]

If the server accepts the request in the multi-signature case (or if only a single signature is present) and one of the signatures fails to verify, the server should return one of the `ResultMinor` error codes in section 9.2, reflecting the first error encountered.

If all of the signatures verify correctly, the server should return the `Success ResultMajor` code and the following `ResultMinor` code:

`urn:oasis:names:tc:dss:1.0:resultminor:ValidMultiSignatures`

Non-normative Note:

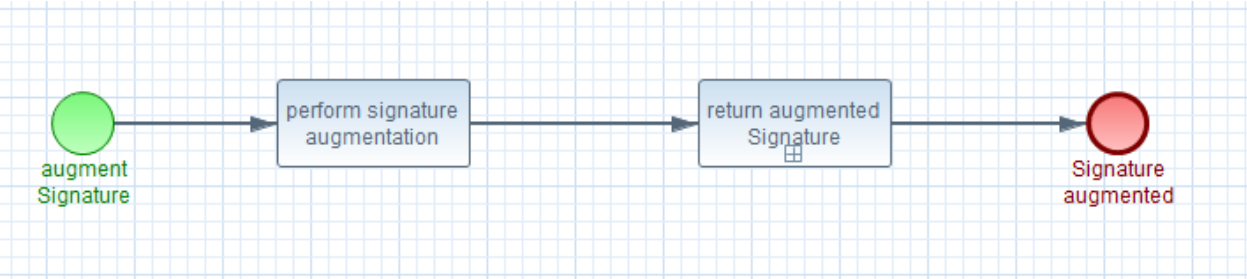
> Multiple signatures may be present in multiple instances of the `SignatureObject` component or within signature containers (e.g. XMLDSig documents or CMS files). So even with just one `SignatureObject` component present multiple signatures need to be processed.

6.3.2 Sub process 'augment Signature'

The presence of the `ReturnAugmentedSignature` element of `OptionalInputsVerify` instructs the server to return an `AugmentedSignature` output, containing a new or augmented signature. With

multiple signature files provided in the verification request the server applies the augmentation to all signatures. The set of resulting signatures will be included in multiple instances of `AugmentedSignature` optional output elements.

Figure 14: Augment Signature

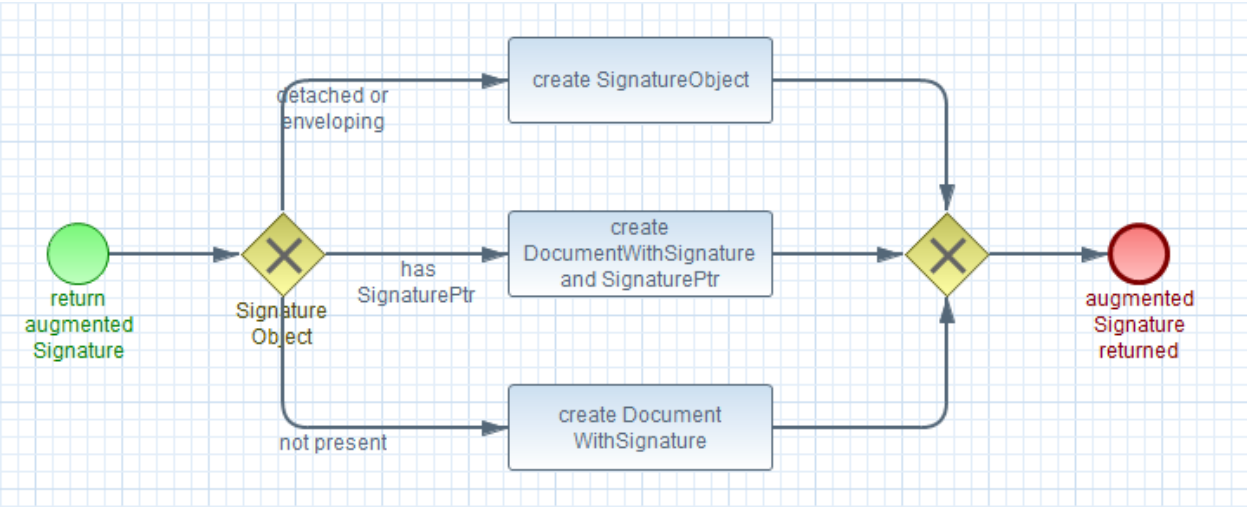


The `Type` element of `ReturnAugmentedSignature` defines the process of "augmenting" a signature. For example, the augmented signature may be the original signature with some additional unsigned signature properties added to it (such as timestamps, counter-signatures, or additional information for use in verification), or the augmented signature could be an entirely new signature calculated on the same input documents as the input signature. « Profiles that use this optional input MUST define the allowed values and their semantics, and the default value of `ReturnAugmentedSignature` (unless only a single type of augmented signature is supported, in which case the element can be omitted). » [DSS-6.3.1-1]

Multiple occurrences of this optional input can be present in a single verify request message. « If multiple occurrences are present, each occurrence MUST have a different value. » [DSS-6.3.1-2] Each occurrence will generate a corresponding `AugmentedSignature` optional output. « These optional outputs SHALL be distinguishable based on their `Type` element, which will match each output with an input. » [DSS-6.3.1-3]

A DSS server SHOULD perform the following steps to return the augmented signature in a `AugmentedSignature` component appropriately. These steps may be changed or overridden by a profile or policy the server is operating under. (e.g. for PDF documents enveloping CMS signatures).

Figure 15: Build AugmentedSignature component



- « If the detached or enveloping signature to be augmented appears within a `Base64Signature` then the `AugmentedSignature` optional output MUST contain the modified `SignatureObject` with the augmented signature. » [DSS-6.3.1-4]
- « If the signature to be augmented is enveloped, and if the `VerifyRequest` contains a `SignatureObject` with a `SignaturePtr` pointing to an `InputDocument` enveloping the signature then the server MUST produce an `AugmentedSignature` component with its

subcomponents `SignatureObject` and `DocumentWithSignature` used. The `DocumentWithSignature` contains the document that envelopes the augmented signature, second a `SignatureObject` having a `SignaturePtr` element that MUST point to the former `DocumentWithSignature`. » [DSS-6.3.1-5]

- « If there is no `SignatureObject` included in the request then the server MUST produce a `DocumentWithSignature` subcomponent containing the document with the augmented signature, only. » [DSS-6.3.1-6] No `SignatureObject` element will be generated.

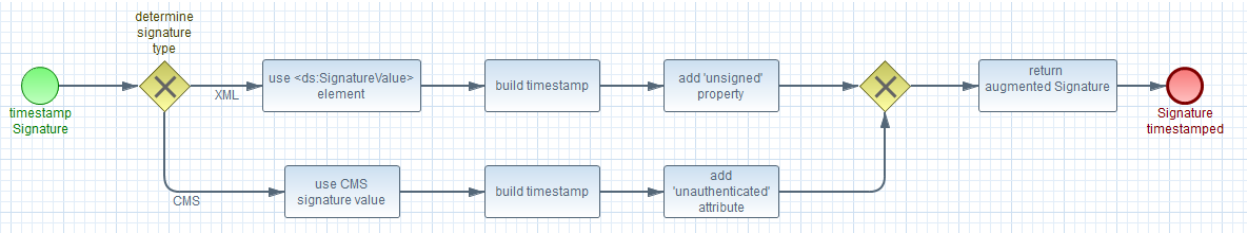
If created the `DocumentWithSignature` subcomponent contains the input document with the given signature inserted. The server places the signature in the document and location identified using the `SignatureObject` / `SignaturePtr` component. « This `Document` MUST include a same-document `RefURI` element which references the data augmented (e.g. of the form `RefURI`). » [DSS-6.3.1-7]

6.3.3 Sub process 'timestamp Signature'

If the `ReturnTimestampedSignature` element of `OptionalInputsVerify` is present the server augments the signature after its verification by embedding a signature timestamp token as an unauthenticated attribute (see "`unauthAttrs`" in section 9.1 [**RFC 5652**]) or *unsigned* property (see section 6.2.5 "The `UnsignedSignatureProperties` element" and section 7.3 "The SignatureTimeStamp element" [XAdES]) of the supplied signature.

The timestamp token will be on the signature value in the case of CMS/PKCS7signatures or the `<ds:SignatureValue>` element in the case of XML signatures.

Figure 16: Timestamp Signature



The `value` of `ReturnTimestampedSignature` indicates what type of timestamp to build. This document defines two values for it, namely:

- `urn:ietf:rfc:3161` for generating a RFC 3161 timestamp token on the signature
- `urn:oasis:names:tc:dss:1.0:core:schema:XMLTimeStampToken`, for generating a XML timestamp token as defined in section 5.3 General Processing of this document.

« Profiles that use this optional input MUST define the allowed values and the default value for the `Type` element (unless only a single type of timestamp is supported, in which case `Type` can be omitted). » [DSS-6.3.2-1]

The sub process of returning the augmented signatures is the same as described in the sub process 'augment Signature' (see section 6.3.2).

Note: Procedures for handling other forms of timestamp may be defined in profiles of the Core. In particular, the DSS XAdES profile [DSS-XAdES-P] defines procedures for handling timestamps against the document being signed, and the DSS Timestamp profile [DSS-TS-P] defines procedures for handling standalone timestamps.

6.3.4 Task 'build VerifyResponse'

The task of building the `VerifyResponse` is shared between all signature formats. The `OptionalInputsVerify` element, server configuration and applied policies may affect the set of elements included in the `OptionalOutputsVerify`.

If the ReturnVerificationTimeInfo element of OptionalInputsVerify is set to 'true' the server returns the VerificationTimeInfo within the OptionalOutputsVerify. It contains the verification time and optionally other relevant time instants that may have been used when determining the verification time or that may be useful for its qualification.

If the ReturnSigningTimeInfo element of OptionalInputsVerify is set to 'true' the server returns the SigningTimeInfo within the OptionalOutputsVerify. It allows the client to obtain the time instant associated to the signature creation. Depending on the applicable server policy, this signing time needs to be qualified, in order to avoid unacceptable measurement errors or false claims, using time boundaries associated to trustworthy time values (based on timestamps or time-marks created using trusted time sources). In this case, the server MAY include these values in the LowerBoundary and UpperBoundary elements, respectively.

Criteria for determining when a time instant can be considered trustworthy and for determining the maximum acceptable delays between the signing time and their boundaries (if any) is outside the scope of this specification.

« When there's no way for the server to determine the signing time, the server MUST omit the SigningTimeInfo output. » [DSS-6.3.3-1]

If the ReturnSignerIdentity element of OptionalInputsVerify is set to 'true' the server returns the SignerIdentity element within the OptionalOutputsVerify. The SignerIdentity optional output contains an indication of who performed the signature. This option is not allowed in multi-signature verification.

If the ReturnTransformedDocument element of OptionalInputsVerify is present, the server returns an input document to which the XML signature transforms specified by a particular <ds:Reference> have been applied. The <ds:Reference> is indicated by the zero-based WhichReference element (0 means the first <ds:Reference> in the signature, 1 means the second, and so on). Multiple occurrences of this optional input can be present in a single verify request message. Each occurrence will generate a corresponding optional output. These options are not allowed in multi-signature verification.

The TransformedDocument element within the OptionalOutputsVerify contains a document corresponding to the specified <ds:Reference> after all the transforms in the reference have been applied. In other words, the hash value of the returned document should equal the <ds:Reference> element's <ds:DigestValue>. To match outputs to inputs, each TransformedDocument component will contain a WhichReference element which matches the corresponding ReturnTransformedDocument optional input element.

If the ReturnProcessingDetails element of OptionalInputsVerify is set to 'true' the server returns the ProcessingDetails element within the OptionalOutputsVerify. The ProcessingDetails element elaborates on what signature verification steps succeeded or failed. This option is not allowed in multi-signature verification.

7 Asynchronous Processing Model

The main functionality of the 'Asynchronous Processing Profile' [DSSAsync] is included in this version of the core. The asynchronous processing is selected by adding the profile identifier

`urn:oasis:names:tc:dss:1.0:profiles:asynchronousprocessing:1.0`

(defined in **[DSS1Async]**) to the requests set of `Profile` elements.

The server MAY decide that the processing of a request cannot be performed within a reasonable timeframe and therefore return an instance of the 'Component ResponseBase' with the `ResultMajor` value of

`urn:oasis:names:tc:dss:1.0:profiles:asynchronousprocessing:resultmajor:Pending`

and the `ResponseID` element set to a server generated value.

The client MAY initiate a request with the top-level component `PendingRequest` (see section 4.3.5) from time to time with the `ResponseID` of the initial response included in the `RequestID` element. The `RequestID` of the related request maybe reused but a client MUST NOT depend on such reuse of `RequestID`. The server may consider a given value of `RequestID` as not appropriate for internal request/response matching or may generally produce its own values for `ResponseID`.

If the server is still not able to return the requested response, it will respond with a `ResultMajor` of 'Pending' again. When the server finally succeeds with its processing the results will be delivered to the client with its next polling call. « In this case the `ResultMajor` value MUST NOT be `Pending` but the `ResultMajor` resulting from the request processing. » [DSS-7-1]

In response to a `PendingRequest` the server may response with the generic `Response` in cases where the service is unable to specialise down to `SignResponse` or `VerificationResponse` components. This will happen when the service doesn't recognise the given `ResponseID`. The `ResultMinor` is set to the special value of

`urn:oasis:names:tc:dss:1.0:profiles:asynchronousprocessing:resultminor:ResponseIdUnknown`

The `ResultMajor` code in this case is `RequesterError`. This result min or code shows up only in response to a `PendingRequest`.

Clients not able to perform the Asynchronous Processing Model MAY treat the `Pending` response as an error or try to perform the operation at later point in time. Even without referring to the `ResponseID` the server MAY be able to respond with full result immediately.

7.1 Asynchronous-only Processing

In case an asynchronous service is unable to reply in a synchronous manner and a requests to this service is made without profiling the call as asynchronous (using the given profile identifier within the `Profile` element), the service returns a `ResultMajor` of `RequesterError` and a `ResultMinor` of

`urn:oasis:names:tc:dss:1.0:profiles:asynchronousprocessing:resultminor:asynchronousOnly`

(as defined in **[DSS1Async]**).

7.2 Enforcing Asynchronous Processing

Once the server is able to reply with a full response immediately, e.g. by using cached responses of preceding processing results, it will not perform asynchronous processing at all. Even with the asynchronous profile included in the request it is the decision of the server to reply to the initial call with a 'Pending' or with the final response. The latter saves unnecessary network roundtrips.

On the other hand, it may simplify the processing on the client side if just one single execution path needs to be implemented. To enforce the server to use the asynchronous processing model unconditionally the optional input element `EnforceAsynchronousProcessing` set to `true`. This element will be ignored with a `PendingRequest` component.

8 DSS Core Bindings

Mappings from DSS messages into standard communications protocols are called DSS *bindings*. *Transport bindings* specify how DSS messages are encoded and carried over some lower-level transport protocol. *Security bindings* specify how confidentiality, authentication, and integrity can be achieved for DSS messages in the context of some transport binding. Below we specify an initial set of bindings for DSS. Future bindings may be introduced by the OASIS DSS TC or by other parties.

8.1 HTTP POST Transport Binding

In this binding, the DSS request/response exchange occurs within an HTTP POST exchange **[RFC 2616]**.

The following rules apply to the HTTP request:

1. The client may send an HTTP/1.0 or HTTP/1.1 request.
2. The Request URI may be used to indicate a particular service endpoint.
3. « The `Content-Type` header MUST be set to “application/xml” or “application/json”. » [DSS-8.1-1]
4. « The `Content-Length` header MUST be present and correct. » [DSS-8.1-2]
5. « The DSS request message MUST be sent in the body of the HTTP Request. » [DSS-8.1-3]

The following rules apply to the HTTP Response:

1. « The `Content-Type` header MUST be set to “text/xml” or “application/json”. » [DSS-8.1-4]
2. « The `Content-Length` header MUST be present and correct. » [DSS-8.1-5]
3. « The DSS response message MUST be sent in the body of the HTTP Response. » [DSS-8.1-6]
4. « The HTTP status code MUST be
    a. either set to 200 if a DSS response message is returned.
    b. or the status code can be set to
        i. either 3*xx* to indicate a redirection
        ii. or 4*xx* to indicate a low-level client error (such as a malformed request)
        iii. or 5*xx* to indicate a low-level server error » [DSS-8.1-7]

8.2 SOAP 1.2 Transport Binding

In this binding, the DSS request/response exchange occurs using the SOAP 1.2 message protocol **[SOAP]**.

The following rules apply to the SOAP request:

1. A single DSS `SignRequest` or `VerifyRequest` element will be transmitted within the body of the SOAP message.
2. « The client MUST NOT include any additional XML elements in the SOAP body. » [DSS-8.2-1]
3. « The character encoding UTF-8 MUST be used for the SOAP message. » [DSS-8.2-2]
4. Arbitrary SOAP headers may be present.

The following rules apply to the SOAP response:

1. « The server MUST return either a single DSS `SignResponse` or `VerifyResponse` element within the body of the SOAP message, or a SOAP fault code. » [DSS-8.2-3]
2. « The server MUST NOT include any additional XML elements in the SOAP body. » [DSS-8.2-4]
3. « If a DSS server cannot parse a DSS request, or there is some error with the SOAP envelope, the server MUST return a SOAP fault code » [DSS-8.2-5]. Otherwise, a DSS result code should be used to signal errors.
4. « The character encoding UTF-8 MUST be used for the SOAP message. » [DSS-8.2-6]
5. Arbitrary SOAP headers may be present.

« On receiving a DSS response in a SOAP message, the client MUST NOT send a fault code to the DSS server. » [DSS-8.2-7]

8.3 Security Bindings

It is good practice to use a security binding (e.g. TLS) to provide confidentiality, authentication and integrity.

The selection of security mechanism and the used parameters depends on many aspects of the usage scenario, for example:

- Required protection level of the content
- Technical limitations (e.g. introduced by mobile clients)
- Regulatory requirements
- Export restrictions

Moreover, these decisions always need to be reconsidered due to new results crypto analysis and known vulnerabilities. Therefore, details regarding protocols and cipher suites are out of scope of this document.

9 DSS-Defined Identifiers

The following sections define various URI-based identifiers. Where possible an existing URN is used to specify a protocol. In the case of IETF protocols the URN of the most current RFC that specifies the protocol is used (see **[RFC 2648]**). URI references created specifically for DSS have the following stem:

`http://docs.oasis-open.org/dss-x/ns/core`

9.1 Signature Type Identifiers

The following identifiers MAY be used as the content of the `SignatureType` optional input (see section 4.4.4 and 4.4.5).

9.1.1 XML Signature

- **URI:** `urn:ietf:rfc:3275`
- This refers to an XML signature per **[XMLDSIG]**.

9.1.2 XML TimeStampToken

- **URI:** `urn:oasis:names:tc:dss:2.0:core:schema:XMLTimeStampToken`
- This refers to an XML timestamp containing an XML signature.

9.1.3 RFC 3161 TimeStampToken

- **URI:** `urn:ietf:rfc:3161`
- This refers to an XML timestamp containing an ASN.1 TimeStampToken, per **[RFC 3161]**.

9.1.4 CMS Signature

- **URI:** `urn:ietf:rfc:3369`
- This refers to a CMS signature per **[RFC 5652]** or prior versions of CMS.

9.1.5 PGP Signature

- **URI:** `urn:ietf:rfc:2440`
- This refers to a PGP signature per **[RFC 2440]**.

9.2 ResultMinors

The following list contains the values of ResultMinor that are defined in the preceding version of this standard (**[DSS1Core]**) and are used in this document.

Abbreviation	URI
OnAll Documents	`urn:oasis:names:tc:dss:1.0:resultminor:valid:signature:OnAllDocuments`
NotAll Documents Referenced	`urn:oasis:names:tc:dss:1.0:resultminor:valid:signature:NotAllDocumentsReferenced`
Incorrect Signature	`urn:oasis:names:tc:dss:1.0:resultminor:invalid:IncorrectSignature`

HasManifest Results	urn:oasis:names:tc:dss:1.0:resultminor:valid:signature:HasManifestResults
Invalid Signature Timestamp	urn:oasis:names:tc:dss:1.0:resultminor:valid:signature:InvalidSignatureTimestamp
Referenced DocumentNot Present	urn:oasis:names:tc:dss:1.0:resultminor:ReferencedDocumentNotPresent
KeyInfoNot Provided	urn:oasis:names:tc:dss:1.0:resultminor:KeyInfoNotProvided
MoreThanOne RefUriOmitted	urn:oasis:names:tc:dss:1.0:resultminor:MoreThanOneRefUriOmitted
InvalidRefURI	urn:oasis:names:tc:dss:1.0:resultminor:InvalidRefURI
NotSupported	urn:oasis:names:tc:dss:1.0:resultminor:NotSupported
Inappropriate Signature	urn:oasis:names:tc:dss:1.0:resultminor:Inappropriate:signature
General Error	urn:oasis:names:tc:dss:1.0:resultminor:GeneralError
KeyLookup Failed	urn:oasis:names:tc:dss:1.0:resultminor:invalid:KeyLookupFailed
CrlNot Availiable	urn:oasis:names:tc:dss:1.0:resultminor:CrlNotAvailiable
OcspNot Availiable	urn:oasis:names:tc:dss:1.0:resultminor:OcspNotAvailiable
Certificate Chain NotComplete	urn:oasis:names:tc:dss:1.0:resultminor:CertificateChainNotComplete
Inappropriate HashAlgorithm	urn:oasis:names:tc:dssx:2.0:resultminor:Inappropriate:HashAlgorithm

10 Security Considerations

There are several potential avenues for attack when processing incoming DSS documents. The following list is non-exhaustive and should not and cannot replace a comprehensive security review.

A comprehensive security review considers the unique technology stack and processes specific to an implementation and not of all implementations.

10.1 Well-Known Attack Vectors

In the following subsections four well-known classes of attack vectors are highlighted:

1. XML Parsing Vulnerabilities
2. XML Canonicalization Vulnerabilities
3. Injection Attacks
4. JSON Deserialization Through Evaluation Attacks

The first two attack vector classes “XML Parsing Vulnerabilities” and “XML Canonicalization Vulnerabilities” can occur in any XML language and therefore do not rely on any specific DSS capabilities.

The third class, “Injection Attacks” applies to any format that is being processed in a deterministic way by an active processor with additional capabilities potentially being triggered by an unexpected and malicious payload.

“JSON Deserialization Through Evaluation Attacks” attack vectors consider processing programming languages and specifically collisions of constructs in the processing language used to consumer any JSON text and the allowed constructs in the JSON format.

In addition to the attack vectors listed and further detailed in the following non-normative subsections, DSS document processing requires interfaces to BASE64 and ASN.1 encoding and decoding in practical implementations, which MAY result in further attack vectors.

10.1.1 XML Parsing Vulnerabilities [non-normative]

There have been vulnerabilities in XML parsing libraries that can cause either denial of service or actual exploits. As an example, see Microsoft’s article on XML Denial of Service Attacks and Defenses. The best defence for these types of attacks is, in short, to keep the XML parser up-to-date and ensure to perform full validation prior to attempting to process the document.

10.1.2 XML Canonicalization Vulnerabilities [non-normative]

Exploitation of the use of canonicalization as content extractor MAY impact an implementation that offers e.g. inclusion and processing of XML Fragments in payloads as described e.g. in [JENSEN-2009].

10.1.3 Injection Attacks [non-normative]

Any DSS content MAY be processed somewhere, thus injection attacks MAY occur in many places which are not specific to DSS. The best defence known, is to sanitize untrusted output (and anything inside a DSS document received from outside the client or server system boundaries should be considered untrusted). For more explanation on injection attacks, see e.g. this OWASP article (https://www.owasp.org/index.php/Top_10-2017_A1-Injection).

10.1.4 JSON Deserialization Through Evaluation Attacks [non-normative]

Generally, there are security issues with processing languages that are capable to evaluate text in that processing language during runtime and dynamically.

Sample vector for JavaScript:

“JSON is a subset of JavaScript that excludes assignment and invocation. Since JSON's syntax is borrowed from JavaScript, it is possible to use that language's "eval()" function to parse most JSON texts (but not all; certain characters such as U+2028 LINE SEPARATOR and U+2029 PARAGRAPH

SEPARATOR are legal in JSON but not JavaScript). This generally constitutes an unacceptable security risk, since the text could contain executable code along with data declarations. The same consideration applies to the use of eval()-like functions in any other programming language in which JSON texts conform to that language's syntax." (cf. [RFC8259] section 12 "Security Considerations".

11 Conformance

11.1 Conformance as a DSS version 2.0 document

To ease communication and subsequent resolution of any specific partial conformance violation, the preceding chapters already provide minimal requirements, that a specific instance component must fulfil, to permit conformance of the complete DSS version 2.0 document.

11.1.1 Conformance for JSON format

The following clause offers a simple two-step process, to either prove or disprove the conformance of a complete JSON document (formulated in terms specific to that implementation language) to this version of DSS:

« Conformance Clause 1: "Valid JSON DSS Document"
A JSON document instance conforms to this specification as a DSS document if it meets all of the following COUNT_ME conditions:

1. Is valid JSON
2. Validates against the JSON Schema

» DSS-11.1.1-1]

11.1.2 Conformance for XML format

The following clause offers a simple three step process, to either prove or disprove the conformance of a complete XML document (formulated in terms specific to that implementation language) to this version of DSS:

« Conformance Clause 1: "Valid XML DSS Document"
An XML document instance conforms to this specification as a DSS document if it meets all of the following three conditions:

1. Is well-formed XML.
2. Consists of a single root element instance as defined in the namespace `http://docs.oasis-open.org/dss-x/ns/core`.
3. Is valid XML.

» [DSS-11.1.2-1]

11.1.3 Conformance for DSS Server

« Conformance Clause 1: "Conforming DSS Server"
A DSS server instance conforms to this specification if the server fulfils all requirements on servers stated in the normative sections of this document. » [DSS-11.1.3-1]

11.1.4 Conformance for DSS Client

« Conformance Clause 1: "Conforming DSS Client"
A DSS client instance conforms to this specification if the client fulfils all requirements on clients stated in the normative sections of this document. » [DSS-11.1.4-1]

Appendix A. Acknowledgments

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

Andreas Kuehne, Individual
Detlef Huehnlein, Individual
Ernst Jan van Nigtevecht, Sonnenglanz Consulting
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Stefan Hagen, Individual

Appendix B. Index of Components and Elements

Appendix C. List of Figures

Appendix D. Revision History

Revision	Date	Editor	Changes Made
WD06	2018-06-10	Andreas Kuehne and Stefan Hagen	Initial Draft version with feedback from the TC
WD07	2018-08-12	Stefan Hagen	Minor editorial fixes
WD08	2018-08-13	Andreas Kuehne	Editorial fixes to ease reading for newcomers (grouping of elements)
WD09	2018-08-20	Stefan Hagen	Revision of namespaces
WD10	2018-08-21	Andreas Kuehne and Stefan Hagen	Fix for JSON Schema URL Encoded ref attribute, alphabetical ordering of references, application of OASIS conformance guidelines, addition of Security Considerations section, repair of broken links, and insertion of test assertion tags.
CD02	2019-01-21	Andreas Kuehne	Handled the remarks received from the public review of csprd01
CD03	2019-02-09	Andreas Kuehne	Added support for multi-signature creation per sign request by changing the related cardinalities to ‘unbounded’