

[MS-WSTEP]:

WS-Trust X.509v3 Token Enrollment Extensions

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Revision Summary

Date	Revision History	Revision Class	Comments
12/5/2008	0.1	Major	Initial Availability
1/16/2009	0.1.1	Editorial	Changed language and formatting in the technical content.
2/27/2009	0.1.2	Editorial	Changed language and formatting in the technical content.
4/10/2009	0.1.3	Editorial	Changed language and formatting in the technical content.
5/22/2009	0.2	Minor	Clarified the meaning of the technical content.
7/2/2009	1.0	Major	Updated and revised the technical content.
8/14/2009	1.1	Minor	Clarified the meaning of the technical content.
9/25/2009	2.0	Major	Updated and revised the technical content.
11/6/2009	3.0	Major	Updated and revised the technical content.
12/18/2009	4.0	Major	Updated and revised the technical content.
1/29/2010	5.0	Major	Updated and revised the technical content.
3/12/2010	5.1	Minor	Clarified the meaning of the technical content.
4/23/2010	5.1.1	Editorial	Changed language and formatting in the technical content.
6/4/2010	5.1.2	Editorial	Changed language and formatting in the technical content.
7/16/2010	6.0	Major	Updated and revised the technical content.
8/27/2010	6.0	None	No changes to the meaning, language, or formatting of the technical content.
10/8/2010	6.0	None	No changes to the meaning, language, or formatting of the technical content.
11/19/2010	6.0	None	No changes to the meaning, language, or formatting of the technical content.
1/7/2011	6.0	None	No changes to the meaning, language, or formatting of the technical content.
2/11/2011	6.0	None	No changes to the meaning, language, or formatting of the technical content.
3/25/2011	6.0	None	No changes to the meaning, language, or formatting of the technical content.
5/6/2011	6.0	None	No changes to the meaning, language, or formatting of the technical content.
6/17/2011	6.1	Minor	Clarified the meaning of the technical content.
9/23/2011	6.1	None	No changes to the meaning, language, or formatting of the technical content.
12/16/2011	7.0	Major	Updated and revised the technical content.
3/30/2012	7.0	None	No changes to the meaning, language, or formatting of the technical content.

Date	Revision History	Revision Class	Comments
7/12/2012	7.1	Minor	Clarified the meaning of the technical content.
10/25/2012	7.2	Minor	Clarified the meaning of the technical content.
1/31/2013	7.2	None	No changes to the meaning, language, or formatting of the technical content.
8/8/2013	8.0	Major	Updated and revised the technical content.
11/14/2013	8.0	None	No changes to the meaning, language, or formatting of the technical content.
2/13/2014	8.0	None	No changes to the meaning, language, or formatting of the technical content.
5/15/2014	8.1	Minor	Clarified the meaning of the technical content.
6/30/2015	9.0	Major	Significantly changed the technical content.

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1 Introduction

The WS-Trust X.509v3 Token Enrollment Protocol Extensions are extensions of WS-Trust that are used by a system to request that a **certificate** be issued.

The communication is initiated by a requesting client who requests a new certificate, retrieval of an issued certificate, or retrieval of a server certificate. The server processes the request and generates a response based on the request type.

Sections 1.8, 2, and 3 of this specification are normative and can contain the terms MAY, SHOULD, MUST, MUST NOT, and SHOULD NOT as defined in [\[RFC2119\]](#). Sections 1.5 and 1.9 are also normative but do not contain those terms. All other sections and examples in this specification are informative.

1.1 Glossary

The following terms are specific to this document:

ASN.1: Abstract Syntax Notation One. ASN.1 is used to describe Kerberos datagrams as a sequence of components, sent in messages. ASN.1 is described in the following specifications: [\[ITUX660\]](#) for general procedures; [\[ITUX680\]](#) for syntax specification, and [\[ITUX690\]](#) for the Basic Encoding Rules (BER), Canonical Encoding Rules (CER), and Distinguished Encoding Rules (DER) encoding rules.

certificate: A certificate is a collection of attributes (1) and extensions that can be stored persistently. The set of attributes in a certificate can vary depending on the intended usage of the certificate. A certificate securely binds a public key to the entity that holds the corresponding private key. A certificate is commonly used for authentication (2) and secure exchange of information on open networks, such as the Internet, extranets, and intranets. Certificates are digitally signed by the issuing **certification authority (CA)** and can be issued for a user, a computer, or a service. The most widely accepted format for certificates is defined by the ITU-T X.509 version 3 international standards. For more information about attributes and extensions, see [\[RFC3280\]](#) and [\[X509\]](#) sections 7 and 8.

Certificate Management Messages over CMS (CMC): An internet standard for transport mechanisms for CMS [\[RFC2797\]](#).

certification authority (CA): A third party that issues public key **certificates**. Certificates serve to bind public keys to a user identity. Each user and certification authority (CA) can decide whether to trust another user or CA for a specific purpose, and whether this trust should be transitive. For more information, see [\[RFC3280\]](#).

Hypertext Transfer Protocol over Secure Sockets Layer (HTTPS): An extension of HTTP that securely encrypts and decrypts webpage requests.

security token service (STS): A web service that issues claims (2) and packages them in encrypted security tokens.

SOAP action: The HTTP request header field used to indicate the intent of the SOAP request, using a URI value. See [\[SOAP1.1\]](#) section 6.1.1 for more information.

SOAP fault: A container for error and status information within a **SOAP message**. See [\[SOAP1.2-1/2007\]](#) section 5.4 for more information.

SOAP message: An **XML** document consisting of a mandatory SOAP envelope, an optional SOAP header, and a mandatory SOAP body. See [\[SOAP1.2-1/2007\]](#) section 5 for more information.

Unicode: A character encoding standard developed by the Unicode Consortium that represents almost all of the written languages of the world. The **Unicode** standard [\[UNICODE5.0.0/2007\]](#)

provides three forms (UTF-8, UTF-16, and UTF-32) and seven schemes (UTF-8, UTF-16, UTF-16 BE, UTF-16 LE, UTF-32, UTF-32 LE, and UTF-32 BE).

Web Services Description Language (WSDL): An XML format for describing network services as a set of endpoints that operate on messages that contain either document-oriented or procedure-oriented information. The operations and messages are described abstractly and are bound to a concrete network protocol and message format in order to define an endpoint. Related concrete endpoints are combined into abstract endpoints, which describe a network service. WSDL is extensible, which allows the description of endpoints and their messages regardless of the message formats or network protocols that are used.

X.509: An ITU-T standard for public key infrastructure subsequently adapted by the IETF, as specified in [RFC3280].

XML: The Extensible Markup Language, as described in [XML1.0].

XML namespace: A collection of names that is used to identify elements, types, and attributes in XML documents identified in a URI reference [RFC3986]. A combination of XML namespace and local name allows XML documents to use elements, types, and attributes that have the same names but come from different sources. For more information, see [XMLNS-2ED].

XML schema: A description of a type of XML document that is typically expressed in terms of constraints on the structure and content of documents of that type, in addition to the basic syntax constraints that are imposed by XML itself. An XML schema provides a view of a document type at a relatively high level of abstraction.

MAY, SHOULD, MUST, SHOULD NOT, MUST NOT: These terms (in all caps) are used as defined in [RFC2119]. All statements of optional behavior use either MAY, SHOULD, or SHOULD NOT.

1.2 References

Links to a document in the Microsoft Open Specifications library point to the correct section in the most recently published version of the referenced document. However, because individual documents in the library are not updated at the same time, the section numbers in the documents may not match. You can confirm the correct section numbering by checking the [Errata](#).

1.2.1 Normative References

We conduct frequent surveys of the normative references to assure their continued availability. If you have any issue with finding a normative reference, please contact dochelp@microsoft.com. We will assist you in finding the relevant information.

[MS-WCCE] Microsoft Corporation, "[Windows Client Certificate Enrollment Protocol](#)".

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997, <http://www.rfc-editor.org/rfc/rfc2119.txt>

[RFC2797] Myers, M., Liu, X., Schaad, J., and Weinstein, J., "Certificate Management Messages Over CMS", RFC 2797, April 2000, <http://www.ietf.org/rfc/rfc2797.txt>

[RFC2986] Nystrom, M. and Kaliski, B., "PKCS#10: Certificate Request Syntax Specification", RFC 2986, November 2000, <http://www.ietf.org/rfc/rfc2986.txt>

[RFC3066] Alvestrand, H., "Tags for the Identification of Languages", BCP 47, RFC 3066, January 2001, <http://www.ietf.org/rfc/rfc3066.txt>

[RFC3852] Housley, R., "Cryptographic Message Syntax (CMS)", RFC 3852, July 2004, <http://www.ietf.org/rfc/rfc3852.txt>

[RFC5246] Dierks, T., and Rescorla, E., "The Transport Layer Security (TLS) Protocol Version 1.2", RFC 5246, August 2008, <http://www.ietf.org/rfc/rfc5246.txt>

[WSDL] Christensen, E., Curbera, F., Meredith, G., and Weerawarana, S., "Web Services Description Language (WSDL) 1.1", W3C Note, March 2001, <http://www.w3.org/TR/2001/NOTE-wsdl-20010315>

[WSSUTP] OASIS Standard, "Web Services Security UsernameToken Profile 1.0", March 2004, <http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-username-token-profile-1.0.pdf>

[WSS] OASIS, "Web Services Security: SOAP Message Security 1.1 (WS-Security 2004)", February 2006, <http://www.oasis-open.org/committees/download.php/16790/wss-v1.1-spec-os-SOAPMessageSecurity.pdf>

[WSTrust1.3Schema] OASIS Standard, "WS-Trust 1.3", <http://docs.oasis-open.org/ws-sx/ws-trust/200512/ws-trust-1.3.xsd>

[WSTrust1.3] Lawrence, K., Kaler, C., Nadalin, A., et al., "WS-Trust 1.3", March 2007, <http://docs.oasis-open.org/ws-sx/ws-trust/200512/ws-trust-1.3-os.html>

[XMLNS] Bray, T., Hollander, D., Layman, A., et al., Eds., "Namespaces in XML 1.0 (Third Edition)", W3C Recommendation, December 2009, <http://www.w3.org/TR/2009/REC-xml-names-20091208/>

[XMLSCHEMA1] Thompson, H., Beech, D., Maloney, M., and Mendelsohn, N., Eds., "XML Schema Part 1: Structures", W3C Recommendation, May 2001, <http://www.w3.org/TR/2001/REC-xmlschema-1-20010502/>

[XMLSCHEMA2] Biron, P.V., Ed. and Malhotra, A., Ed., "XML Schema Part 2: Datatypes", W3C Recommendation, May 2001, <http://www.w3.org/TR/2001/REC-xmlschema-2-20010502/>

1.2.2 Informative References

[SCEP] Nourse, A., and Vilhuber, J. Ed., "Cisco Systems' Simple Certificate Enrollment Protocol", April 2009, <http://tools.ietf.org/html/draft-nourse-scep-19>

1.3 Overview

The WS-Trust X.509v3 Token Enrollment Extensions (WSTEP) defines the token enrollment profile for WS-Trust [\[WSTrust1.3\]](#) to allow a client to request **X.509v3** certificates.

Existing **certificate authorities** support **ASN.1** formats such as PKCS#10 ([\[RFC2986\]](#)), PKCS#7 ([\[RFC3852\]](#)), or CMC ([\[RFC2797\]](#)) to encode a certificate request, and those requests are carried in an existing protocol, such as Windows Client Certificate Enrollment Protocol [\[MS-WCCE\]](#) or Cisco's SCEP ([\[SCEP\]](#)). WSTEP also carries those requests from the client to the issuer.

WSTEP provides for issuance, renewal, and delayed-issuance scenarios for X.509v3 digital certificates. The server is known in WS-Trust [\[WSTrust1.3\]](#) terminology as a **Security Token Service (STS)**.

The WS-Trust protocol [\[WSTrust1.3\]](#) definition provides the framework for the STS and for enrollment profile extensions. A typical client interacts with a STS with a request security token (RST) message. The STS responds to a client request security token message with a request security token response (RSTR) or a **SOAP fault**.

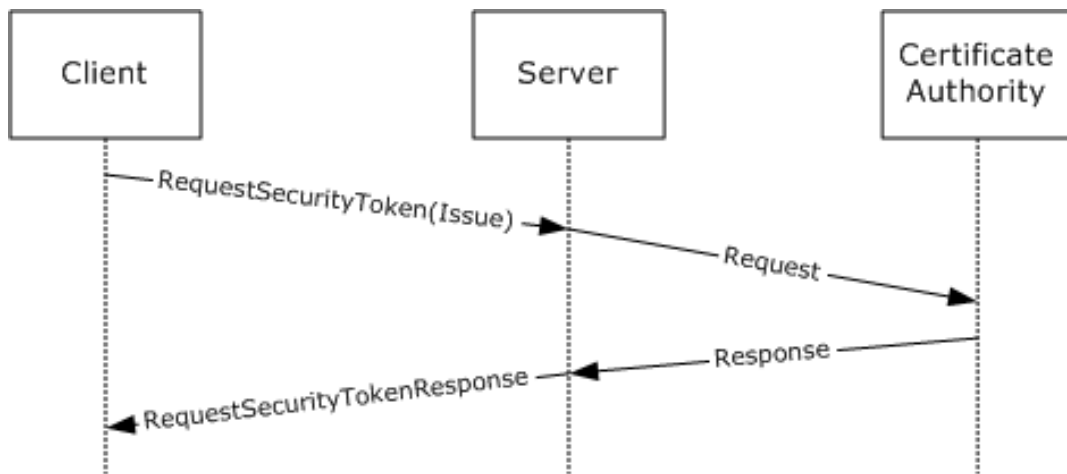


Figure 1: Typical sequence for certificate enrollment

The following figure shows a scenario in which a request cannot be satisfied immediately. In this scenario, the client makes a request, and the server reply indicates that the request is pending some other action. The client then queries the request at a later time, presumably after any conditions have been met, and receives a reply that the request was issued, rejected, or is still pending.

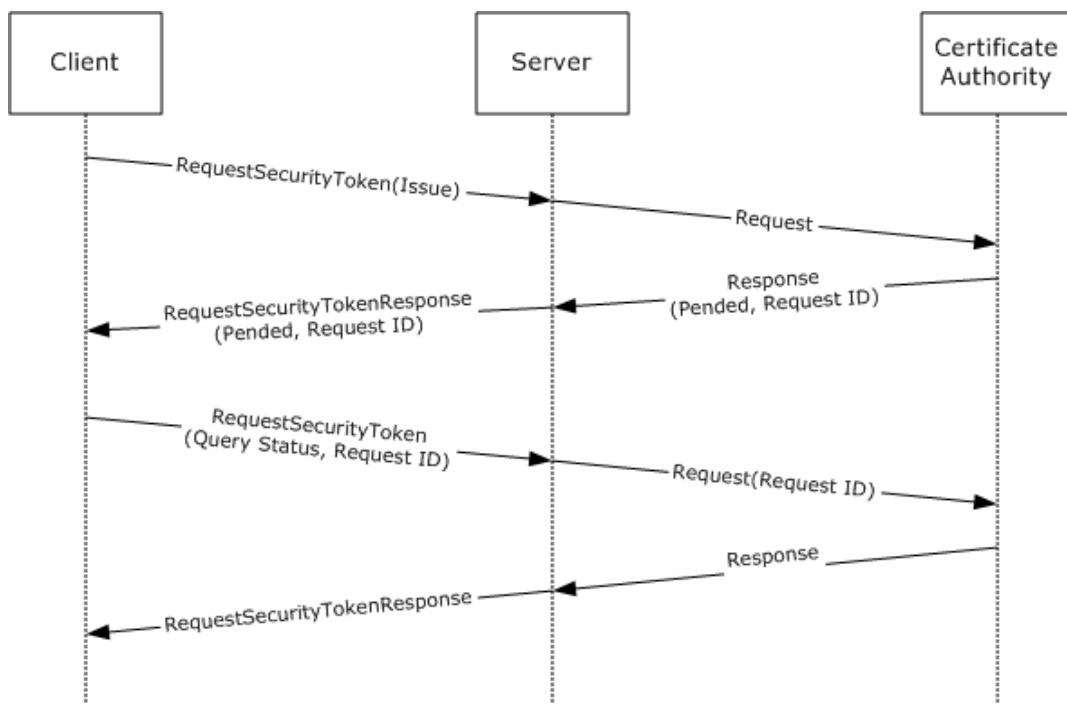


Figure 2: Typical sequence for a pended certificate enrollment request

In some circumstances, the client request may be rejected. In these instances, the STS responds with a SOAP fault. The following figure shows the typical sequence.

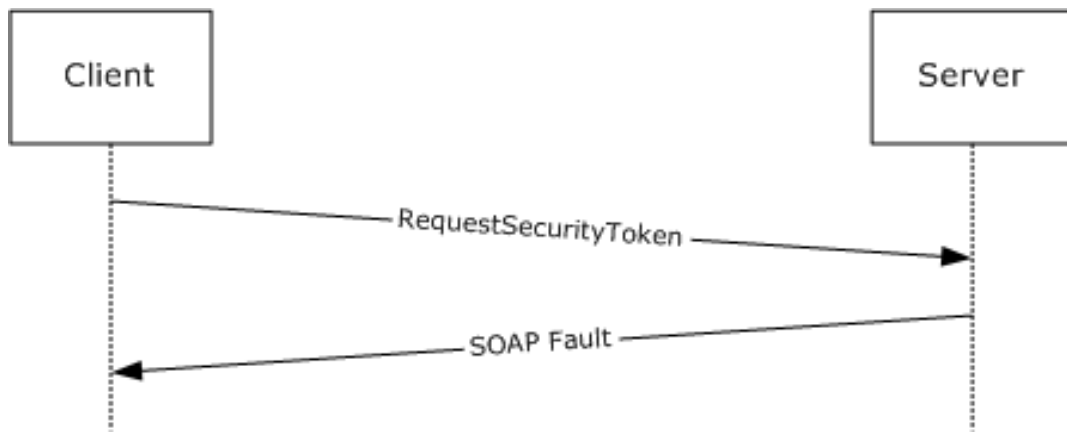


Figure 3: Typical sequence for a rejected certificate renewal request

The following figure is an example of a message exchange for a renewal request. A renewal request uses an existing certificate and requests a new lifespan. From the point of view of the WSTEP protocol, this is the same as an issue request, as the message format is unchanged.

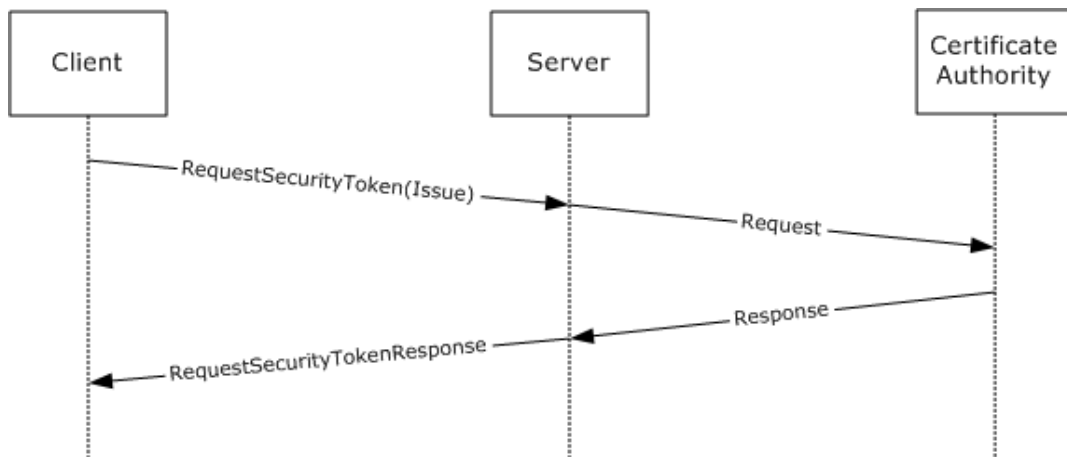


Figure 4: Typical sequence for a certificate renewal request

1.4 Relationship to Other Protocols

The following figure shows the WSTEP Protocol stack diagram.

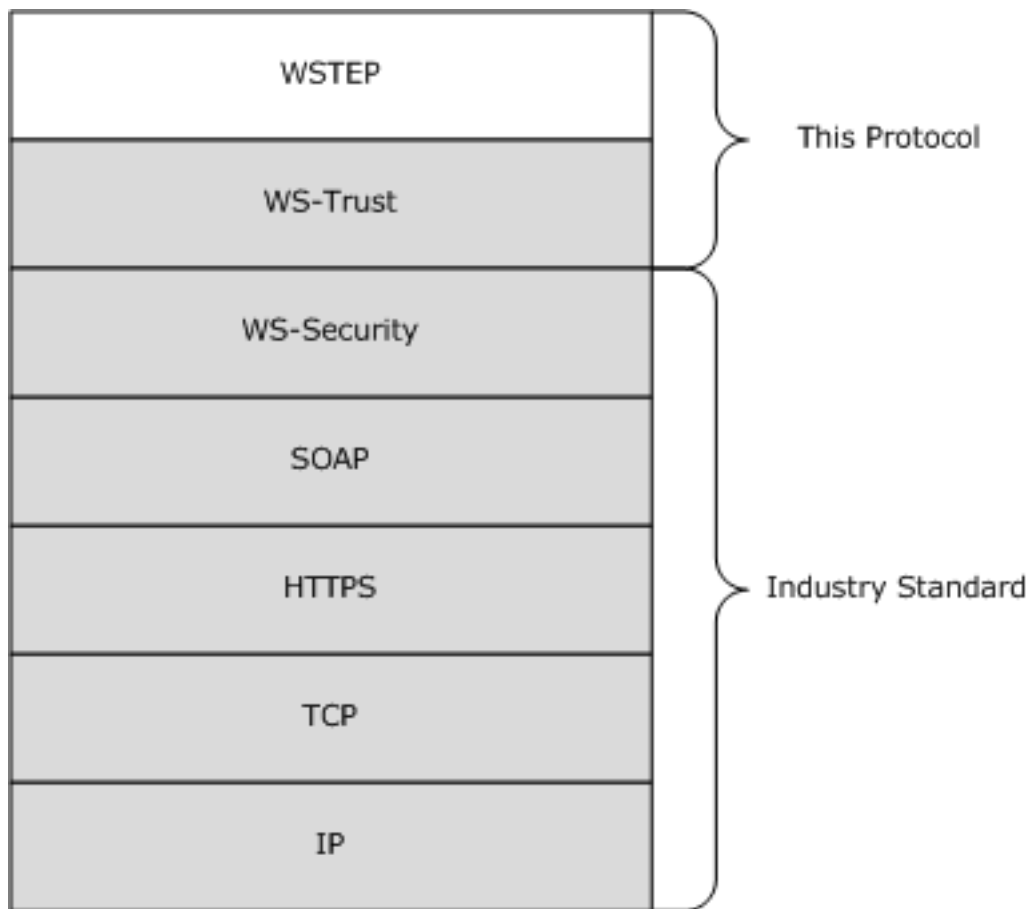


Figure 5: WSTEP Protocol stack diagram

The WSTEP protocol specification is a profile of the WS-Trust Protocol [\[WSTrust1.3\]](#) and makes use of the SOAP and **Hypertext Transfer Protocol over Secure Sockets Layer (HTTPS)** protocols for messaging and security.

1.5 Prerequisites/Preconditions

The WSTEP protocol specification facilitates the issuance of X.509v3 certificates. A server implementation of the protocol requires the functionality of a certificate authority, capable of interpreting requests in at least one of PKCS#7, PKCS#10, or **Certificate Management Messages over CMS (CMC)**.

1.6 Applicability Statement

The WSTEP protocol specification is applicable only for requests for X.509v3 certificates.

1.7 Versioning and Capability Negotiation

The WSTEP protocol specification does not include versioning and capability negotiation.

1.8 Vendor-Extensible Fields

The WSTEP protocol specification does not include any vendor-extensible fields. WSTEP adheres to the WS-Trust 1.3 [\[WSTrust1.3\]](#) provided extension points.

1.9 Standards Assignments

None.

2 Messages

2.1 Transport

SOAP version 1.2 MUST be used for messaging for the WSTEP protocol. HTTPS protocol MUST be used as the transport.

2.2 Common Message Syntax

This section contains common definitions used by this protocol. The syntax of the definitions uses the **XML schema** as defined in [\[XMLSCHEMA1\]](#) and [\[XMLSCHEMA2\]](#), and the **Web Services Description Language** as defined in [\[WSDL\]](#).

2.2.1 Namespaces

This specification defines and references various **XML** namespaces, using the mechanisms specified in [\[XMLNS\]](#). Although this specification associates a specific **XML namespace** prefix for each XML namespace that is used, the choice of any particular XML namespace prefix is implementation-specific and not significant for interoperability.

Prefixes and XML namespaces used in this specification are as follows.

Prefix	Namespace URI	Reference
xs	http://www.w3.org/2001/XMLSchema	[XMLSCHEMA1]
wst	http://docs.oasis-open.org/ws-sx/ws-trust/200512	[WSTrust1.3]
auth	http://schemas.xmlsoap.org/ws/2006/12/authorization	[XMLSCHEMA1]
wsu	http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd	
wsse	http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd	
wstep	http://schemas.microsoft.com/windows/pki/2009/01/enrollment	This document

2.2.2 Messages

None.

2.2.3 Elements

This specification does not define any common XML schema element definitions.

2.2.4 Complex Types

This specification does not define any common XML schema complex type definitions.

2.2.5 Simple Types

The WSTEP protocol specification does not define any common XML schema simple type definitions.

2.2.6 Attributes

The WSTEP protocol specification does not define any common XML schema attribute definitions.

2.2.7 Groups

The WSTEP protocol specification does not define any common XML schema group definitions.

2.2.8 Attribute Groups

The WSTEP protocol specification does not define any common XML schema attribute group definitions.

3 Protocol Details

The client side of this protocol is a simple pass-through. No additional timers or other state is required on the client side of this protocol. Calls made by the higher-layer protocol or application are passed directly to the transport layer, and the results returned by the transport are passed directly back to the higher-layer protocol or application.

This section addresses the message processing model for the protocol. It includes related information required by an implementation to successfully send and consume protocol messages.

3.1 SecurityTokenService Server Details

The **SecurityTokenService** hosts a message endpoint that receives **RequestSecurityToken** messages. When received, the server processes the client request and sends it to the certificate authority. Upon receiving a response from the certificate authority, a response is generated, and the server sends either a **RequestSecurityTokenResponse** message or a SOAP fault. When the message has been sent to the client, the server returns to the waiting state.



Figure 6: Security token service state model

The items of information that are communicated between the server and the certificate authority are specified in this section, but the method of communication used, including timeout and error handling (local API, local remote procedure call (RPC), or some other protocol) is not specified.

The certificate authority MAY have additional requirements that MUST be met in order to issue an X509v3 Certificate, such as manager approval, payment processing, or validation of request information. In these instances, a certificate authority response indicating the issuance is pending.

3.1.1 Abstract Data Model

A server supporting the WSTEP protocol maintains a relationship to an issuer which processes messages submitted by the server. When communicating with requestors, a server can support a variety of languages.

Issuer: An address of a certificate authority (CA). The format of the stored address is specific to the implementation and to the form of communication used between the Issuer and the Server.

SupportedLanguages: A list of language identifiers supported by the server. The set of languages are of type xml:lang and defined in [\[RFC3066\]](#).

DefaultLanguage: The default language for the server. DefaultLanguage is of type xml:lang, and the set of supported languages is defined in [\[RFC3066\]](#).

3.1.1.1 Authentication

The WS-Trust X509v3 Enrollment Extensions use the authentication provisions in WS-Security ([\[WSS\]](#)) for the X509v3 Security Token issuer to authenticate the X509v3 Security Token requestor. This section defines the schema used to express the credential descriptor for each supported credential type.

3.1.1.1.1 Kerberos Authentication

Authentication using Kerberos is done at the transport layer.

3.1.1.1.2 X.509v3 Certificate Authentication

Authentication using X509v3 certificates is done at the transport level using Transport Level Security (TLS) 1.2 as defined in [\[RFC5246\]](#).

3.1.1.1.3 Username and Password Authentication

The username and password credential is provided in a request message using the WS-Security Username Token Profile 1.0. The username is provided as defined in section 3.1 of the Ws-Security document [\[WSSUTP\]](#).

3.1.1.1.4 No (Anonymous) Authentication

If no authentication is provided at either the transport layer or the message layer, the request is considered to be anonymous. Anonymous authentication is supported only for renewal requests, where the signature from the existing certificate on the request object serves as authentication for the X509v3 Security Token requestor.

3.1.2 Timers

None.

3.1.3 Initialization

The *SupportedLanguages* object MUST be initialized with the set of languages that the server supports.

The *DefaultLanguage* parameter MUST be initialized with the language that is to be used by the server when a request does not define a language preference, or the preference is not in *SupportedLanguages*.<1>

3.1.4 Message Processing Events and Sequencing Rules

Operation	Description
wst:RequestSecurityToken2	The wst:RequestSecurityToken2 operation is the sole operation in the WSTEP protocol. It provides the mechanism for certificate enrollment requests, retrieval of pending certificate status, and the request of the server key exchange certificate. The wst:RequestSecurityToken2 operation is defined in WS-Trust 1.3 [WSTrust1.3] .

3.1.4.1 wst:RequestSecurityToken2

The wst:RequestSecurityToken2 operation provides the mechanism for certificate enrollment requests, retrieval of pending certificate status, and the request of the server key exchange certificate. The wst:SecurityTokenService port and wst:RequestSecurityToken2 operation are defined in the [\[WSTrust1.3\]](#) WSDL wsdl:portType definition.

```
<wsdl:operation name="RequestSecurityToken2">
  <wsdl:input message="wst:RequestSecurityTokenMsg" />
  <wsdl:output message="wst:RequestSecurityTokenResponseCollectionMsg" />
</wsdl:operation>
```

WSTEP makes use of the wst:RequestSecurityToken2 operation. The wst:RequestSecurityToken operation defined in the SecurityTokenService operation is not used. The **wst:RequestSecurityTokenMsg** message consists of a single object definition: the client request. The client request is made using the acceptable SOAP actions as defined in section [3.1.4.2](#) and RequestType values, as defined in section [3.1.4.1.2.7](#).

3.1.4.1.1 Messages

The following WSDL message definitions are specific to this operation.

3.1.4.1.1.1 wst:RequestSecurityTokenMsg

The wst:RequestSecurityTokenMsg is an incoming message, and is defined in WS-Trust 1.3 [\[WSTrust1.3\]](#) WSDL.

wst:RequestSecurityToken: An instance of a **wst:RequestSecurityTokenType** complex type as defined in section [3.1.4.1.3.3](#). The **wst:RequestSecurityToken** element defines the client request and the required information for it to be processed.

3.1.4.1.1.2 wst:RequestSecurityTokenResponseCollectionMsg

The wst:RequestSecurityTokenResponseCollectionMsg is an outgoing message, and is defined in WS-Trust 1.3 [\[WSTrust1.3\]](#) WSDL.

wst:RequestSecurityTokenResponseCollectionMsg: An instance of a **wst:RequestSecurityTokenResponseCollection** element as defined in section [3.1.4.1.2.6](#). This element contains the results of the client request.

3.1.4.1.2 Elements

3.1.4.1.2.1 wstep:CertificateEnrollmentWSDetail

The **wstep:CertificateEnrollmentWSDetail** element is used to convey additional information to a client as part of the SOAP fault structure when a server returns a SOAP fault.

```
<xs:element name="CertificateEnrollmentWSDetail" nillable="true" type="wstep:CertificateEnrollmentWSDetailType" />
```

wstep:CertificateEnrollmentWSDetail: An instance of a `<wstep:CertificateEnrollmentWSDetailType>` as defined in section [3.1.4.1.3.7](#). If there is no additional information, the **wstep:CertificateEnrollmentWSDetail** SHOULD be omitted in the SOAP fault.

3.1.4.1.2.2 DispositionMessage

```
<xs:element name="DispositionMessage" type="wstep:DispositionMessageType" nillable="true" />
```

DispositionMessage: An instance of a `DispositionMessageType` object as defined in section [3.1.4.1.3.1](#).

3.1.4.1.2.3 wst:KeyExchangeToken

The `<wst:KeyExchangeToken>` element is defined in WS-Trust 1.3 [\[WSTrust1.3\]](#) section 8.4.

wst:KeyExchangeToken: The `wst:KeyExchangeToken` element provides a key exchange token that can be used in certificate enrollment requests that include the private key.

3.1.4.1.2.4 RequestID

```
<xs:element name="RequestID" type="xs:string" nillable="true"/>
```

RequestID: A string identifier used to identify a request.

3.1.4.1.2.5 wst:RequestSecurityToken

The `<wst:RequestSecurityToken>` element is defined in WS-Trust 1.3 [\[WSTrust1.3\]](#), section 3.1.

wst:RequestSecurityToken: An instance of a **wst:RequestSecurityTokenType** object as specified in section [3.1.4.1.3.3](#).

3.1.4.1.2.6 RequestSecurityTokenResponseCollection

The `RequestSecurityTokenResponseCollection` is defined in WS-Trust 1.3 [\[WSTrust1.3\]](#), section 3.2.

RequestSecurityTokenResponseCollection: An instance of a **wst:RequestSecurityTokenResponseCollectionType** object as specified in section [3.1.4.1.3.5](#).

3.1.4.1.2.7 wst:RequestType

The `<wst:RequestType>` element is defined in [\[WSTrust1.3\]](#) section 3.1.

wst:RequestType: An instance of a <wst:RequestTypeOpenEnum> object as defined in [WSTrust1.3] XML schema definition(XSD).

The <wst:RequestType> MUST have one of the following values:

```
"http://docs.oasis-open.org/ws-sx/ws-trust/200512/Issue"  
"http://schemas.microsoft.com/windows/pki/2009/01/enrollment/QueryTokenStatus"  
"http://docs.oasis-open.org/ws-sx/ws-trust/200512/KET"
```

If the <wst:RequestType> has any other value, the server MUST respond with a SOAP fault.

3.1.4.1.2.8 wst:TokenType

The <TokenType> element is defined in [\[WSTrust1.3\]](#), section 3.1.

wst:TokenType: For the X.509 enrollment extension to WS-Trust, the <wst:tokentype> element MUST be http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-1.0#X509v3.

3.1.4.1.3 Complex Types

The following XML schema complex type definitions are specific to this operation.

3.1.4.1.3.1 DispositionMessageType

The DispositionMessageType is an extension to the string type that allows an attribute definition of the language for the string. The DispositionMessageType is used to provide additional information about the server processing.

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

xs:string: The string element contains the literal string disposition message returned from the server. The string element contains an xml:lang attribute that defines the language for the string. The language SHOULD be provided for each string element instance.

xml:lang: The language reference xml:lang, indicating the natural or formal language the string element content is written in.

3.1.4.1.3.2 wst:RequestedSecurityTokenType

The wst:RequestedSecurityTokenType is defined in WS-Trust XML schema definition (XSD) [\[WSTrust1.3Schema\]](#).

```
<xs:complexType name="RequestedSecurityTokenType">  
  <xs:sequence>  
    <xs:any namespace="##any" processContents="lax" />  
  </xs:sequence>  
</xs:complexType>
```

The WSTEP extends wst: RequestedSecurityTokenType with two additional elements.

```
<xs:element ref="wsse:BinarySecurityToken" />
<xs:element ref="wsse:SecurityTokenReference" />
```

wsse:BinarySecurityToken: The wsse:BinarySecurityToken element contains the issued certificate. The issued certificate follows the encoding and data structure defined in [\[MS-WCCE\]](#) section 2.2.2.8.

wsse:SecurityTokenReference: A URI reference used to indicate where a pending Certificate Request can be retrieved. The server MUST provide its own URI as the value of the <wsse:BinarySecurityTokenReference:Reference> element as specified in [\[WSTrust1.3\]](#) section 4.2.

3.1.4.1.3.3 wst:RequestSecurityTokenType

The **wst:RequestSecurityTokenType** complex type contains the elements for the security token request in the RequestSecurityTokenMsg message. It is the client-provided object for a certificate enrollment request. **wst:RequestSecurityTokenType** is defined in the WS-Trust [\[WSTrust1.3\]](#) XML schema definition (XSD).

```
<xs:complexType name="RequestSecurityTokenType">
  <xs:annotation>
    <xs:documentation>
      Actual content model is non-deterministic, hence wildcard. The following shows intended
      content model:
      <xs:element ref='wst:TokenType' minOccurs='0' />
      <xs:element ref='wst:RequestType' />
      <xs:element ref='wsp:AppliesTo' minOccurs='0' />
      <xs:element ref='wst:Claims' minOccurs='0' />
      <xs:element ref='wst:Entropy' minOccurs='0' />
      <xs:element ref='wst:Lifetime' minOccurs='0' />
      <xs:element ref='wst:AllowPostdating' minOccurs='0' />
      <xs:element ref='wst:Renewing' minOccurs='0' />
      <xs:element ref='wst:OnBehalfOf' minOccurs='0' />
      <xs:element ref='wst:Issuer' minOccurs='0' />
      <xs:element ref='wst:AuthenticationType' minOccurs='0' />
      <xs:element ref='wst:KeyType' minOccurs='0' />
      <xs:element ref='wst:KeySize' minOccurs='0' />
      <xs:element ref='wst:SignatureAlgorithm' minOccurs='0' />
      <xs:element ref='wst:Encryption' minOccurs='0' />
      <xs:element ref='wst:EncryptionAlgorithm' minOccurs='0' />
      <xs:element ref='wst:CanonicalizationAlgorithm' minOccurs='0' />
      <xs:element ref='wst:ProofEncryption' minOccurs='0' />
      <xs:element ref='wst:UseKey' minOccurs='0' />
      <xs:element ref='wst:SignWith' minOccurs='0' />
      <xs:element ref='wst:EncryptWith' minOccurs='0' />
      <xs:element ref='wst:DelegateTo' minOccurs='0' />
      <xs:element ref='wst:Forwardable' minOccurs='0' />
      <xs:element ref='wst:Delegatable' minOccurs='0' />
      <xs:element ref='wsp:Policy' minOccurs='0' />
      <xs:element ref='wsp:PolicyReference' minOccurs='0' />
      <xs:any namespace='##other' processContents='lax' minOccurs='0' maxOccurs='unbounded'
    />
  </xs:documentation>
</xs:annotation>
  <xs:sequence>
    <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded" />
  </xs:sequence>
  <xs:attribute name="Context" type="xs:anyURI" use="optional" />
  <xs:anyAttribute namespace="##other" processContents="lax" />
</xs:complexType>
```

WSTEP extends <wst:RequestSecurityTokenType> with the following elements:

```

<xs:element ref="wsse:BinarySecurityToken" minOccurs="0"
maxOccurs="1" />
<xs:element ref="auth:AdditionalContext" minOccurs="0"
maxOccurs="1" />
<xs:element ref="wst:RequestKET" minOccurs="0" maxOccurs="1" />
<xs:element ref="wstep:RequestID" minOccurs="0" maxOccurs="1" />

```

Only the elements specified below are used in WSTEP. Any element received that is not specified below SHOULD be ignored.

wst:TokenType: Refers to the wst:TokenType definition in section [3.1.4.1.2.8](#).

wst:RequestType: Refers to the wst:RequestType definition in section [3.1.4.1.2.7](#). The wst:RequestType is used to identify the type of the security token request.

wst:RequestKET: Used when requesting a key exchange token as defined in [WSTrust1.3] section 8.4.

wsse:BinarySecurityToken: Provides the DER ASN.1 representation of the certificate request. The type of token is defined by the wst:TokenType element. For the X.509 enrollment extension the wst:TokenType MUST be specified as in section 3.1.4.1.2.8. The certificate request follows the formatting from [\[MS-WCCE\]](#) section 2.2.2.6. The EncodingType attribute of the wsse:BinarySecurityToken element MUST be set to base64Binary.

auth:AdditionalContext: The auth:AdditionalContext element is used to provide extra information in a wst:RequestSecurityToken message. It is an optional element, and SHOULD be omitted if there is no extra information to be passed.

wstep:RequestID: An instance of **wstep:RequestID** as specified in section [3.1.4.1.2.4](#).

WSTEP extends <wst:RequestSecurityTokenType> with an additional attribute:

```

<xs:attribute name="PreferredLanguage" type="xs:language"
use="optional" />

```

Only the attribute specified below is used in WSTEP. Any attribute received that is not specified below SHOULD be ignored.

wstep:PreferredLanguage: The **wstep:PreferredLanguage** attribute defines the preferred language to be used in a server response.

3.1.4.1.3.4 wst:RequestSecurityTokenResponseType

The wst:RequestSecurityTokenResponseType contains the elements that are part of a server response to a wst:RequestSecurityToken message. wst:RequestSecurityTokenResponseType is defined in the WS-Trust [\[WSTrust1.3\]](#) XML schema definition (XSD).

```

<xs:complexType name="RequestSecurityTokenResponseType">
  <xs:annotation>
    <xs:documentation>
      Actual content model is non-deterministic, hence wildcard. The following shows intended
      content model:
      <xs:element ref='wst:TokenType' minOccurs='0' />
      <xs:element ref='wst:RequestType' />
      <xs:element ref='wst:RequestedSecurityToken' minOccurs='0' />
      <xs:element ref='wsp:AppliesTo' minOccurs='0' />
      <xs:element ref='wst:RequestedAttachedReference' minOccurs='0' />
      <xs:element ref='wst:RequestedUnattachedReference' minOccurs='0' />
      <xs:element ref='wst:RequestedProofToken' minOccurs='0' />
    </xs:documentation>
  </xs:annotation>
</xs:complexType>

```

```

<xs:element ref='wst:Entropy' minOccurs='0' />
<xs:element ref='wst:Lifetime' minOccurs='0' />
<xs:element ref='wst:Status' minOccurs='0' />
<xs:element ref='wst:AllowPostdating' minOccurs='0' />
<xs:element ref='wst:Renewing' minOccurs='0' />
<xs:element ref='wst:OnBehalfOf' minOccurs='0' />
<xs:element ref='wst:Issuer' minOccurs='0' />
<xs:element ref='wst:AuthenticationType' minOccurs='0' />
<xs:element ref='wst:Authenticator' minOccurs='0' />
<xs:element ref='wst:KeyType' minOccurs='0' />
<xs:element ref='wst:KeySize' minOccurs='0' />
<xs:element ref='wst:SignatureAlgorithm' minOccurs='0' />
<xs:element ref='wst:Encryption' minOccurs='0' />
<xs:element ref='wst:EncryptionAlgorithm' minOccurs='0' />
<xs:element ref='wst:CanonicalizationAlgorithm' minOccurs='0' />
<xs:element ref='wst:ProofEncryption' minOccurs='0' />
<xs:element ref='wst:UseKey' minOccurs='0' />
<xs:element ref='wst:SignWith' minOccurs='0' />
<xs:element ref='wst:EncryptWith' minOccurs='0' />
<xs:element ref='wst:DelegateTo' minOccurs='0' />
<xs:element ref='wst:Forwardable' minOccurs='0' />
<xs:element ref='wst:Delegatable' minOccurs='0' />
<xs:element ref='wsp:Policy' minOccurs='0' />
<xs:element ref='wsp:PolicyReference' minOccurs='0' />
<xs:any namespace='##other' processContents='lax' minOccurs='0' maxOccurs='unbounded'
/>
</xs:documentation>
</xs:annotation>
<xs:sequence>
  <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded" />
</xs:sequence>
<xs:attribute name="Context" type="xs:anyURI" use="optional" />
<xs:anyAttribute namespace="##other" processContents="lax" />
</xs:complexType>

```

WSTEP extends the wst:RequestSecurityTokenResponseType with the following elements:

```

<xs:element ref="wstep:DispositionMessage" />
<xs:element ref="wsse:BinarySecurityToken" minOccurs="0" maxOccurs="1" />
<xs:element ref="wstep:RequestID" minOccurs="0" maxOccurs="1" />
<xs:element ref="wst:KeyExchangeToken" minOccurs="0" maxOccurs="1" />
/>

```

Only the elements documented as follows are used by WSTEP. Any element received that is not documented as follows SHOULD be ignored.

wst:TokenType: Refers to the TokenType definition in section [3.1.4.1.2.8](#).

wstep:DispositionMessage: Refers to the definition in section [3.1.4.1.2.2](#). The wstep:DispositionMessage element is used to convey any additional server disposition information as part of the response message.

wsse:BinarySecurityToken: Refers to the wsse:BinarySecurityToken definition in section [3.1.4.1.3.2](#).

wst: KeyExchangeToken: Refers to the wst:KeyExchangeToken definition in section [3.1.4.1.2.3](#).

wst:RequestedSecurityToken: An instance of a wst:RequestedSecurityTokenType object as defined in section 3.1.4.1.3.2.

wstep:RequestID: An instance of a **wstep:RequestID** as defined in section [3.1.4.1.2.4](#) that conveys the request identifier of the originating request.

3.1.4.1.3.5 wst:RequestSecurityTokenResponseCollectionType

The <wst:RequestSecurityTokenResponseCollectionType> is defined in the [\[WSTrust1.3\]](#) XML schema definition (XSD) as a collection of one or more <wst:RequestSecurityTokenResponse> elements. The WS-Trust X.509v3 Token Enrollment Extensions further constrain the [WSTrust1.3] definition and the <wst:RequestSecurityTokenResponseCollection> collection MUST contain at most one <wst:RequestSecurityTokenResponse> element.

```
<xs:complexType name="RequestSecurityTokenResponseCollectionType">
  <xs:annotation>
    <xs:documentation>
      The <wst:RequestSecurityTokenResponseCollection> element (RSTRC) MUST be used to return a
      security token or response to a security token request on the final
      response.</xs:documentation>
    </xs:annotation>
  <xs:sequence>
    <xs:element ref="wst:RequestSecurityTokenResponse" minOccurs="1" maxOccurs="unbounded" />
  </xs:sequence>
  <xs:anyAttribute namespace="##other" processContents="lax" />
</xs:complexType>
```

wst:RequestSecurityTokenResponse: An instance of a [wst:RequestSecurityTokenResponseType](#) object. The <wst:RequestSecurityTokenResponseCollectionType> MUST contain only one <RequestSecurityTokenResponse> element.

3.1.4.1.3.6 wst:RequestTypeEnum

The <wst:RequestTypeEnum> is defined in WS-Trust [\[WSTrust1.3\]](#) XML schema definition (XSD). WSTEP defines the following values for <wst:RequestTypeEnum>.

```
"http://schemas.microsoft.com/windows/pki/2009/01/enrollment/QueryTokenStatus"
```

WSTEP makes use of the Key Exchange Token request type defined in [WSTrust1.3] section 10:

```
"http://docs.oasis-open.org/ws-sx/ws-trust/200512/KET"
```

and the issue request type defined in [WSTrust1.3] XML Schema Definition (XSD) :

```
"http://docs.oasis-open.org/ws-sx/ws-trust/200512/Issue"
```

3.1.4.1.3.7 wstep:CertificateEnrollmentWSDetailType

The <wstep:CertificateEnrollmentWSDetailType> contains additional information pertaining to error conditions.

```
<xs:complexType name="CertificateEnrollmentWSDetailType">
  <xs:sequence>
    <xs:element minOccurs="0" maxOccurs="1" name="BinaryResponse" nillable="true"
      type="xs:string" />
    <xs:element minOccurs="0" maxOccurs="1" name="ErrorCode" nillable="true" type="xs:int" />
    <xs:element minOccurs="0" maxOccurs="1" name="InvalidRequest" nillable="true"
      type="xs:boolean" />
    <xs:element minOccurs="0" maxOccurs="1" name="RequestID" type="xs:string"
      nillable="true" />
  </xs:sequence>
</xs:complexType>
```

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

wstep:BinaryResponse: The wstep:BinaryResponse element is used to provide a response if the Issuer generates one. If there is no response to provide, the wstep:BinaryResponse element MUST be nil.

wstep:ErrorCode: An integer value representing a server error. If there is no error to provide, wstep:ErrorCode MUST be specified as nil.

wstep:InvalidRequest: If the request is denied by the Issuer the server MUST return true. For other errors the wstep:InvalidRequest SHOULD be false.

wstep:RequestID: If the Issuer provides a wstep:RequestID to the server, it MUST be provided to a client. If no wstep:RequestID is provided by the Issuer, the wstep:RequestID element should be specified as nil.

3.1.4.1.4 Attributes

There are no attributes that are specific to this operation.

3.1.4.2 Processing Rules

An incoming **SOAP message** MUST be processed to evaluate the **SOAP actions** and authentication information.

If the user is authenticated successfully using the provided authentication information, message processing MUST continue, and the authentication information SHOULD be provided to the Issuer. If the authentication fails, the server MUST respond with a SOAP fault.

If the SOAP action is "http://schemas.microsoft.com/windows/pki/2009/01/enrollment/RST/wstep" the server must follow the Request Security Token Processing Rules per section [3.1.4.2.1](#).

If the SOAP action is "http://docs.oasis-open.org/ws-sx/ws-trust/200512/RST/KET" the server must follow the Key Exchange Token Processing Rules per section [3.1.4.2.2](#).

If any other SOAP action is defined, the server SHOULD respond with a SOAP fault.

3.1.4.2.1 WSTEP Action: Request Security Token Processing Rules

A <wst:RequestSecurityTokenMsg> MUST contain a <wst:RequestType> element as defined in section [3.1.4.1.2.7](#). If the <wst:RequestType> element is absent, nil, or undefined, the server MUST respond with a SOAP fault.

If a **wstep:PreferredLanguage** attribute is not present in a <RequestSecurityTokenType> object, or the value is not in SupportedLanguages, the server SHOULD use DefaultLanguage.

If the <wst:RequestType> is "http://docs.oasis-open.org/ws-sx/ws-trust/200512/Issue", the server MUST process the request per section [3.1.4.2.1.1](#).

If the <wst:RequestType> is "http://schemas.microsoft.com/windows/pki/2009/01/enrollment/QueryTokenStatus" the server MUST process the request per section [3.1.4.2.1.2](#).

If the <wst:RequestType> is any other value, the server MUST respond with a SOAP fault.

3.1.4.2.1.1 New and Renewal Request Processing

A **wst:RequestSecurityToken** message with a **wst:RequestType** value of "http://docs.oasis-open.org/ws-sx/ws-trust/200512/Issue" is used for the purposes of issuing an X.509v3 certificate or for renewal of an existing X.509v3 certificate.

For this type of message, a server has additional syntax constraints on the request message.

wsse:BinarySecurityToken: If the **wsse:BinarySecurityToken** element is absent or undefined, the server MUST respond with a SOAP fault.

wstep:RequestID: If the **wstep:RequestID** element is present and defined, the server SHOULD ignore it.

The server MUST provide the **wsse:BinarySecurityToken** to the Issuer and SHOULD provide the **auth:AdditionalContext** (see section [3.1.4.1.3.3](#)) to the Issuer.

If the Issuer responds with an error, the server MUST respond with a SOAP fault. If the Issuer indicates the issuance is pending, the server MUST use the Issuer response to generate a pending **wst:RequestSecurityTokenResponseCollectionMsg** message. If the Issuer responds with an issued certificate, the server MUST respond with a **wst:RequestSecurityTokenResponseCollectionMsg** message providing the issued certificate.

3.1.4.2.1.2 QueryTokenStatus Request Processing

A **wst:RequestSecurityToken** message with a **<wst:RequestType>** of "http://schemas.microsoft.com/windows/pki/2009/01/enrollment/QueryTokenStatus" is used to retrieve an issued certificate or check the status of a certificate request that was pending.

For this type of message, the server has additional syntax constraints on the request message.

The **wstep:RequestID** element is a null-terminated **Unicode** string that contains a certificate request identifier (as defined in section [3.1.4.1.2.4](#)). If the **<wstep:RequestID>** element is absent, defined as nil, or contains no value the server MUST return a SOAP fault.

The server MUST provide the **wstep:RequestID** to the Issuer.

If the Issuer responds with an error, the server MUST respond with a SOAP fault. If the Issuer indicates the issuance is pending, the server MUST use the Issuer response to generate a pending **wst:RequestSecurityTokenResponseCollectionMsg** message. If the Issuer responds with an issued certificate, the server MUST respond with a **wst:RequestSecurityTokenResponseCollectionMsg** message providing the issued certificate.

3.1.4.2.2 KET Action: Request Security Token Processing Rules

A **wst:RequestSecurityTokenMsg** MUST contain a **<wst:RequestType>** element as defined in section [3.1.4.1.2.7](#). If the **<wst:RequestType>** element is absent, nil, or undefined, the server MUST respond with a SOAP fault.

If the **<wst:RequestType>** is "http://docs.oasis-open.org/ws-sx/ws-trust/200512/KET" the server MUST process the request per section [3.1.4.2.2.1](#).

If the **<wst:RequestType>** is any other value, the server MUST respond with a SOAP fault.

3.1.4.2.2.1 Key Exchange Token Request Processing

A **RequestSecurityToken** message of **wst:RequestType** of "http://docs.oasis-open.org/ws-sx/ws-trust/200512/KET" is used to retrieve the Key Exchange Token.

For this type of message, a server has additional syntax constraints on the **wst:RequestSecurityTokenMsg** message.

If the <wst:RequestKET> element is absent, the server MUST return a SOAP fault.

The server requests the Key Exchange Token from the issuer. If the issuer responds with an error, the server MUST respond with a SOAP fault. Otherwise, the server uses the Issuer response to generate a **wst:RequestSecurityTokenResponseCollectionMsg** message.

The <wst:RequestSecurityTokenResponse> element in the server response follows the [\[WSTrust1.3\]](#) definition in section 8, but for key exchange in the WSTEP protocol, the <wst:KeyExchangeToken> element MUST be present, and provides the key exchange token provided from the Issuer.

3.1.5 Timer Events

None.

3.1.6 Other Local Events

None.

4 Protocol Examples

4.1 RequestSecurityToken Request/Response Message Sequence

In the following message sequence, the username/password authentication headers have been included in the message sequences for clarity.

4.1.1 Standard Certificate Request

4.1.1.1 RequestSecurityToken Message (Issue Request)

```
<s:Envelope xmlns:a="http://www.w3.org/2005/08/addressing"
xmlns:s="http://www.w3.org/2003/05/soap-envelope">
  <s:Header>
    <a:Action s:mustUnderstand="1">
http://schemas.microsoft.com/windows/pki/2009/01/enrollment/RST/wstep</a:Action>
    <a:MessageID>urn:uuid:b5d1a601-5091-4a7d-b34b-5204c18b5919</a:MessageID>
    <a:ReplyTo>
    <a:Address>http://www.w3.org/2005/08/addressing/anonymous</a:Address>
    </a:ReplyTo>
  </s:Header>
  <s:Body xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema">
    <RequestSecurityToken xmlns="http://docs.oasis-open.org/ws-sx/ws-trust/200512">
    <TokenType>http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-
1.0#X509v3</TokenType>
    <RequestType>http://docs.oasis-open.org/ws-sx/ws-trust/200512/Issue</RequestType>
    <BinarySecurityToken EncodingType="http://docs.oasis-open.org/wss/2004/01/
oasis-200401-wss-wssecurity-secext-1.0.xsd#base64binary"
ValueType="http://docs.oasis-open.org/wss/2004/01/
oasis-200401-wss-wssecurity-secext-1.0.xsd#PKCS7"
xmlns="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-
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4.1.1.2 Server RequestSecurityToken Response

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cz1jZXJ0aWZpY2F0aW9uQXV0aG9yaXR5MB0GA1UdDgQWBRRq9uVvKHZBYbq+35qDh
PiNkw8V7ejAObGNVHQ8BAf8EBAMCBaAwawYDVR0RBGQwYqa3BgorBgEEAYI3FAID
oCkMJ2FiYn1AZDktMTM1MUMwNDA2QS5udHRlc3QubWljcm9zb2Z0LmNvbYEnYWJi
eUBEOS0xMzUxQzA0MDZBLk5UVEVTVc5NSUNST1NPR1QuQ09NMIHrBgNVHR8EgeMw
geAwgd2ggdggdeGgdRszGFwOi8vL0NOPUZCX0VudFN1YkNBLENOPTktMTM1MUMw
NDA3QSxDTj1DRFAsQ049UHVibGljJTlws2V5JTlWU2Vydm1jZXMsQ049U2Vydm1j
ZXMsQ049Q29uZm1ndXJhdG1vbixEQz1kOS0xMzUxQzA0MDZBLERDPW50dGVzdCxE
Qz1taWNyb3NvZnQsREM9Y29tP2N1cnRpZmljYXRlUmV2b2NhdG1vbixkxpc3Q/YmFz
ZT9vYmplY3RDbGFzcz1jUkxEaXN0cmliZXJpb25Qb2ludDAfBgNVHSMEGDAWgBSf
t42RgtEFHdAx4j3213qBdeVcyDapBgNVHSUEIjAgBgorBgEEAYI3CgMEBggrBgEF
BQcDBAYIKwYBBQUHAwIwDQYJKoZIhvcNAQEFBQADggEBAMC53cnFMKGmiFPiRbDo
U4XUoiJnpyM3+Bs+HzihMCRnJdEWh23igwaeXvZcdWejMvuH2xp9qOfLwdOcETH2
Gt9RyJ4Dv/gt1vvaTsbDx10n0fKsH4mAqS6LummQuNBttU0pHJaWb7gqnDhA9gj2
h6HFvX9jhWfDkMovsxbTRWNOAeUx9ovbMgqDlorxeBLG2pkyy26kOXTywsdlc/gQ
f58E3pmc9b3e2QcPPQvanmyOkFW/LnUYtpceTi6kGVLScolqb/984aUeni/Q6G7M
SK4XODae637doX6KZx7pWS4cBUZnhlXkWagWmwzDpAntale19oMjB+jWw0V3Pzn xTk=</BinarySecurityToken>
</RequestedSecurityToken>
<RequestID
xmlns="http://schemas.microsoft.com/windows/pki/2009/01/enrollment">61</RequestID>
</RequestSecurityTokenResponse>
</RequestSecurityTokenResponseCollection>
</s:Body>
</s:Envelope>
```

4.1.2 Key Exchange Token Request

4.1.2.1 Client Exchange Token Request

```
<s:Envelope xmlns:a="http://www.w3.org/2005/08/addressing"
xmlns:s="http://www.w3.org/2003/05/soap-envelope">
  <s:Header>
    <a:Action s:mustUnderstand="1">
http://docs.oasis-open.org/ws-sx/ws-trust/200512/RST/KET</a:Action>
    <a:MessageID>urn:uuid:c2884a79-b943-45c6-ac02-7256071de309</a:MessageID>
    <a:ReplyTo>
    <a:Address>http://www.w3.org/2005/08/addressing/anonymous</a:Address>
    </a:ReplyTo>
    </s:Header>
  <s:Body xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema">
    <RequestSecurityToken xmlns="http://docs.oasis-open.org/ws-sx/ws-trust/200512">
    <TokenType>http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-
1.0#X509v3</TokenType>
    <RequestType>http://docs.oasis-open.org/ws-sx/ws-trust/200512/KET</RequestType>
    <RequestKET />
    <RequestID xsi:nil="true"
xmlns="http://schemas.microsoft.com/windows/pki/2009/01/enrollment" />
    </RequestSecurityToken>
  </s:Body>
</s:Envelope>
```

4.1.1.2 Server Key Exchange Token Response

```
<s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
xmlns:a="http://www.w3.org/2005/08/addressing">
  <s:Header>
    <a:Action s:mustUnderstand="1">
http://docs.oasis-open.org/ws-sx/ws-trust/200512/RSTR/KETFinal</a:Action>
    <ActivityId CorrelationId="45f6782a-fb93-4a48-b0bb-a21496ba1f3c"
xmlns="http://schemas.microsoft.com/2004/09/ServiceModel/Diagnostics">
17f6073c-c108-4268-9ce4-713ed86894b6</ActivityId>
    <a:RelatesTo>urn:uuid:c2884a79-b943-45c6-ac02-7256071de309</a:RelatesTo>
  </s:Header>
  <s:Body>
    <RequestSecurityTokenResponseCollection
xmlns="http://docs.oasis-open.org/ws-sx/ws-trust/200512">
    <RequestSecurityTokenResponse>
    <TokenType>http://docs.oasis-open.org/wss/2004/01/
oasis-200401-wss-x509-token-profile-1.0#X509v3</TokenType>
    <RequestedSecurityToken>
    <KeyExchangeToken>
    <BinarySecurityToken ValueType="http://docs.oasis-open.org/wss/2004/01/
oasis-200401-wss-x509-token-profile-1.0#X509v3"
EncodingType="http://docs.oasis-open.org/wss/2004/01/
oasis-200401-wss-wssecurity-secext-1.0.xsd#base64binary"
xmlns="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-
1.0.xsd">MIIFoJCCBfqqAwIBAgIKGNn1JQAAAAAQDANBgkqhkiG9w0BAQUFADAzMRswGQYD
VQQLEhJnNAWNYb3NvZnZnQGUETJIFRlYw0xVDASBgNVBAMMC0ZCX0VudFN1YkNBMB4X
DTA5MDMwNTE4MjYyMl0xDTA5MDMwMjE4MzYyMl0wODEBMBkGA1UECXMSTWljcm9z
b2Z0IFBLSzBzUWFTMRkwFwYDQVQDDBBGQ19FbnRtdWJDQS1yY2hmMIIBIjANBgkq
hkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEAWaBSajsW24Kk106+39WQT87+HxaHSizX
BXOqJC1cZOLjqrSkdc4KnUHV+XXohDO6ETCJ5vKXw90ThT6YWDqpn06G0PJ+h9S3
rmyz1EvXaXg4/eTnDygrVji5QgyXUWK5/BSJFDf160yG2lLlueeS7Eux13Rn12m2
IuvL40EexvhM08XvobhAQmYi1YGkYJImeT2Uq1mVJ0hxjAPI4SY56z2rHdsLft1Pf
tpQirHPJfWsa3ILMoaw5JODCYf7ixL4IyTaJQJ4+vSttcz0Jyezje0m7mNS8k6aw
P0bzJnGMZkiq50q9TYN0ZfBYGE0cQRLLyPCITToaV6np0lZEKvCsCQIDAQABo4IC
sTCCAg0wHQYDVR0OBBYEFDO96yx8TPm5xHhJkxqrsGmokCeJMB8GA1UdIwQYMBaA
FJ+3jZGC0QUd0DHiPfaXeoF15VzIMIHRBgNVHR8EgeMwgeAwgd2ggdgggdeGgdRs
ZGFwOi8vL0N0PUZCX0VudFN1YkNBLENOPTktMTM1MUMwNDA3QSxDTj1DRFAsQ049
UHVibG1jJTIwS2V5JTUwU2Vydm1jZXMzQ049U2Vydm1jZXMzQ049Q29uZmlndXJh
dG1vbixEQz1kOS0xMzUxQzA0MDZBLERDPW50dGVzdCxEQz1taWNyb3NvZnZnQsREM9
Y29tP2N1cnRmZmljYXRlUmV2b2NhdG1vbKxpc3Q/YmFzZT9vYmplY3RDbGFzZl1j
UkxEXXN0cm1idXRpb25Qb21udDCB2gYIKwYBBQUHAQEgEgc0wgcowgccGCCsGAQUF
BzAChog6bGRhcDovLy9DTj1GQl9FbnRtdWJDQSxDTj1BSUeS0049UHVibG1jJTIw
S2V5JTUwU2Vydm1jZXMzQ049U2Vydm1jZXMzQ049Q29uZmlndXJhdG1vbixEQz1k
OS0xMzUxQzA0MDZBLERDPW50dGVzdCxEQz1taWNyb3NvZnZnQsREM9Y29tP2N1cnRm
ZmlndXJhdG1maWVudGU/YmFzZT9vYmplY3RDbGFzZl1jZXJ0aWZpY2F0aW9uQXV0aG9yaXR5
MCMGCCSsGAQQBgjcUAgQWWhQAQwBBAEUAeABjAGgAYQBuAGcAZTA3BgkrBgEEAYI3
FQcEKjAoBiArBgEEAYI3FQiDpLiY7eQShOGZGYGtn3+D2dr4gUYBGgIBagIBADAU
BgNVHSUEDTALBgkrBgEEAYI3FQUwDgYDVR0PAQH/BAQDAGUgMBwGCCSsGAQQBgjcV
CgQPMMA0wCwYJKwYBBAGCNxUFMA0GCSqGSIb3DQEBBQUAA4IBAQDESvFy3wA1iBjJ
pcWYC736HTLsu+90215XQvfFvqswJayHQy6aRGvkoWf6qQcm8IJFp2fM/K290v1o
KEdR1U/zC36TEL2jCxtJAW9/bwA5XEm9Ph+TFBH9focXFCS9FisFuuJzdaL357eI
WXBuYDgzQXJcl+naKjC+74dKft/T7URU0e/8TRX0FLXJG+7teCNEtSE5/oBMMo
yF+HNUmsjyoXmVZoHwB3J7/9ULMpI6lc0BrLVIKghMmCuIDkIuv67WQj/6NfG7uR
shWg/QbRwuEQk21s9D9dtZwrN7XWgBbNAF6FnwZg7X9GqIDQ9erb6sZPYWg5GbZ
XVTXYIKj</BinarySecurityToken>
    </KeyExchangeToken>
    </RequestedSecurityToken>
  </RequestSecurityTokenResponse>
</RequestSecurityTokenResponseCollection>
</s:Body>
</s:Envelope>
```

4.1.3 Retrieval of a previously pended certificate request with Query Token Status

4.1.3.1 Client Request

```
<s:Envelope xmlns:a="http://www.w3.org/2005/08/addressing"
xmlns:s="http://www.w3.org/2003/05/soap-envelope">
  <s:Header>
    <a:Action s:mustUnderstand="1">
http://schemas.microsoft.com/windows/pki/2009/01/enrollment/RST/wstep</a:Action>
    <a:MessageID>urn:uuid:ce330bb2-0ca2-473b-a29a-19e9264666ff</a:MessageID>
    <a:ReplyTo>
    <a:Address>http://www.w3.org/2005/08/addressing/anonymous</a:Address>
    </a:ReplyTo>
  </s:Header>
  <s:Body xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema">
    <RequestSecurityToken xmlns="http://docs.oasis-open.org/ws-sx/ws-trust/200512">
    <TokenType>http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-x509-token-profile-
1.0#X509v3</TokenType>

<RequestType>http://schemas.microsoft.com/windows/pki/2009/01/enrollment/QueryTokenStatus</Re
questType>
    <RequestID
xmlns="http://schemas.microsoft.com/windows/pki/2009/01/enrollment">65</RequestID>
    </RequestSecurityToken>
  </s:Body>
</s:Envelope>
```

4.1.4 Message exchange with a server fault

4.1.4.1 Client Request

See section [4.1.1.1](#) for an example of a client request.

4.1.4.2 Server Fault Response

```
<s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
xmlns:a="http://www.w3.org/2005/08/addressing">
  <s:Header>
    <a:Action s:mustUnderstand="1">http://schemas.microsoft.com/net/2005/12/
windowscommunicationfoundation/dispatcher/fault</a:Action>
    <a:RelatesTo>urn:uuid:ce330bb2-0ca2-473b-a29a-19e9264666ff</a:RelatesTo>
    <ActivityId CorrelationId="4f0e4425-4883-41c1-b704-771135d18f84"
xmlns="http://schemas.microsoft.com/2004/09/ServiceModel/Diagnostics">
eda7e63d-0c42-455d-9c4f-47ab85803a50</ActivityId>
  </s:Header>
  <s:Body>
    <s:Fault>
    <s:Code>
    <s:Value>s:Receiver</s:Value>
    <s:Subcode>
    <s:Value xmlns:a="http://schemas.microsoft.com/net/2005/12/windowscommunicationfoundation/
dispatcher">a:InternalServiceFault</s:Value>
    </s:Subcode>
    </s:Code>
    <s:Reason>
    <s:Text xml:lang="en-US">The server was unable to process the request
due to an internal error. For more information about the error, either turn
on IncludeExceptionDetailInFaults (either from ServiceBehaviorAttribute or
from the <lt;serviceDebug>&gt; configuration behavior) on the server in order to
```



```

AgEBMEEWmZbEbMBkGAlUECxMSTWlJcm9zb2Z0IFBLSSBUZWFtMRQwEgYDVQDDatG
Ql9FbnRtDjWJDQIKGNfBgAAAAAPjAJBgUrDgMCGGUAMA0GCSqGSIB3DQEBAQUA
BIIBAF06/80HTk6v4fX5rYijOEpz43tvLQOk/0SfXeg4Nlm47SAzqDzNSZ3QlJLJ
vZoBnz4E2vclITZsLYpMN0o4rxflZwc+2X7MtoYbnbmV1lZnTnQINDfmbIiXyi+L
zkjw+ZOTZUxqNYIXhevKru3P3nDhFENhSm/qC5Wovg7igCsDh9XJ/G6ZkQ8SEbl
vkBU2lRjP0yKYaEUXz/Y0yViIxpYCFrByDU50ngXhwOhBcbAc5RImhI807xE04W
YQl3sBxWllsFuxMsmzwQlTJrFauvjoPt96Hflog96p9w8DlZKxtlhqCI+XqIIqur
30aWtKmxTQTxG8uBCrczYAgfWGk=</BinarySecurityToken>
<RequestID xsi:nil="true"
xmlns="http://schemas.microsoft.com/windows/pki/2009/01/enrollment" />
</RequestSecurityToken>
</s:Body>
</s:Envelope>

```

4.1.5.2 Server Request Security Token Response

```

<s:Envelope xmlns:s="http://www.w3.org/2003/05/soap-envelope"
xmlns:a="http://www.w3.org/2005/08/addressing">
  <s:Header>
    <a:Action s:mustUnderstand="1">
http://schemas.microsoft.com/windows/pki/2009/01/enrollment/RSTRC/wstep</a:Action>
    <ActivityId CorrelationId="b17bfb40-747b-477a-a83c-175624e401aa"
xmlns="http://schemas.microsoft.com/2004/09/ServiceModel/Diagnostics">
0a9f1849-8211-489c-a2b7-6a07edle6832</ActivityId>
    <a:RelatesTo>urn:uuid:b0a9b388-2581-451d-8c03-270d4ffe2928</a:RelatesTo>
  </s:Header>
  <s:Body>
    <RequestSecurityTokenResponseCollection
xmlns="http://docs.oasis-open.org/ws-sx/ws-trust/200512">
      <RequestSecurityTokenResponse>
        <TokenType>
http://docs.oasis-open.org/wss/2004/01/
oasis-200401-wss-x509-token-profile-1.0#X509v3</TokenType>
          <DispositionMessage xml:lang="en-US"
xmlns="http://schemas.microsoft.com/windows/pki/2009/01/
enrollment">Issued</DispositionMessage>
            <BinarySecurityToken
ValueType="http://docs.oasis-open.org/wss/2004/01/
oasis-200401-wss-wssecurity-secext-1.0.xsd#PKCS7"
EncodingType="http://docs.oasis-open.org/wss/2004/01/
oasis-200401-wss-wssecurity-secext-1.0.xsd#base64binary"
xmlns="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-
1.0.xsd">MIIRLAYJKoZIHvcNAQcCoIIRhTCCEYECAQMxCzAJBgUrDgMCGGUAMH0GCCsGAQUF
BwwDoHEEBzBtMGcwIQIBAQYIKwYBBQUHwExEjAQAQEAAMCAQEMBklzc3VlZDBC
AgECBgorBgEEAYI3CgoBMTEwLwIBADADAgEBMSUwIwYJKwYBBAGCNxURMRyEFiOg
XmwOBU0M1DF7AGxjuzamgDsImAAwAKCCD0EwggNbMIICQ6ADAgECAhAeqF9153Dz
n0o0G27H8w6RMA0GCSqGSIB3DQEBBQUAMdQxGzAZBqNVBAsTEk1pY3Jvc29mdCBQ
S0kgVGVhbTEVMBMGAlUEAwMRkJfRW50Um9vdENBMB4XDTA5MDMwMzAzMjQxMl0X
DTE0MDMwMzAzMzQxMFowNDEbMBkGAlUECxMSTWlJcm9zb2Z0IFBLSSBUZWFtMRUw
EwYDVQDDaxGQl9FbnRsb290Q0EwggEiMA0GCSqGSIB3DQEBAQUAA4IBDwAwggEK
AoIBAQCInE154od1KuJPZ8BoaqVIsuE4BX9dXTsk0BmBVblPlYzI1RWm0NE1Zr40
TdgZ/Nv69kwCOzi0D0Eo58fHYz3FAh6rw4o+ABpx9nFJlJj69D9H7JIQWsdT0e
nQxvW59vzotQfMz00T//lNCilX3aBMj6VjArX51fYLCqBr2QgW9BmEkaiVntw9Vd
1gvJTPNoYg79c2V2Mux+4M9dzIR17xw8Mx4LhJrXXKQPZ1YgwVewdAXelS5aEOXG
LI2GIx15LtsUQzYxcelSVotVcfr4NM31Xkis5x679DtxMoB2gYqjUhb1hTLIQwK
8V5v5jjjsuy7tXP5qIEpOq7B6NCzAgMBAAGjaTBnMBMGCSsGAQQBgjCUAgQGhGQA
QwBBMA4GA1UdDwEB/wQEAWIBhjAPBgNVHRMBAf8EBTADAQH/MB0GA1UdDgQWBBS9
oNbJWz92vLuQSIJlDzAmg3dVTAQBgkrBgEEAYI3FQEEAwIBADANBgkqhkiG9w0B
AQUFAAOCAQEAvr8MMHZHcnUUyKGFnBE8qNPKIHI9oDEee3jnChqO9wmKbEzV4701
+ejdiDjiC9FQLHhbUwXhKPj0nAtqXN48E9XLPzS/ezx/LwsEv5LlroioRBym8NbA
1dLJNFqskrC0FAhefg9Jc4c91Q3uyGUjMb4Hoa9b2cqNIeMeRzV+Ll0H0wVZpg9o
180oCIFX/woETKBryiLnXPlybdQu0E7brTkyYmXJsGuFPgZLzj6DVFOdbLZMmEJNY
60pr98dFJYwcnhjdVx0FtRTsXnU8epeAYOEHWJCuU01bWpcRPF6C6sJY0wmRaP7
iOCOGXhoF061cbL08fztvGpUkyZfDoHg3DCCBUwggQ0oAMCAQICCMEMfNwAAAAA
AAIwDQYJKoZIHvcNAQEFBQAwNDEbMBkGAlUECxMSTWlJcm9zb2Z0IFBLSSBUZWFt

```



```
deT08i8ksQ+aO/LsbEShmK/qWmHnnQ45Z8bWxkpvt7EtxpYGwQiZt6lU2oQt/UYL
hZBPEYQC1KpgCTMmVuzk6NdEim2z7RXUMIFBmjDTAh6M9FdLmMKQDw==</BinarySecurityToken>
  <RequestedSecurityToken>
    <BinarySecurityToken
      ValueType="http://docs.oasis-open.org/wss/2004/01/
oasis-200401-wss-x509-token-profile-1.0#X509v3"
      EncodingType="http://docs.oasis-open.org/wss/2004/01/
oasis-200401-wss-wssecurity-secext-1.0.xsd#base64binary"
      xmlns="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-
1.0.xsd">MIIGjCCBxagAwIBAgIKGNnsjgAAAAAPzANBgkqhkiG9w0BAQUFADAzMRswGQYD
VQQLExJNAWNYb3NvZnQGUeUjFIRlYwOxZDASBGNVBAAMC0ZCZ0VudFN1YkNBMB4X
DTA5MDMwNTE4MjYyMVoXDTEwMDMwNTE4MjYyMVowgb4xEzARBgoJkiaJk/IsZAEZ
Fgnjb20xGTAXBgoJkiaJk/IsZAEZFgltaWNYb3NvZnQxZjAUBgoJkiaJk/IsZAEZ
FgzudHRlc3QxHTAbBgoJkiaJk/IsZAEZFg1kOS0xMzUxQzA0MDZBLERDPW50dGVzdCxE
EwVVC2Vyc2ENMAsGALUEAxEYwJieTE2MDQGCsGSI3DQEJARYnYWJieUBEOS0x
MzUxQzA0MDZBLk5UVEVTVc5NSUNST1NPR1QuQ09NMIIBIjANBgkqhkiG9w0BAQEFA
AOCAQ8AMIIBCgKCAQEAxulshJgY469YhdEuMxGNiWRu8k04afHFyOTi3WEtG8Fy
S2Vid35kw+uOq/6AnhiotKIDCTuyVHjIG9Be9H6piR+xml3uovkBJ2Ow2k2GarZ/
eMD2UEBiuJk569Yz0M1FP9SD1UMbpI2Z809dcvRP13zy6Kk5uqdxehpLC3tJE9DC
KtMal1ZfJR4eZs0e3Xa2eGFI8kH9jtJ9ajXtt97x5oiWY00dVhZ+GvqJwUHQFIJU
8iV6rjXQ4M2VhSjVnpXiZSc8VmxrRoz4V64y/MKqasTgkpvYDr3QxA1N5ggAmji8
0IuaVEUz4+kTfFXpjIFUEm/10e7It134ucGrijQuqWIDAQABO4IDFjCCAxIwRAYJ
KoZIHvcNAQkPBDCwNTAObggqhkig9w0DAgICAIwDgYIKoZIhvcNAQcAgCAMAcG
BSsOAwIHMAoGCCqGSI3DQMHMBcGCSSGAQQBgjcUAgQKHggAVQBzAGUAcjCB2gYI
KwYBBQUHAEgc0wgcowgccGCCsGAQUFBzAChog6bGRhcDovLy9DTj1GQl9FbnRT
dWJdQSxDTj1BSUeS049UHvibG1jJTIwS2V5JTlWU2VydmljZXMsQ049U2Vydmlj
ZXMsQ049Q29uZmlndXJhdG1vbixEQz1kOS0xMzUxQzA0MDZBLERDPW50dGVzdCxE
Qz1taWNYb3NvZnQsREM9Y29tP2NBQ2VydG1maWVhdGU/YmFzZT9vYmplY3RDbGFz
cz1jZXJ0aWZpY2F0aW9uXUV0aG9yaXR5MB0GAlUdDgQWBBT2ht3VPgSMOvf7763Y
ZRfhPYEZ0zaOBgNVHQ8BAf8EBAMCBaAwawYDVR0RBGQwYqA3BgorBgEEAYI3FAID
oCkMJ2FiYn1AZDktMTM1MUMwNDA2QS5udHRlc3QubW1jcm9zb2Z0LmNvbYEnYWJi
eUBEOS0xMzUxQzA0MDZBLk5UVEVTVc5NSUNST1NPR1QuQ09NMIHRBgNVHR8EgeMw
geAwgd2ggdggdeGgdRsZGFwOi8vL0NOPUZCZ0VudFN1YkNBLENOPtktMTM1MUMw
NDA3QSxDTj1DRFAsQ049UHvibG1jJTIwS2V5JTlWU2VydmljZXMsQ049U2Vydmlj
ZXMsQ049Q29uZmlndXJhdG1vbixEQz1kOS0xMzUxQzA0MDZBLERDPW50dGVzdCxE
Qz1taWNYb3NvZnQsREM9Y29tP2N1cnRpb25Qb2ludDAfBgNVHSMEGDAWBSf
t42RgtEFHdAx4j3213qBdeVcyDAPBgNVHSUEIjAgBgorBgEEAYI3CgMEBggrBgEF
BQcDBAYIKwYBBQUHAWIwDQYJKoZIhvcNAQEFBQADggEBAKGRijDwlCwVWvRiDov2
OEUbdFceggjKW2epK3FDxC9m0CpSe1yccZquVQ+hXUvTo3Ux5C54FOU7VugdXIwu
eSYmLLEDIxLcq/P29PF724OKUejAyxyDuYcUEgSTTrml+IYyshvYLiW02rvcy1Vc
4hzu2F82BACfeTYkCsBvmyJLP7i5xdB4zhqvTRNqughA6Xbj91+Ddl+low7mS/Go
+NhoqTft1vXpjp9n8IUMZuVU+CiD0svjyXPdfwJN8GskraJbBihwoW/NE64+oxS1
Ee0bTeS7jezJ51AJQf8bBD/0+ImhUmGj5qS4pGqyRMkiQL5EP406Zhq2DSdiNF8M
P+I=</BinarySecurityToken>
  </RequestedSecurityToken>
  <RequestID
    xmlns="http://schemas.microsoft.com/windows/pki/2009/01/enrollment">63</RequestID>
  </RequestSecurityTokenResponse>
</RequestSecurityTokenCollection>
</s:Body>
</s:Envelope>
```

5 Security

5.1 Security Considerations for Implementers

None.

5.2 Index of Security Parameters

None.

6 Appendix A: Full WSDL

The WSTEP protocol is a profile extension of WS-Trust1.3. As such, it does not have a WSDL.

WS-Trust 1.3 WSDL: The full WSDL for WS-Trust can be found at: <http://docs.oasis-open.org/ws-sx/ws-trust/200512/ws-trust-1.3.wsdl>.

WSTEP XML Schema: For the convenience of implementation, the XML schema is provided here.

```
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:wstep="http://schemas.microsoft.com/windows/pki/2009/01/enrollment"
  targetNamespace="http://schemas.microsoft.com/windows/pki/2009/01/enrollment"
  elementFormDefault="qualified">

  <xs:import namespace="http://www.w3.org/XML/1998/namespace"
    schemaLocation="http://www.w3.org/2001/xml.xsd" />

  <xs:element name="DispositionMessage" type="wstep:DispositionMessageType" nillable="true"
  />
  <xs:complexType name="DispositionMessageType">
    <xs:simpleContent>
      <xs:extension base="xs:string">
        <xs:attribute ref="xml:lang" use="optional" />
      </xs:extension>
    </xs:simpleContent>
  </xs:complexType>
  <xs:element name="CertificateEnrollmentWSDetail" nillable="true"
type="wstep:CertificateEnrollmentWSDetailType" />
  <xs:complexType name="CertificateEnrollmentWSDetailType">
    <xs:sequence>
      <xs:element minOccurs="0" maxOccurs="1" name="BinaryResponse" nillable="true"
type="xs:string" />
      <xs:element minOccurs="0" maxOccurs="1" name="ErrorCode" nillable="true" type="xs:int"
/ >
      <xs:element minOccurs="0" maxOccurs="1" name="InvalidRequest" nillable="true"
type="xs:boolean" />
      <xs:element minOccurs="0" maxOccurs="1" name="RequestID" type="xs:string"
nillable="true" />
    </xs:sequence>
  </xs:complexType>
  <xs:element name="RequestID" type="xs:string" nillable="true" />
  <xs:attribute name="PreferredLanguage" type="xml:language" use="optional"/>
</xs:schema>
```

7 Appendix B: Product Behavior

The information in this specification is applicable to the following Microsoft products or supplemental software. References to product versions include released service packs.

Note: Some of the information in this section is subject to change because it applies to an unreleased, preliminary version of the Windows Server operating system, and thus may differ from the final version of the server software when released. All behavior notes that pertain to the unreleased, preliminary version of the Windows Server operating system contain specific references to Windows Server 2016 Technical Preview as an aid to the reader.

- Windows 7 operating system
- Windows Server 2008 R2 operating system
- Windows 8 operating system
- Windows Server 2012 operating system
- Windows 8.1 operating system
- Windows Server 2012 R2 operating system
- Windows 10 operating system
- Windows Server 2016 Technical Preview operating system

Exceptions, if any, are noted below. If a service pack or Quick Fix Engineering (QFE) number appears with the product version, behavior changed in that service pack or QFE. The new behavior also applies to subsequent service packs of the product unless otherwise specified. If a product edition appears with the product version, behavior is different in that product edition.

Unless otherwise specified, any statement of optional behavior in this specification that is prescribed using the terms SHOULD or SHOULD NOT implies product behavior in accordance with the SHOULD or SHOULD NOT prescription. Unless otherwise specified, the term MAY implies that the product does not follow the prescription.

[<1> Section 3.1.3](#): Windows servers set the *DefaultLanguage* parameter to the installed language.

8 Change Tracking

This section identifies changes that were made to this document since the last release. Changes are classified as New, Major, Minor, Editorial, or No change.

The revision class **New** means that a new document is being released.

The revision class **Major** means that the technical content in the document was significantly revised. Major changes affect protocol interoperability or implementation. Examples of major changes are:

- A document revision that incorporates changes to interoperability requirements or functionality.
- The removal of a document from the documentation set.

The revision class **Minor** means that the meaning of the technical content was clarified. Minor changes do not affect protocol interoperability or implementation. Examples of minor changes are updates to clarify ambiguity at the sentence, paragraph, or table level.

The revision class **Editorial** means that the formatting in the technical content was changed. Editorial changes apply to grammatical, formatting, and style issues.

The revision class **No change** means that no new technical changes were introduced. Minor editorial and formatting changes may have been made, but the technical content of the document is identical to the last released version.

Major and minor changes can be described further using the following change types:

- New content added.
- Content updated.
- Content removed.
- New product behavior note added.
- Product behavior note updated.
- Product behavior note removed.
- New protocol syntax added.
- Protocol syntax updated.
- Protocol syntax removed.
- New content added due to protocol revision.
- Content updated due to protocol revision.
- Content removed due to protocol revision.
- New protocol syntax added due to protocol revision.
- Protocol syntax updated due to protocol revision.
- Protocol syntax removed due to protocol revision.
- Obsolete document removed.

Editorial changes are always classified with the change type **Editorially updated**.

Some important terms used in the change type descriptions are defined as follows:

- **Protocol syntax** refers to data elements (such as packets, structures, enumerations, and methods) as well as interfaces.
- **Protocol revision** refers to changes made to a protocol that affect the bits that are sent over the wire.

The changes made to this document are listed in the following table. For more information, please contact dochelp@microsoft.com.

Section	Tracking number (if applicable) and description	Major change (Y or N)	Change type
Z Appendix B: Product Behavior	Updated the product applicability list to include Windows 10.	Y	Content update.

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