

[MS-MDE]: Mobile Device Enrollment Protocol

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1 Introduction

An industry trend has been developing in which employees connect their personal mobile computing devices to the corporate network and resources (either on premise or through the cloud) to perform workplace tasks. This trend requires support for easy configuration of the network and resources, such that employees can register personal devices with the company for work-related purposes. Applications and technology to support easy configuration must also enable IT professionals to manage the risk associated with having uncontrolled devices connected to the corporate network.

The Mobile Device Management Protocol (MDM) [\[MS-MDM\]](#) specifies a protocol for managing devices through a **Device Management Service (DMS)**. This document describes the Mobile Device Enrollment Protocol (MDE), which enables enrolling a device with the DMS through an **Enrollment Service (ES)**. The protocol includes the discovery of the **Management Enrollment Service (MES)** and enrollment with the ES.

Sections 1.8, 2, and 3 of this specification are normative and contain [\[RFC2119\]](#) language. Sections 1.5 and 1.9 are also normative but cannot contain RFC 2119 language. All other sections and examples in this specification are informative.

1.1 Glossary

The following terms are defined in [\[MS-GLOS\]](#):

- base64**
- CA**
- certificate**
- certification authority (CA)**
- DNS**
- Domain Name System (DNS)**
- Hypertext Transfer Protocol over Secure Sockets Layer (HTTPS)**
- root certificate**
- Secure Sockets Layer (SSL)**
- security token**
- SOAP action**
- SOAP body**
- SOAP header**
- TLS**
- Transport Layer Security (TLS)**
- URL**
- Web services**
- Web Services Description Language (WSDL)**
- X.509**
- XML**
- XML namespace**
- XML Schema (XSD)**

The following terms are specific to this document:

certificate enrollment policy: A certificate policy that specifies the rules for enrollment.

certificate policy: A document that identifies the actors of a public key infrastructure (PKI), along with their roles and tasks.

certificate signing request: In a public key infrastructure (PKI) configuration, a request message sent from a requestor to a certification authority (CA) to apply for a digital identity certificate.

device management client: An application or agent running on a device that implements the Mobile Device Management Protocol [MS-MDM].

Device Management Service (DMS): Server software that secures, monitors, manages, and supports devices deployed across mobile operators, service providers, and enterprises.

Discovery Service (DS): A simple protocol based on an endpoint with a known portion of an address that is used to discover services which have no upfront name or location hints.

enrollment client: An application or agent that implements the initiator or client portion of MDE.

Enrollment Service (ES): A server or collection of servers implementing the WS-Trust X.509v3 Token Enrollment Extensions [MS-WSTEP].

ES endpoint: A service endpoint for handling enrollment requests from clients.

HTML form: A component of a web page that allows a user to enter data that is sent to a server for processing.

Management Enrollment Service (MES): A server or collection of servers implementing the server side of MDE.

provisioning information: In MDE, the service endpoint to the DMS which is a prerequisite for the device management client to initiate a session.

query string: The part of a Uniform Resource Locator (URL) that contains the data to be passed to a web application.

Security Token Service (STS): A special type of server defined in WS-Trust [WSTrust1.3].

service endpoint: A server or collection of servers that expose one or more service endpoints to which messages can be sent.

URL scheme: The top level of an URL naming structure. All URL references are formed with a scheme name, followed by a colon character ":". For example, in the URL <http://contoso.com>, the URL scheme name is http.

XML Path Language (XPath): A language used to create expressions that can address parts of an XML document, manipulate strings, numbers, and Booleans, and can match a set of nodes in the document, as specified in [XPath]. XPath models an XML document as a tree of nodes of different types, including element, attribute, and text. XPath expressions can identify the nodes in an XML document based on their type, name, and values, as well as the relationship of a node to other nodes in the document.

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

1.2 References

References to Microsoft Open Specifications documentation do not include a publishing year because links are to the latest version of the documents, which are updated frequently. References to other documents include a publishing year when one is available.

A reference marked "(Archived)" means that the reference document was either retired and is no longer being maintained or was replaced with a new document that provides current implementation details. We archive our documents online [[Windows Protocol](#)].

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. Please check the archive site, <http://msdn2.microsoft.com/en-us/library/E4BD6494-06AD-4aed-9823-445E921C9624>, as an additional source.

[MS-MDM] Microsoft Corporation, "[Mobile Device Management Protocol](#)".

[MS-WSTEP] Microsoft Corporation, "[WS-Trust X.509v3 Token Enrollment Extensions](#)".

[MS-XCEP] Microsoft Corporation, "[X.509 Certificate Enrollment Policy 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>

[RFC2616] Fielding, R., Gettys, J., Mogul, J., et al., "Hypertext Transfer Protocol -- HTTP/1.1", RFC 2616, June 1999, <http://www.ietf.org/rfc/rfc2616.txt>

[SOAP1.2-1/2003] Gudgin, M., Hadley, M., Mendelsohn, N., et al., "SOAP Version 1.2 Part 1: Messaging Framework", W3C Recommendation, June 2003, <http://www.w3.org/TR/2003/REC-soap12-part1-20030624>

[SOAP1.2-2/2003] Gudgin, M., Hadley, M., Mendelsohn, N., et al., "SOAP Version 1.2 Part 2: Adjuncts", W3C Recommendation, June 2003, <http://www.w3.org/TR/2003/REC-soap12-part2-20030624>

[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>

[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>

[WSTrust1.3] 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.S., 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., and Malhotra, A., Eds., "XML Schema Part 2: Datatypes", W3C Recommendation, May 2001, <http://www.w3.org/TR/2001/REC-xmlschema-2-20010502/>

1.2.2 Informative References

[MS-GLOS] Microsoft Corporation, "[Windows Protocols Master Glossary](#)".

1.3 Overview

MDE enables a device to be enrolled with the DMS through an ES, including the discovery of the MES and enrollment with the ES. After a device is enrolled, the device can be managed with the DMS using MDM.

The process for enrolling a device using MDE is shown in the following diagram.

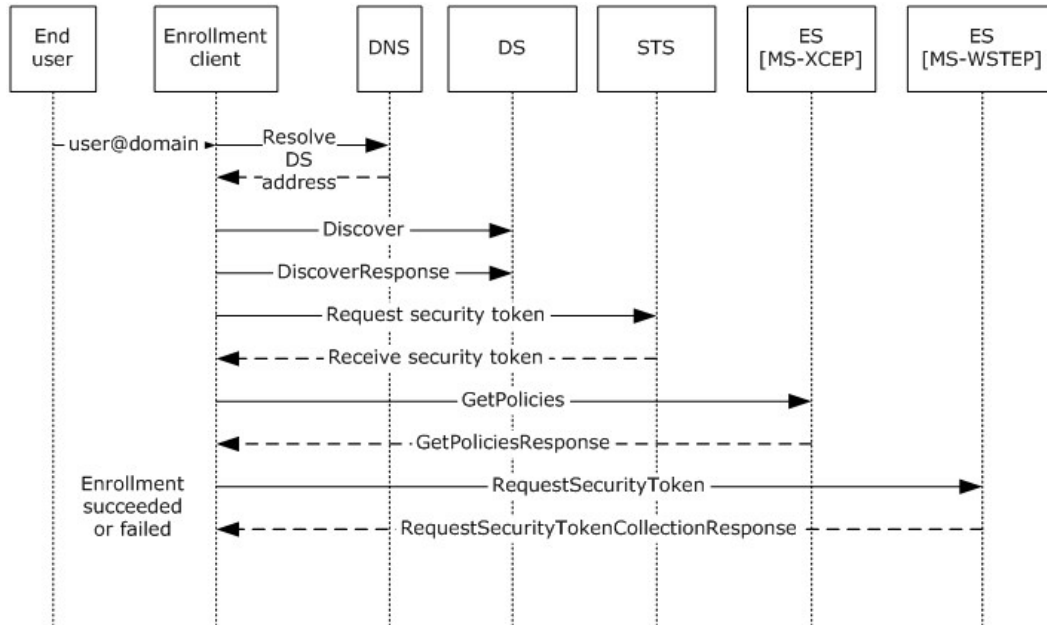


Figure 1: Typical sequence for enrolling a message using MDE

The enrollment process consists of the following steps.

1. The user's email name is entered via the **enrollment client**.
2. The enrollment client extracts the domain suffix from the email address, prepends the domain name with a well-known label, and resolves the address to the **Discovery Service (DS)**. The administrator configures the network name resolution service (that is, the **Domain Name System (DNS)**) appropriately.
3. The enrollment client sends a **Discover** message (see section [3.1.4.1.1.1](#)) to the **DS**. The **DS** responds with a **DiscoverResponse** message (see section [3.1.4.1.1.2](#)) containing the Uniform Resource Locators (URLs) of **service endpoints** required for the following steps.
4. The enrollment client communicates with the **Security Token Service (STS)** (see section [3.2](#)) to obtain a **security token** to authenticate with the ES.
5. The enrollment client sends a **GetPolicies** message (see section [3.3.4.1.1.1](#)) to the **ES endpoint [MS-XCEP]** using the security token received in the previous step. The ES endpoint [MS-XCEP] responds with a **GetPoliciesResponse** message (see section [3.3.4.1.1.2](#)) containing the **certificate policies** required for the next step. For more information about these messages, see [MS-XCEP] sections [3.1.4.1.1.1](#) and [3.1.4.1.1.2](#).
6. The enrollment client sends a **RequestSecurityToken** message (see section [3.4.4.1.1.1](#)) to the ES endpoint [\[MS-WSTEP\]](#) using the security token received in step 4. The ES endpoint [MS-

WSTEP] responds with a **RequestSecurityTokenResponseCollection** (see section [3.4.4.1.1.2](#)) containing the identity and **provisioning information** for the **device management client** [MS-MDM]. For more information about these messages, see [MS-WSTEP] sections [3.1.4.1.1.1](#) and [3.1.4.1.1.2](#).

The steps for MDE device enrollment correspond to five phases as shown in the following diagram.

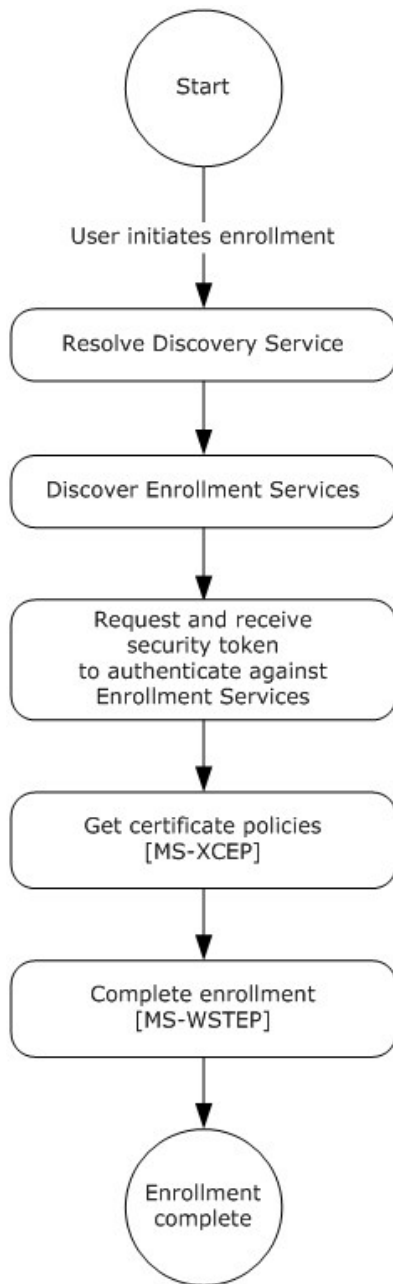


Figure 2: MDE device enrollment phases

1.4 Relationship to Other Protocols

MDE depends on the WS-Trust X.509v3 Token Enrollment Extensions [\[MS-WSTEP\]](#).

MDE depends on the X.509 Certificate Enrollment Policy Protocol [\[MS-XCEP\]](#).

The Mobile Device Management Protocol (MDM) depends on MDE. A device has to be enrolled in an MES through the use of MDE before the device can be managed using MDM [\[MS-MDM\]](#).

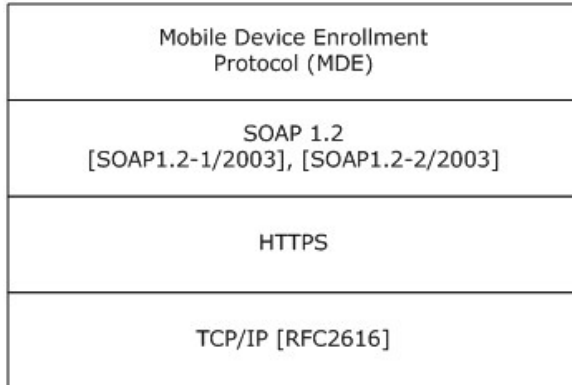


Figure 3: Relationship to other protocols

1.5 Prerequisites/Preconditions

MDE issues X.509v3 [\[MS-WSTEP\]](#) certificates and provisioning information for device management clients [\[MS-MDM\]](#) to enable a relationship between the user and a device in the DMS.

The MES issues a security token (after appropriate authentication) that is used to authenticate to the ES.

The ES communicates with a **certification authority (CA)** to issue an **X.509 certificate**.

The ES issues provisioning information for a device management client [\[MS-MDM\]](#). The ES has to be configured with this information or be able to retrieve it from the DMS.

1.6 Applicability Statement

A device has to be enrolled in an MES through the use of MDE before the device can be managed using MDM [\[MS-MDM\]](#).

1.7 Versioning and Capability Negotiation

None.

1.8 Vendor-Extensible Fields

None.

1.9 Standards Assignments

None.

2 Messages

2.1 Transport

MDE is a client-to-server protocol that consists of a SOAP-based Web service.

MDE operates over the following **Web services** transports:

- SOAP 1.2 ([\[SOAP1.2-1/2003\]](#), [\[SOAP1.2-2/2003\]](#)) over HTTPS over TCP/IP [\[RFC2616\]](#)

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 (WSDL)** 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
ac	http://schemas.microsoft.com/windows/pki/2009/01/enrollment	[MS-WSTEP]
tns	http://schemas.microsoft.com/windows/pki/2009/01/enrollment	This specification
wsaw	http://www.w3.org/2006/05/addressing/wsdl	
wsdl	http://schemas.xmlsoap.org/wsdl/	[WSDL]
wst	http://docs.oasis-open.org/ws-sx/ws-trust/200512	[WSTrust1.3]
xcep	http://schemas.microsoft.com/windows/pki/2009/01/enrollmentpolicy	[MS-XCEP]
xsd	http://www.w3.org/2001/XMLSchema	[XMLSCHEMA1]

2.2.2 Messages

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

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

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

2.2.6 Attributes

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

2.2.7 Groups

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

2.2.8 Attribute Groups

This specification does not define any common XML schema attribute group definitions.

3 Protocol Details

3.1 IDiscoveryService Server Details

This section describes the first and second phases in MDE device enrollment: resolving the **DS** and discovering the ES. The following diagram highlights these two phases.

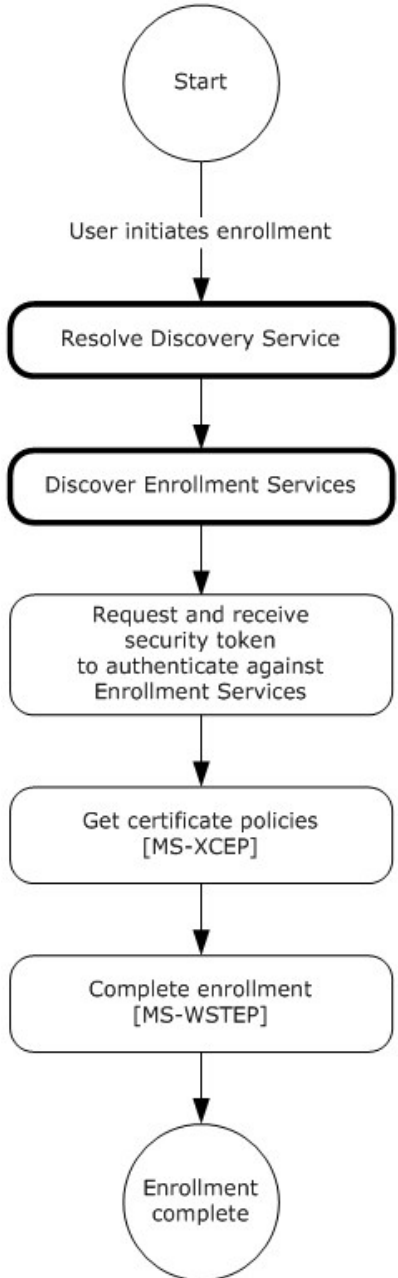


Figure 4: MDE device enrollment: resolving the DS and discovering the ES

The **IDiscoveryService DS** in MDE hosts an endpoint to receive messages from the enrollment client. When a **Discover** request message (see section [3.1.4.1.1.1](#)) is received from the client, the server processes the request and returns a **DiscoverResponse** message (see section [3.1.4.1.1.2](#)) to the client. The response identifies the endpoints to be used by the client to obtain the security tokens and enroll via the ES. After the response message is sent to the client, the server returns to the waiting state.

The following diagram shows the role of the server in resolving the **DS** for the enrollment client:

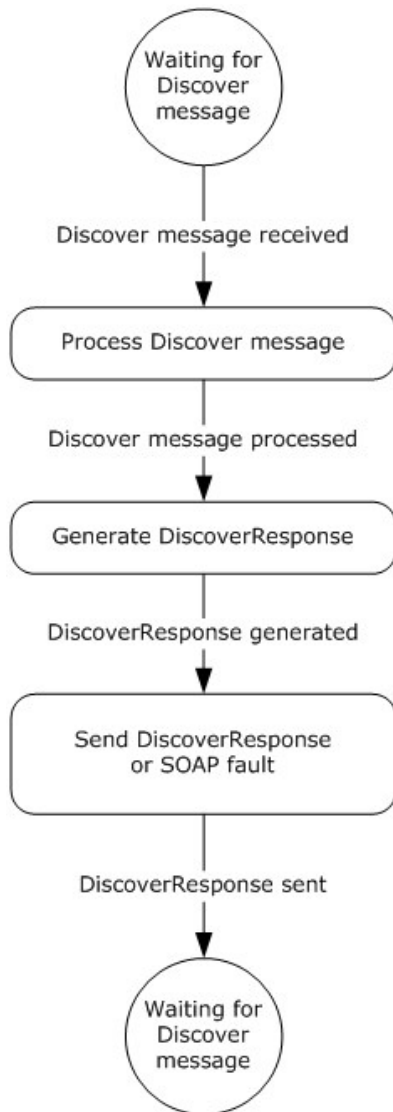


Figure 5: Role of server in resolving the DS

As a prerequisite for enabling the enrollment client to discover the **DS**, the administrator **MUST** configure the **DNS**, such that the name "EnterpriseEnrollment.[User's Domain]" resolves to the **DS**. The enrollment client extracts the domain suffix from the email address of the enrolling user and prepends it with the DNS to construct the address for the **DS**. For example, if the email address for

the user is "user1@contoso.com", the enrollment client extracts the domain suffix "contoso.com" and prepends it with the DNS to construct the **DS** address "EnterpriseEnrollment.contoso.com".

The enrollment client validates the **Secure Sockets Layer (SSL)** certificate that is protecting the **DS** endpoint, along with any intermediary certificates that are signed by a trusted **CA**.

3.1.1 Abstract Data Model

This section describes a conceptual model of possible data organization that an implementation maintains to participate in this protocol. The described organization is provided to facilitate the explanation of how the protocol behaves. This document does not mandate that implementations adhere to this model as long as their external behavior is consistent with that described in this document.

EnrollmentServiceDirectory: A repository which stores the URLs for the services used during enrollment.

3.1.2 Timers

None.

3.1.3 Initialization

The **EnrollmentServicesDirectory** element MUST be initialized with the list of ES's.

3.1.4 Message Processing Events and Sequencing Rules

The following table summarizes the list of WSDL operations as defined by this specification for discovering the ES:

WSDL Operation	Description
Discover	Describes the messages for discovering service endpoints to complete enrollment. Service endpoints include the security token issuance endpoints and the ES endpoints.

3.1.4.1 Discover

The **Discover** operation defines the client request and server response messages that are used to complete the process of discovering URLs for the ES's.

This operation is specified by the following WSDL.

```
<wsdl:operation name="Discover">
  <wsdl:input
    wsaw:Action="http://schemas.microsoft.com/windows/management/2012/01/enrollment/IDiscoveryService/Discover" name="IDiscoveryService_Discover_InputMessage"
    message="tns:IDiscoveryService_Discover_InputMessage"/>
  <wsdl:output
    wsaw:Action="http://schemas.microsoft.com/windows/management/2012/01/enrollment/IDiscoveryService/DiscoverResponse" name="IDiscoveryService_Discover_OutputMessage"
    message="tns:IDiscoveryService_Discover_OutputMessage"/>
</wsdl:operation>
```

The following sections specify the request commands used in conjunction with the SyncML message specified in. [\[MS-MDM\]](#) section 2.2.4.1.

3.1.4.1.1 Messages

The following table summarizes the set of WSDL message definitions that are specific to this operation.

Message	Description
IDiscoveryService_Discover_InputMessage	Sent from the client to the server to discover service endpoints.
IDiscoveryService_Discover_OutputMessage	Sent from the server to the client and contains the information about the service endpoints.

3.1.4.1.1.1 IDiscoveryService_Discover_InputMessage Message

The **IDiscoveryService_Discover_InputMessage** message contains the **Discover** request message for the **Discover** operation.

The **SOAP action** value is:

```
http://schemas.microsoft.com/windows/management/2012/01/enrollment/IDiscoveryService/Discover
```

The **Discover** request message is sent from the client to the server to discover ES endpoints.

```
<wsdl:message name="IDiscoveryService_Discover_InputMessage">  
  <wsdl:part name="Discover" element="tns:Discover"/>  
</wsdl:message>
```

tns:Discover: An instance of a <Discover> element (section [3.1.4.1.2.1](#)).

3.1.4.1.1.2 IDiscoveryService_Discover_OutputMessage Message

The **IDiscoveryService_Discover_OutputMessage** message contains the **DiscoverResponse** response message for the **Discover** operation.

The SOAP action value is:

```
http://schemas.microsoft.com/windows/management/2012/01/enrollment/IDiscoveryService/Discover  
Response
```

The **DiscoverResponse** response message is sent from the server to the client and contains information about the ES endpoints.

```
<wsdl:message name="IDiscoveryService_Discover_OutputMessage">  
  <wsdl:part name="DiscoverResponse" element="tns:DiscoverResponse"/>  
</wsdl:message>
```

tns:DiscoverResponse: An instance of a <DiscoverResponse> element (section [3.1.4.1.2.2](#)).

3.1.4.1.2 Elements

The following table summarizes the set of XML schema element definitions that are specific to this operation.

Element	Description
Discover	Contains the body of the Discover request message sent by the client.
DiscoverResponse	Contains the body of the Discover response message sent by the server in response to the request message received from the client.

3.1.4.1.2.1 Discover

The <Discover> element contains the client request to the server.

```
<xsd:element name="Discover" nillable="true">
  <xsd:complexType>
    <xsd:sequence>
      <xsd:element minOccurs="1" maxOccurs="1" name="request" nillable="true"
type="tns:DiscoveryRequest"/>
    </xsd:sequence>
  </xsd:complexType>
</xsd:element>
```

request: This element is of type <DiscoveryRequest> (section [3.1.4.1.3.1](#)) and contains information about the request.

3.1.4.1.2.2 DiscoverResponse

The <DiscoverResponse> element contains the information to send in the response from the server to the client.

```
<xsd:element name="DiscoverResponse" nillable="true">
  <xsd:complexType>
    <xsd:sequence>
      <xsd:element minOccurs="1" maxOccurs="1" name="DiscoverResult" nillable="true"
type="tns:DiscoveryResponse"/>
    </xsd:sequence>
  </xsd:complexType>
</xsd:element>
```

DiscoverResult: This element is of type <DiscoveryResponse> (section [3.1.4.1.3.2](#)) and contains response information from the server.

3.1.4.1.3 Complex Types

The following table summarizes the set of XML schema complex type definitions that are specific to this operation.

ComplexType	Description
DiscoveryRequest	Specifies the type of the <Discover> element for the Discover (section 3.1.4.1.1.1) message.

ComplexType	Description
DiscoveryResponse	Specifies the type of the <DiscoverResponse> element for the DiscoverResponse (section 3.1.4.1.2) message.

3.1.4.1.3.1 DiscoveryRequest

The <DiscoveryRequest> complex type describes the information to send to the server in the <Discover> request element (section [3.1.4.1.2.1](#)).

Namespace: <http://schemas.microsoft.com/windows/management/2012/01/enrollment>

```
<xsd:complexType name="DiscoveryRequest">
  <xsd:sequence>
    <xsd:element minOccurs="0" maxOccurs="1" name="EmailAddress" nillable="true"
type="xsd:string"/>
    <xsd:element minOccurs="0" maxOccurs="1" name="RequestVersion" nillable="true"
type="xsd:string"/>
  </xsd:sequence>
</xsd:complexType>
```

EmailAddress: This element supplies the name of the user making the enrollment request. The <EmailAddress> value is used by the **DS** to identify the ES's to return to the client.

RequestVersion: The value MUST be set to nil.

3.1.4.1.3.2 DiscoveryResponse

The <DiscoveryResponse> complex type describes the information to send to the client in the <DiscoverResponse> request element (section [3.1.4.1.2.2](#)).

Namespace: <http://schemas.microsoft.com/windows/management/2012/01/enrollment>

```
<xsd:complexType name="DiscoveryResponse">
  <xsd:sequence>
    <xsd:element minOccurs="0" maxOccurs="1" name="AuthPolicy" nillable="true"
type="xsd:string"/>
    <xsd:element minOccurs="0" maxOccurs="1" name="EnrollmentPolicyServiceUrl"
nillable="true" type="xsd:string"/>
    <xsd:element minOccurs="0" maxOccurs="1" name="EnrollmentServiceUrl" nillable="true"
type="xsd:string"/>
    <xsd:element minOccurs="0" maxOccurs="1" name="AuthenticationServiceUrl" nillable="true"
type="xsd:string"/>
  </xsd:sequence>
</xsd:complexType>
```

AuthPolicy: The value of <AuthPolicy> MUST be the string "federated".

EnrollmentPolicyServiceUrl: The value of <EnrollmentPolicyServiceUrl> MUST be the address of the **DS** against which the X.509 Certificate Enrollment Policy Protocol [\[MS-XCEP\]](#) operations are performed.

EnrollmentServiceUrl: The value of <EnrollmentServiceUrl> MUST be the address of the **DS** against which the WS-Trust X.509v3 Token Enrollment Extensions [\[MS-WSTEP\]](#) operations are performed.

AuthenticationServiceUrl: The value of <AuthenticationServiceUrl> MUST be the name of the STS from which the client will retrieve a security token.

3.1.5 Timer Events

None.

3.1.6 Other Local Events

None.

3.2 Interaction with Security Token Service (STS)

This section describes the third phase in MDE device enrollment: requesting and receiving the security token. The following diagram highlights this phase.

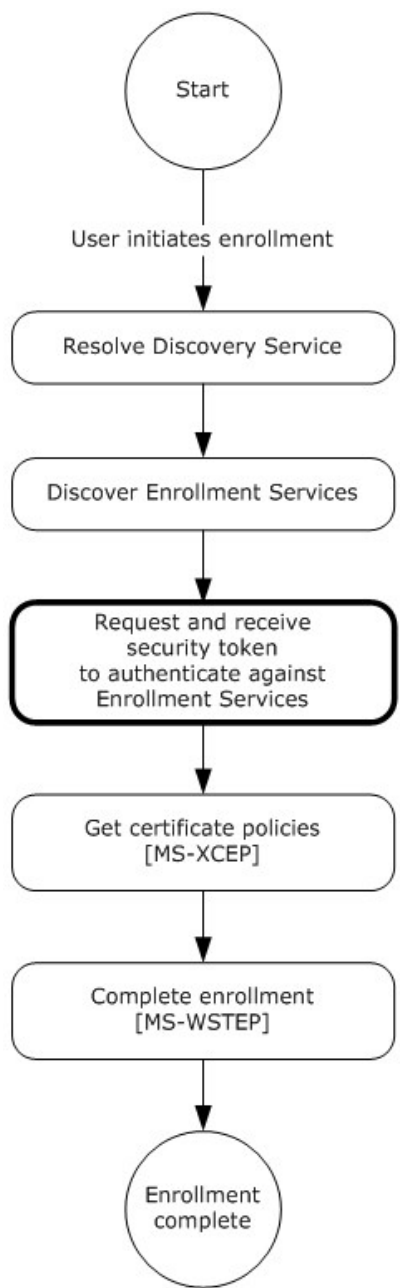


Figure 6: MDE device enrollment: requesting and receiving the security token

After the enrollment client receives the **DiscoverResponse** message (section [3.1.4.1.1.2](#)), the client obtains a security token from the STS specified in the value for the `<DiscoveryResponse><AuthenticationServiceUrl>` element (section [3.1.4.1.3.2](#)).

Note The enrollment client is agnostic with regards to the protocol flows for authenticating and returning the security token. While the STS might prompt for user credentials directly or enter into a federation protocol with an STS and directory service, MDE is agnostic to all of this. To remain

agnostic, all protocol flows pertaining to authentication that involve the enrollment client are passive, that is, browser-implemented.

The following are the explicit requirements for the STS:

The <DiscoveryResponse><AuthenticationServiceUrl> element (section [3.1.4.1.3.2](#)) MUST support HTTPS.

The enrollment client issues an HTTPS request as follows:

```
AuthenticationServiceUrl?appru=<appid>&login_hint=<User Principal Name>
```

<appid> is of the form `ms-app://string`

<User Principal Name> is the name of the enrolling user, for example, `user@constoso.com`. The value of this attribute serves as a hint that can be used by the STS as part of the authentication.

After authentication is complete, the STS SHOULD return an **HTML form** document with a POST method action of `appid` identified in the **query string** parameter. For example:

```
HTTP/1.1 200 OK
Content-Type: text/html; charset=UTF-8
Vary: Accept-Encoding
Content-Length: 556

<!DOCTYPE>
<html>
  <head>
    <title>Working...</title>
    <script>
      function formSubmit() {
        document.forms[0].submit();
      }
      window.onload=formSubmit;
    </script>
  </head>
  <body>
    <form method="post" action="ms-app://windows.immersivecontrolpanel">
      <p><input type="hidden" name="wresult" value="token value"/></p>
      <input type="submit"/>
    </form>
  </body>
</html>
```

The STS has to send a POST to a redirect **URL** of the form `ms-app://string` (the **URL scheme** is `ms-app`) as indicated in the POST method action. The security token value is the **base64**-encoded string `"http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd#base64binary"` contained in the <wsse:BinarySecurityToken> EncodingType attribute (section [3.3](#)). This string is opaque to the enrollment client; the client does not interpret the string.

3.3 Interaction with X.509 Certificate Enrollment Policy

This section describes the fourth phase in MDE device enrollment: interacting with the X.509 Certificate Enrollment Policy Protocol [\[MS-XCEP\]](#) to obtain the certificate policies. The following diagram highlights this phase.

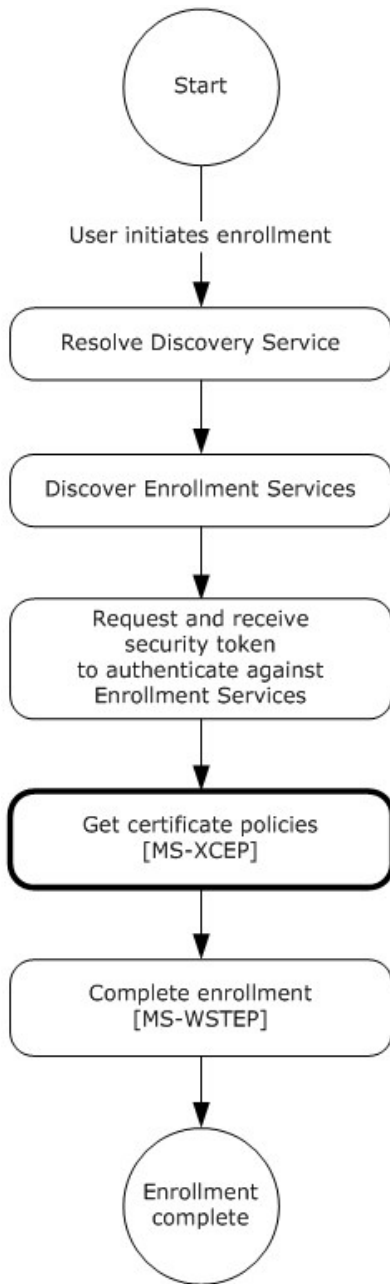


Figure 7: MDE device enrollment: getting the certificate policies

The X.509 Certificate Enrollment Policy Protocol [MS-XCEP] enables a client to request certificate enrollment policies from a server. The communication is initiated by the enrollment client request to

the server for the certificate enrollment policies. The server authenticates the client, validates the request, and returns a response with a collection of **certificate enrollment policy** objects. As described in section 3.2, the enrollment client uses the certificate enrollment policies to complete the enrollment process [MS-WSTEP]. MDE uses the policies to allow the ES to specify the hash algorithm and key length as described in the following section.

Authentication

MDE implements the authentication provisions in WS-Security 2004 [WSS] to enable the ES [MS-XCEP] to authenticate the **GetPolicies** requestor [MS-XCEP]. This section defines the schema used to express the credential descriptor for the credential type. The security token credential is provided in a request message using the <wsse:BinarySecurityToken> element [WSS]. The security token is retrieved as described in section 3.2. The authentication information is as follows:

wsse:Security: MDE implements the <wsse:Security> element defined in [WSS] section 5. The <wsse:Security> element MUST be a child of the <s:Header> element (see [MS-XCEP] section 4).

wsse:BinarySecurityToken: MDE implements the <wsse:BinarySecurityToken> element defined in [WSS] section 6.3. The <wsse:BinarySecurityToken> element MUST be included as a child of the <wsse:Security> element in the **SOAP header**.

- As was described in section 3.2, inclusion of the <wsse:BinarySecurityToken> element is opaque to the enrollment client and the client does not interpret the string and inclusion of the element is agreed upon by the STS (as identified in the **DS** <AuthenticationServiceUrl> element of <DiscoveryResponse> (section 3.1.4.1.3.2)) and the ES.
- The <wsse:BinarySecurityToken> element contains a base64-encoded string. The enrollment client uses the security token received from the STS and base64-encodes the token to populate the <wsse:BinarySecurityToken> element.

wsse:BinarySecurityToken/attributes/ValueType: The <wsse:BinarySecurityToken> ValueType attribute MUST be "http://schemas.microsoft.com/5.0.0.0/ConfigurationManager/Enrollment/DeviceEnrollmentUserToken".

wsse:BinarySecurityToken/attributes/EncodingType: The <wsse:BinarySecurityToken> EncodingType attribute MUST be "http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd#base64binary".

3.3.1 Abstract Data Model

None.

3.3.2 Timers

None.

3.3.3 Initialization

None.

3.3.4 Message Processing Events and Sequencing Rules

The following table summarizes the list of WSDL operations as defined by this specification for obtaining the certificate policies:

Operation	Description
GetPolicies	Defines the client request and server response messages for completing the process of retrieving a certificate policy for enrollment.

This section specifies the details for how MDE uses messages defined by the X.509 Certificate Enrollment Policy Protocol [\[MS-XCEP\]](#).

3.3.4.1 GetPolicies Operation

The **GetPolicies** operation defines the client request and server response messages that are used to complete the process of retrieving a certificate policy for enrollment.

```
<wsdl:operation name="GetPolicies">
  <wsdl:input
    wsaw:Action=http://schemas.microsoft.com/windows/pki/2009/01/enrollmentpolicy/IPolicy/GetPolicies
    message="xcep:IPolicy_GetPolicies_InputMessage"/>
  <wsdl:output
    wsaw:Action=http://schemas.microsoft.com/windows/pki/2009/01/enrollmentpolicy/IPolicy/GetPoliciesResponse
    message="xcep:IPolicy_GetPolicies_OutputMessage"/>
</wsdl:operation>
```

3.3.4.1.1 Messages

The following table summarizes the set of WSDL message definitions that are specific to this operation.

Message	Description
GetPolicies	Sent from the client to the server to retrieve the certificate policies for enrollment.
GetPoliciesResponse	Sent from the server to the client and contains the requested certificate policy objects for enrollment.

3.3.4.1.1.1 GetPolicies

The **GetPolicies** message contains the request for the **GetPolicies** operation.

The SOAP action value is:

```
http://schemas.microsoft.com/windows/pki/2009/01/enrollmentpolicy/IPolicy/GetPolicies
```

The **GetPolicies** request message is sent from the client to the server to retrieve the certificate policies for enrollment.

```
<wsdl:message name="IPolicy_GetPolicies_InputMessage">
  <wsdl:part name="request" element="xcep:GetPolicies"/>
</wsdl:message>
```

xcep:GetPolicies: An instance of a <GetPolicies> element as specified in [\[MS-XCEP\]](#) section 3.1.4.1.2.1. MDE modifies the **GetPolicies** message defined in [\[MS-XCEP\]](#) section 3.1.4.1.1.1.

Authentication MUST be implemented for this message as defined in section [3.3](#). In summary, the following elements and attributes MUST be specified in the SOAP header:

wsse:Security: The <wsse:Security> element MUST be a child of <s:Header>.

wsse:BinarySecurityToken: The <wsse:BinarySecurityToken> element MUST be a child of <wsse:Security> in <s:Header>.

wsse:BinarySecurityToken/attributes/ValueType: The <wsse:BinarySecurityToken> ValueType attribute MUST be `"http://schemas.microsoft.com/5.0.0.0/ConfigurationManager/Enrollment/DeviceEnrollmentUserToken"`.

wsse:BinarySecurityToken/attributes/EncodingType: The <wsse:BinarySecurityToken> EncodingType attribute MUST be `"http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd#base64binary"`.

The following elements with their specified values MUST be included in the **SOAP body** of the request message.

xcep:requestfilter: MDE modifies the <GetPolicies> element by setting the <requestFilter> element **xsi:nil** attribute to `"true"` (see [\[MS-XCEP\]](#) section 3.1.4.1.2.1).

xcep:lastUpdate: MDE modifies the <GetPolicies> **xcep:client** attribute by setting the <Client> <lastUpdate> element **xsi:nil** attribute to `"true"` (see [\[MS-XCEP\]](#) section 3.1.4.1.3.9).

xcep:preferredLanguage: MDE modifies the <GetPolicies> **xcep:client** attribute by setting the <Client> <preferredLanguage> element **xsi:nil** attribute to `"true"` (see [\[MS-XCEP\]](#) section 3.1.4.1.3.9).

3.3.4.1.1.2 GetPoliciesResponse

The **GetPoliciesResponse** message contains the response for the **GetPolicies** operation.

The SOAP action value is:

```
http://schemas.microsoft.com/windows/pki/2009/01/enrollmentpolicy/IPolicy/GetPoliciesResponse
```

The **GetPoliciesResponse** message is sent from the server to the client and contains the requested certificate enrollment policies.

```
<wsdl:message name="IPolicy_GetPolicies_OutputMessage">
  <wsdl:part name="response" element="xcep:GetPoliciesResponse"/>
</wsdl:message>
```

xcep:GetPoliciesResponse: An instance of a <GetPoliciesResponse> element as specified in [\[MS-XCEP\]](#) section 3.1.4.1.2.2.

The enrollment client evaluates the following child elements of the <GetPoliciesResponse> element to determine whether to include the child element in the SOAP body of the response message. When a child element is included, the element and value are specified using syntax similar to **XML Path Language (XPath)**.

xcep:GetPoliciesResponse/response/policies/policy/attributes/policyschema: The value MUST be 3 (see [\[MS-XCEP\]](#) section 3.1.4.1.3.1).

xcep:GetPoliciesResponse/response/policies/policy/attributes/privatekeyattributes/minimalkeylength (see [\[MS-XCEP\]](#) section 3.1.4.1.3.20).

xcep:GetPoliciesResponse/response/policies/policy/attributes/privatekeyattributes/hasalgorithmoidreference: The referenced object identifier (OID) MUST be in the <GetPoliciesResponse> element (see [\[MS-XCEP\]](#) section 3.1.4.1.3.1).

xcep:GetPoliciesResponse/oIDs/oID: The OID referred to by the value of the **hasalgorithmoidreference** element specified in the previous point (see [\[MS-XCEP\]](#) section 3.1.4.1.2.2). The value MUST conform to the constraints specified in [\[MS-XCEP\]](#) section 3.1.4.1.3.16. For example, the <group> element value is 1.

3.3.5 Timer Events

None.

3.3.6 Other Local Events

None.

3.4 Interaction with WS-Trust X.509v3 Token Enrollment

This section describes the fifth phase in MDE device enrollment: interacting with the WS-Trust X.509v3 Token Enrollment Extensions [\[MS-WSTEP\]](#) to complete enrollment. The following diagram highlights this final phase.

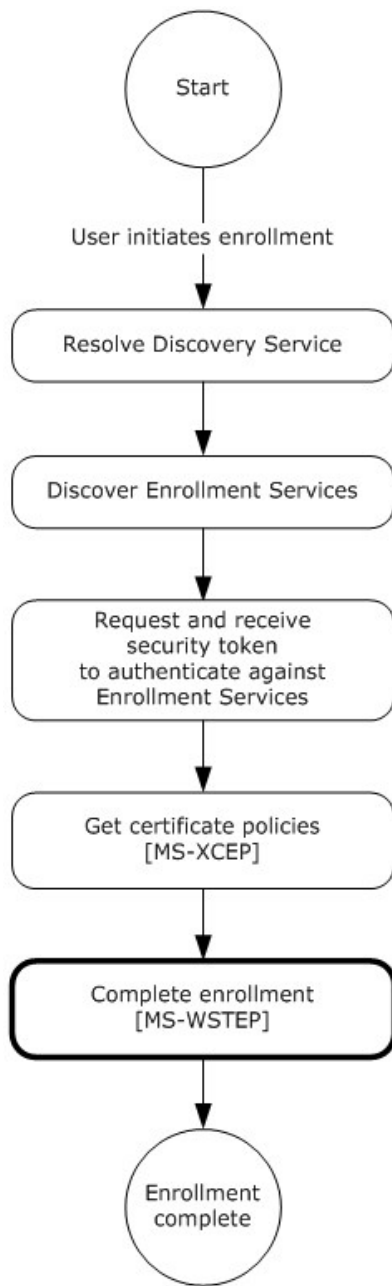


Figure 8: MDE device enrollment: completing enrollment

The WS-Trust X509v3 Enrollment Extensions [MS-WSTEP] are extensions of WS-Trust Security 2004 [WSS] that are used by a system to request that a certificate be issued. MDE implements an extension profile of the extensions defined in [MS-WSTEP], to enable a device to be enrolled and receive an identity. The following sections specify the details of the MDE profile of and extensions defined in [MS-WSTEP].

Authentication

The WS-Trust X509v3 Enrollment Extensions [MS-WSTEP] use the authentication provisions in WS-Security 2004 [WSS] to enable 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. The security token credential is provided in a request message using the <wsse:BinarySecurityToken> element [WSS]. The security token is retrieved as described in section 3.2. The authentication information is as follows:

wsse:Security: MDE implements the <wsse:Security> element defined in [WSS] section 5. The <wsse:Security> element MUST be a child of the <s:Header> element (see [MS-XCEP] section 4).

wsse:BinarySecurityToken: MDE implements the <wsse:BinarySecurityToken> element defined in [WSS] section 6.3. The <wsse:BinarySecurityToken> element MUST be included as a child of the <wsse:Security> element in the SOAP header.

- As was described in section 3.2, inclusion of the <wsse:BinarySecurityToken> element is opaque to the enrollment client and is agreed upon by the STS (as identified in the **DS** <AuthenticationServiceUrl> element of <DiscoveryResponse> (section 3.1.4.1.3.2)) and the ES.
- The <wsse:BinarySecurityToken> element contains a base64-encoded security token. The enrollment client uses the security token received from the STS to populate the <wsse:BinarySecurityToken> element.

wsse:BinarySecurityToken/attributes/ValueType: The <wsse:BinarySecurityToken> ValueType attribute MUST be "http://schemas.microsoft.com/5.0.0.0/ConfigurationManager/Enrollment/DeviceEnrollmentUserToken".

wsse:BinarySecurityToken/attributes/EncodingType: The <wsse:BinarySecurityToken> EncodingType attribute MUST be "http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd#base64binary".

3.4.1 Abstract Data Model

None.

3.4.2 Timers

None.

3.4.3 Initialization

None.

3.4.4 Message Processing Events and Sequencing Rules

The following table summarizes the list of WSDL operations as defined by this specification for completing enrollment:

Operation	Description
RequestSecurityToken	Provides the mechanism for completing the enrollment process. MDE uses the messages defined by this operation as specified in the WS-Trust X.509v3 Token Enrollment Extensions (see [MS-WSTEP] section 3.1.4).

3.4.4.1 RequestSecurityToken Operation

The **RequestSecurityToken** operation is called by the client to register a device.

```
<wsdl:operation name="RequestSecurityToken">
  <wsdl:input
    wsaw:Action="http://schemas.microsoft.com/windows/pki/2009/01/enrollment/RST/wstep"
    message="tns:IWindowsDeviceEnrollmentService_RequestSecurityToken_InputMessage"/>
  <wsdl:output
    wsaw:Action="http://schemas.microsoft.com/windows/pki/2009/01/enrollment/RSTRC/wstep"
    message="tns:IWindowsDeviceEnrollmentService_RequestSecurityToken_OutputMessage"/>
  <wsdl:fault
    wsaw:Action="http://schemas.microsoft.com/windows/pki/2009/01/enrollment/IWindowsDeviceEnrollmentService/RequestSecurityTokenWindowsDeviceEnrollmentServiceErrorFault"
    name="WindowsDeviceEnrollmentServiceErrorFault"
    message="tns:IWindowsDeviceEnrollmentService_RequestSecurityToken_WindowsDeviceEnrollmentServiceErrorFault_FaultMessage"/>
</wsdl:operation>
```

3.4.4.1.1 Messages

The following table summarizes the set of WSDL message definitions that are specific to this operation.

Message	Description
RequestSecurityToken	Sent from the client to the server to enroll a certificate and to retrieve provisioning information.
RequestSecurityTokenResponseCollection	Sent from the server to the client and contains the requested certificate and provisioning information.

3.4.4.1.1.1 RequestSecurityToken

The **RequestSecurityToken** message contains the request for the **RequestSecurityToken** operation.

The SOAP action value is:

```
http://schemas.microsoft.com/windows/pki/2009/01/enrollment/RST/wstep
```

The **RequestSecurityToken** request message ([\[WSTrust1.3\]](#) section 3.1) is sent from the client to the server to enroll a certificate and to retrieve provisioning information.

```
<wsdl:message name="RequestSecurityTokenMsg">
  <wsdl:part name="request" element="wst:RequestSecurityToken" />
</wsdl:message>
```

wst:RequestSecurityToken: MDE modifies the implementation of the **RequestSecurityToken** message as defined in [\[MS-WSTEP\]](#) section 3.1.4.1.1.1 and its associated protocols.

Authentication MUST be implemented for this message as defined in section [3.4](#). In summary, the following elements and attributes MUST be specified in the SOAP header:

wsse:Security: The <wsse:Security> element MUST be a child of <s:Header>.

wsse:BinarySecurityToken: The <wsse:BinarySecurityToken> element MUST be a child of <wsse:Security> in <s:Header>.

wsse:BinarySecurityToken/attributes/ValueType: The <wsse:BinarySecurityToken> ValueType attribute MUST be "http://schemas.microsoft.com/5.0.0.0/ConfigurationManager/Enrollment/DeviceEnrollmentUserToken".

wsse:BinarySecurityToken/attributes/EncodingType: The <wsse:BinarySecurityToken> EncodingType attribute MUST be "http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd#base64binary".

The following elements and attributes MUST be specified in the SOAP body of the request message.

wst:RequestSecurityToken: The <wst:RequestSecurityToken> element MUST be a child of <s:Body>.

wst:RequestType: The <wst:RequestType> element MUST be a child of <wst:RequestSecurityToken> and the value MUST be "http://docs.oasis-open.org/ws-sx/ws-trust/200512/Issue" (see [\[WSTrust1.3\]](#) section 3.1).

wst:TokenType: The <wst:tokentype> element MUST be a child of <wst:RequestSecurityToken> and the value MUST be "http://schemas.microsoft.com/5.0.0.0/ConfigurationManager/Enrollment/DeviceEnrollmentToken" (see [\[WSTrust1.3\]](#) section 3.1).

wsse:BinarySecurityToken: The <wsse:BinarySecurityToken> element MUST be a child of <wst:RequestSecurityToken> and MUST contain a base64-encoded **certificate signing request**.

wsse:BinarySecurityToken/attributes/ValueType: The <wsse:BinarySecurityToken> ValueType attribute MUST be "http://schemas.microsoft.com/windows/pki/2009/01/enrollment#PKCS10".

wsse:BinarySecurityToken/attributes/EncodingType: The <wsse:BinarySecurityToken> EncodingType attribute MUST be "http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd#base64binary".

ac:AdditionalContext: The <ac:AdditionalContext> element MUST be a child of <wst:RequestSecurityToken> (see [\[MS-WSTEP\]](#) section 3.1.4.1.3.3).

ac:ContextItem: One or more <ac:ContextItem> elements MUST be specified as child elements of <ac:AdditionalContext> to represent the device type.

ac:ContextItem/attributes/Name: The <ac:ContextItem> Name attribute MUST be the literal string "DeviceType".

ac:Value: The <ac:Value> element MUST be a child of <ac:AdditionalContext> and the value MUST be CIMClient_Windows.

3.4.4.1.1.2 RequestSecurityTokenResponseCollection

The **RequestSecurityTokenResponseCollection** message contains the response for the **RequestSecurityToken** operation.

The SOAP action value is:

<http://schemas.microsoft.com/windows/pki/2009/01/enrollment/RSTRC/wstep>

The **RequestSecurityTokenResponseCollection** message ([\[WSTrust1.3\]](#) section 3.2) is sent from the server to the client and contains the requested certificate and provisioning information.

```
<wsdl:message name="RequestSecurityTokenResponseCollectionMsg">
  <wsdl:part name="responseCollection" element="wst:RequestSecurityTokenResponseCollection"/>
</wsdl:message>
```

wst:RequestSecurityTokenResponseCollection: MDE modifies the implementation of the **RequestSecurityTokenResponseCollection** message as defined in [\[MS-WSTEP\]](#) section 3.1.4.1.1.2 and its associated protocols.

The following elements and attributes MUST be specified in the SOAP body of the response message.

wst:RequestSecurityTokenResponseCollection: The `<wst:RequestSecurityTokenResponseCollection>` element MUST be a child of `<s:Body>`.

wst:RequestSecurityTokenResponse: The `<wst:RequestSecurityTokenResponse>` element MUST be a child of `<wst:RequestSecurityTokenResponseCollection>` (see [\[WSTrust1.3\]](#) section 3.2).

wst:RequestedSecurityToken: The `<wst:RequestedSecurityToken>` element MUST be a child of `<wst:RequestSecurityTokenResponse>` (see [\[WSTrust1.3\]](#) section 3.2).

wst:TokenType: The `<wst:tokentype>` element MUST be a child of `<wst:RequestedSecurityToken>` and the value MUST be `"http://schemas.microsoft.com/5.0.0.0/ConfigurationManager/Enrollment/DeviceEnrollmentToken"` (see [\[WSTrust1.3\]](#) section 3.1).

wsse:BinarySecurityToken: The `<wsse:BinarySecurityToken>` element MUST be a child of `<wst:RequestedSecurityToken>` and MUST contain a base64-encoded **XML** provisioning document that consists of an X509 certificate and provisioning information for the device management client. The provisioning document schema is described in section [3.6](#).

wsse:BinarySecurityToken/attributes/ValueType: The `<wsse:BinarySecurityToken>` `ValueType` attribute MUST be `"http://schemas.microsoft.com/5.0.0.0/ConfigurationManager/Enrollment/DeviceEnrollmentProvisionDoc"`.

wsse:BinarySecurityToken/attributes/EncodingType: The `<wsse:BinarySecurityToken>` `EncodingType` attribute MUST be `"http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd#base64binary"`.

3.4.5 Timer Events

None.

3.4.6 Other Local Events

None.

3.5 Certificate Renewal

The enrollment client can request to renew an existing certificate. This section defines how the **RequestSecurityToken** message (section [3.5.4.1.1.1](#)) and **RequestSecurityTokenResponseCollection** message (section [3.5.4.1.1.2](#)) are called using the existing certificate for authentication.

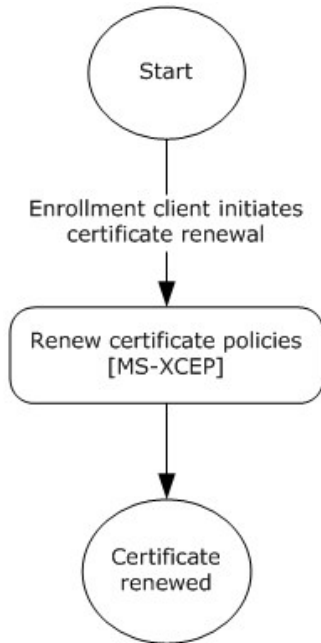


Figure 9: Enrollment client certificate renewal

3.5.1 Abstract Data Model

None.

3.5.2 Timers

None.

3.5.3 Initialization

None.

3.5.4 Message Processing Events and Sequencing Rules

The WSDL operations for certificate renewal are as specified in section [3.4.4](#).

3.5.4.1 RequestSecurityToken Operation

MDE does not modify the RequestSecurityToken operation for the certificate renewal process. The operation is as specified in section [3.4.4.1](#).

3.5.4.1.1 Messages

MDE does not modify the set of messages for the RequestSecurityToken operation for the certificate renewal process. The set of messages are as specified in section [3.4.4.1.1](#).

3.5.4.1.1.1 RequestSecurityToken

For the certificate renewal process, MDE modifies the **RequestSecurityToken** message as follows. The remainder of the definition for the **RequestSecurityToken** message is as specified in section [3.4.4.1.1.1](#).

Because the enrollment client uses the existing certificate to perform client **Transport Layer Security (TLS)**, the security token is not populated in the SOAP header. As a result, the ES is required to support client **TLS**.

The following elements and attributes **MUST** be included as specified in the SOAP body of the request message.

wst:RequestType: The <wst:RequestType> element **MUST** be the value "<http://docs.oasis-open.org/ws-sx/ws-trust/200512/Renew>" (see [\[WSTrust1.3\]](#) section 3.1).

wsse:BinarySecurityToken/attributes/ValueType: The <wsse:BinarySecurityToken> ValueType attribute **MUST** be "<http://schemas.microsoft.com/windows/pki/2009/01/enrollment#PKCS7>".

3.5.4.1.1.2 RequestSecurityTokenCollectionResponse

For the certificate renewal process, MDE modifies the RequestSecurityTokenCollectionResponse message as follows. The remainder of the definition for the RequestSecurityTokenCollectionResponse message is as specified in section [3.4.4.1.1.2](#).

For the certificate renewal process, the same provisioning document is used as specified in section [3.6](#). However, only the CertificateStore/My/User/EncodedCertificate is returned.

```
<wap-provisioningdoc version="1.1">
  <!-- This contains information about issued certificate. -->
  <characteristic type="CertificateStore">
    <characteristic type="My" >
      <characteristic type="User">
        <!-- Certificate thumbprint. -->
        <characteristic type="B692158116B7B82EDA4600FF4145414933B0D5AB">
        <!-- Base64 encoding of issued certificate. -->
        <parm name="EncodedCertificate"
value="MIIDFDCCAoGgAwIBAgIQ4DQRvmm9g7NkpQ7Tnb0HyjAJBgUrDgMCHQUAMBwxGjAYBgNVBAMTEVNDX09ubGluZV
9Jc3N1aW5nMB4XDTEzMDYwM1oXDTE0MDQwMzIzMTFwM1owLzEtMCSGAlUEAxMkZTRjNmI4OTMtMDdhNy00YjI
0LTg3OGUtOWQ4NjAyYzNkMjg5SMIIBIjANBgkqhkiG9w0BAQEAAAOCAQ8AMIIBCgKCAQEAvwSr/T+vRwucCDo
r5XBN+bEFdsdCGzU3DWMhmfQKAv1j70THsEgm90yo8x6XwNBI/DO/3qU0J4Ns8eXK6aRN64IyisfciKZn1gXnbo
FsZVbxf4Y8ADqprfilCU2k/0oFEHuNDcPmYDZWwyuNOirtK/Yu/SbVzZMPmCpdZwu5iXZnwAj5GvSpgyzqVfOanh
HFNCHZ4M9qHRFy3sDUoQTF1UPHLkiIbT9Twt8+MFULI7EwqjFQJTaLWI7hfPb9J8jKY8gfYjEbAlT4z6iqdFHaX
M9bCeKOHI/cgFloE/TRuAkEsp sk0m1ph7mgsHFhUKLtQ5J7SITMIDqy3KnDThq/QIDAQABgREAWsMuaEI/OEep7Ji
BYhBzaYIRAJ04xuSnByRLh46dhgLD0omjgaEwgZ4wDAYDVR0TAQH/BAIwADAcBggqhkiG9xQFBGQQNcMmZjkH+kS1h
Nkaw23C2TAcBgqhkiG9xQFAwQQBikH6Jq4/0+cSMjvuzoazjAcBggqhkiG9xQFBGQQk7jG5KcHJEuHjp2GAsPSi
TAWBgNVHSUBAf8EDDAKBggrBgEFBQcDAjAcBgqhkiG9xQFCgQQSnqw5rqYgkOz+p8pEAnLFzAJBgUrDgMCHQUAA
4GBAMWTO5MPoRrn+/LMO+hgF06h8EMiyLG2t81BOI72440vyJzE9Xsbluej0miHOFqBRi/jedYvbJ0G3K3R7HYtH49lhVVSZ2v6vA9Wdu
Kh1CaGnXdkvseZiHe7AAR+EXyafCQwjTWGDEB53/87qIlnkslw35DS+LaRGrpCvRvG3Y9Cn" />
      </characteristic>
    </characteristic>
  </characteristic>
</wap-provisioningdoc>
```

```
</characteristic>
</wap-provisioningdoc>
```

3.5.5 Timer Events

None.

3.5.6 Other Local Events

None.

3.6 XML Provisioning Document Schema

As described in section [3.4.4.1.1.2](#), the <RequestSecurityTokenResponseCollection>

<wsse:BinarySecurityToken> element contains an XML provisioning document. The entire XML provisioning document is base64-encoded in the RequestSecurityTokenResponseCollection message (section [3.4.4.1.1.2](#)). The document contains:

The requested client certificate, the trusted **root certificate**, and intermediate certificates.

The provisioning information for the device management client.

The enrollment client installs the client certificate, as well as the trusted root certificate and intermediate certificates. The provisioning information includes content such as the location of the DMS and various properties that the device management client uses to communicate with the DMS.

The following schema is an example of the XML required for the provisioning document. The explanation for each field in the document appears inline in the example as XML comments.

```
<wap-provisioningdoc version="1.1">
  <!-- This contains information about issued and trusted certificates. -->
  <characteristic type="CertificateStore">
    <!-- This contains trust certificates. -->
    <characteristic type="Root">
      <characteristic type="System">
        <!--The thumbprint of the certificate to be added to the trusted root store -->
        <characteristic type="5BE128213D05DC6CB87A059469130FC6686992EF">
          <!-- Base64 encoding of the trust root certificate -->
          <parm name="EncodedCertificate"
value="MIIB2TCCAUagAwIBAgIQyRjUagpgKYJPlAZXnPL4SDAJBgUrDgMCHQUAMBwxGjAYBgNVBAMTEVNDX09ubGluZV
9Jc3N1aW5nMB4XDTA4MTEyNjAyMDAzMloXDTE0MDMyNjAyMDAzMlowHDEaMBGAlUEAxMRU0Nft25saW5lX01zc3Vpbmc
wgZ8wDQYJKoZIhvcNAQEBBQADgY0AMIGJAoGBAM6Ck062YpeXE18cwkN7ycAf1/L2Z9bdfyfqxGLx89zwSiUBrvoEDtnt
9fWGkTQ5LVz+lJy/k/TRLiM/3h94FT00QzBke6yICLq7UCX5z8LRFEHSSGGaBgkotrkPsX3pG6agczNqF2h4Bngq+4BVb
sA2PMpsXiVtWUtVht45PD/JAgMBAAGBEQBawy5oQj84R6nsmIFiEHNpghEAWsMuaEI/OEep7JiBYhBzaTAJBgUrDgMCHQ
UAA4GBAC331598+rVBg+ipGb0Q4rreQFBlkFWa2Xv4Ea00xInq0PmtRxCxMCuLJIKSeg8IMSaAU0xGZYPaHSNHf1vUqrU
kLEjjyXNa5URbo322KCR2iTu5URddxD1FCE5SXwzZ/YHD3U9GvKfSQXZNDiF+VI8mtN115jUhjzaIFtWL4dMe" />
          </characteristic>
        </characteristic>
      </characteristic>
    <characteristic type="My" >
      <characteristic type="User">
        <!-- Client certificate thumbprint. -->
        <characteristic type="B692158116B7B82EDA4600FF4145414933B0D5AB">
          <!-- Base64 encoding of the client certificate -->
          <parm name="EncodedCertificate"
value="MIIDFDCCAoGgAwIBAgIQ4DQRvmm9g7NKpQ7Tnb0HyjAJBgUrDgMCHQUAMBwxGjAYBgNVBAMTEVNDX09ubGluZV
```

```

9Jc3N1aW5nMB4XDTEzMDQwMzIzMDYwM1oXDTE0MDQwMzIzMTETwM1owLzEtMCsGALUEAxMkZTRjNmI4OTMtMDdhNy00YjI
0LTg3OGUtOWQ4NjAyYzNkMjg5MIIBIjANBgkqhkiG9w0BAQEAAAOCAQ8AMIIBCgKCAQEAvwSr/T+vRwucCDor5XBN+bEF
dsdCGzU3DWMhmfQKAv1j70THsEgm90yo8x6XwNBI/DO/3qU0J4Ns8eXK6aRN64IyisfciKZn1gXnboFsZVbxf4Y8ADqpr
filCU2k/0oFEHuNDcPmYDZWwYuNOirtK/Yu/SbVyZMPmCpdZwu5iXZnwAj5GvSpgyzqVfOanhHFNCHZ4M9qHRFy3sDUoQ
TF1UPHLkiIbT9Twt8+MFULI7EwqjFQJTaIWI7hfPb9J8jKY8gfYjEbAlT4z6iqdFHaXM9bCeKOHI/cgFloE/TRuAkEsp
sk0m1ph7mgsHFhUKLtQ5J7SITMIDgy3KnDThq/QIDAQABgREAwMueAI/OEep7JiBYhBzaYIRAJ04xuSnByRLh46dhgLD
0omjgaEwgZ4wDAYDVR0TAAQH/BAIwADAcBggqhkiG9xQFBGQQNcMmZjkH+kSlhNkaw23C2TAcBggqhkiG9xQFAwQOBikH6
Jq4/0+cSMjvuzoazjAcBggqhkiG9xQFBGQQk7jG5KcHJEuHjpp2GAsPSiTAWBgNVH5SUBAF8EDDAKBggrBgEFBQcDAjAcBg
qhkiG9xQFCgQQSnqw5rqYgkOz+p8pEAnLFzAJBgUrDgMCHQUAA4GBAMWTO5MPoRRn+/LMO+hgF06h8EMiyLG2t81BOI7
2440vyJzE9Xsbluej0miHOFqBRI/jedYvbJ0G3K3R7HYtH49lhVVSZ2v6vAWduKh1CaGnXdkvseZiHe7AAR+EXyafCQwJ
TWGDEB53/87qIlnkslw35DS+LaRGrpCvRvG3Y9Cn" />
<characteristic type="PrivateKeyContainer">
  <parm name="KeySpec" value="2"/>
  <parm name="ContainerName" value="ConfigMgrEnrollment"/>
  <parm name="ProviderType" value="1"/>
</characteristic>
</characteristic>
</characteristic>
</characteristic>
</characteristic>

<!-- Contains information about the management service and configuration for the management
agent -->
<characteristic type="APPLICATION">
  <parm name="APPID" value="w7"/>
  <!-- Management Service Name. -->
  <parm name="PROVIDER-ID" value="Contoso Management Service"/>
  <parm name="NAME" value="BecMobile"/>
  <!-- Link to an application that the management service may provide eg a Windows Store
application link. The Enrollment Client may show this link in its UX.-->
  <parm name="SSPHyperlink" value="http://go.microsoft.com/fwlink/?LinkId=255310" />
  <!-- Management Service URL. -->
  <parm name="ADDR" value="https://ContosoManagementService.com/MDMHandler"/>
  <parm name="ServerList" value="https://ContosoManagementService.com/MDMHandler" />
  <parm name="ROLE" value="4294967295"/>
  <!-- Discriminator to set whether the client should do Certificate Revocation List
checking. -->
  <parm name="CRLCheck" value="0"/>
  <parm name="CONNRETRYFREQ" value="6" />
  <parm name="INITIALBACKOFFTIME" value="30000" />
  <parm name="MAXBACKOFFTIME" value="120000" />
  <parm name="BACKCOMPATRETRYDISABLED" />
  <parm name="DEFAULTENCODING" value="application/vnd.syncml.dm+wbxml" />
  <!-- Search criteria for client to find the client certificate using subject name of the
certificate -->
  <parm name="SSLCLIENTCERTSEARCHCRITERIA" value="Subject=CN%3de4c6b893-07a7-4b24-878e-
9d8602c3d289&amp;Stores=MY%5CUser"/>
  <characteristic type="APPAUTH">
    <parm name="AAUTHLEVEL" value="CLIENT"/>
    <parm name="AAUTHTYPE" value="DIGEST"/>
    <parm name="AAUTHSECRET" value="dummy"/>
    <parm name="AAUTHDATA" value="nonce"/>
  </characteristic>
  <characteristic type="APPAUTH">
    <parm name="AAUTHLEVEL" value="APPSRV"/>
    <parm name="AAUTHTYPE" value="DIGEST"/>
    <parm name="AAUTHNAME" value="dummy"/>
    <parm name="AAUTHSECRET" value="dummy"/>
    <parm name="AAUTHDATA" value="nonce"/>
  </characteristic>
</characteristic>

```

```

<!-- Extra Information to seed the management agent's behavior . -->
<characteristic type="Registry">
  <characteristic type="HKLM\Security\MachineEnrollment">
    <parm name="RenewalPeriod" value="363" datatype="integer" />
  </characteristic>
  <characteristic type="HKLM\Security\MachineEnrollment\OmaDmRetry">
    <!-- Number of retries if client fails to connect to the management service. -->
    <parm name="NumRetries" value="8" datatype="integer" />
    <!--Interval in minutes between retries. -->
    <parm name="RetryInterval" value="15" datatype="integer" />
    <parm name="AuxNumRetries" value="5" datatype="integer" />
    <parm name="AuxRetryInterval" value="3" datatype="integer" />
    <parm name="Aux2NumRetries" value="0" datatype="integer" />
    <parm name="Aux2RetryInterval" value="480" datatype="integer" />
  </characteristic>
</characteristic>
<!-- Extra Information about where to find device identity information. This is redundant
in that it is duplicative to what is above, but it is required in the current version of the
protocol. -->
<characteristic type="Registry">
  <characteristic type="HKLM\Software\Windows\CurrentVersion\MDM\MachineEnrollment">
    <parm name="DeviceName" value="" datatype="string" />
  </characteristic>
</characteristic>
<characteristic type="Registry">
  <characteristic type="HKLM\SOFTWARE\Windows\CurrentVersion\MDM\MachineEnrollment">
    <!--Thumbprint of root certificate. -->
    <parm name="SslServerRootCertHash" value="5BE128213D05DC6CB87A059469130FC6686992EF"
datatype="string" />
    <!-- Store for device certificate. -->
    <parm name="SslClientCertStore" value="MY%5CSystem" datatype="string" />
    <!-- Common name of issued certificate. -->
    <parm name="SslClientCertSubjectName" value="CN%3de4c6b893-07a7-4b24-878e-9d8602c3d289"
datatype="string" />
    <!--Thumbprint of issued certificate. -->
    <parm name="SslClientCertHash" value="B692158116B7B82EDA4600FF4145414933B0D5AB"
datatype="string" />
  </characteristic>
  <characteristic
type="HKLM\Security\Provisioning\OMADM\Accounts\037B1F0D3842015588E753CDE76EC724">
    <parm name="SslClientCertReference"
value="My;System;B692158116B7B82EDA4600FF4145414933B0D5AB" datatype="string" />
  </characteristic>
</characteristic>
</wap-provisioningdoc>

```

4 Protocol Examples

4.1 Discovery Example

The following example is a full request/response sequence using the Discovery protocol to auto-discover a management enrollment server based on the user's email address.

4.1.1 Discovery Example: Request

The following snippet demonstrates the call to the **Discovery** (section [3.1.4.1.1.1](#)) input message.

```
<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/management/2012/01/enrollment/IDiscoveryService/Discover
    </a:Action>
    <a:MessageID>urn:uuid:748132ec-a575-4329-b01b-6171a9cf8478</a:MessageID>
    <a:ReplyTo>
      <a:Address>http://www.w3.org/2005/08/addressing/anonymous</a:Address>
    </a:ReplyTo>
    <a:To s:mustUnderstand="1">
      https://manage.contoso.com:443/EnrollmentServer/Discovery.svc
    </a:To>
  </s:Header>
  <s:Body>
    <Discover xmlns="http://schemas.microsoft.com/windows/management/2012/01/enrollment">
      <request xmlns:i="http://www.w3.org/2001/XMLSchema-instance">
        <EmailAddress>johndoe@contoso.com</EmailAddress>
        <RequestVersion>1.0</RequestVersion>
      </request>
    </Discover>
  </s:Body>
</s:Envelope>
```

4.1.2 Discovery Example: Response

The following snippet demonstrates the call to the **Discovery** (section [3.1.4.1.1.2](#)) output message.

```
<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/management/2012/01/enrollment/IDiscoveryService/DiscoverResponse
    </a:Action>
    <ActivityId CorrelationId="48915517-66c6-4ab7-8f77-c8277e45b3cf"
xmlns="http://schemas.microsoft.com/2004/09/ServiceModel/Diagnostics">a4067bc9-ce15-446b-a3f7-5ea1006256f5
    </ActivityId>
    <a:RelatesTo>
      urn:uuid:748132ec-a575-4329-b01b-6171a9cf8478
    </a:RelatesTo>
  </s:Header>
  <s:Body>
```

```

    <DiscoverResponse
xmlns="http://schemas.microsoft.com/windows/management/2012/01/enrollment">
  <DiscoverResult xmlns:i="http://www.w3.org/2001/XMLSchema-instance">
    <AuthPolicy>Federated</AuthPolicy>
    <AuthUrl>prod</AuthUrl>
    <AuthenticationServiceUrl>
      https://portal.manage.contoso.com/LoginRedirect.aspx
    </AuthenticationServiceUrl>
    <EnrollmentPolicyServiceUrl>
      https://manage.contoso.com/DeviceEnrollment/WinDeviceEnrollmentService.svc
    </EnrollmentPolicyServiceUrl>
    <EnrollmentServiceUrl>
      https://manage.contoso.com/DeviceEnrollment/WinDeviceEnrollmentService.svc
    </EnrollmentServiceUrl>
  </DiscoverResult>
</DiscoverResponse>
</s:Body>
</s:Envelope>

```

4.2 GetPolicies Example

The following example is a full request/response sequence where the caller requests certificate policies that are used to determine if the enrollment service is compliant with the caller's requirements.

4.2.1 GetPolicies Example: Request

The following snippet demonstrates the call to the **GetPolicies** (section [3.3.4.1.1.1](#)) message.

```

<s:Envelope
  xmlns:s="http://www.w3.org/2003/05/soap-envelope"
  xmlns:a="http://www.w3.org/2005/08/addressing"
  xmlns:u="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd">
  <s:Header>
    <a:Action s:mustUnderstand="1">
http://schemas.microsoft.com/windows/pki/2009/01/enrollmentpolicy/IPolicy/GetPolicies
    </a:Action>
    <a:MessageID>
      urn:uuid:5fb5f6fd-4709-414b-8afa-0c05f6686d1c
    </a:MessageID>
    <a:ReplyTo>
      <a:Address>
        http://www.w3.org/2005/08/addressing/anonymous
      </a:Address>
    </a:ReplyTo>
    <a:To s:mustUnderstand="1">
      https://sts.contoso.com/service.svc/cep
    </a:To>
    <wsse:Security
      s:mustUnderstand="1"
      xmlns:o="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
      <wsse:BinarySecurityToken
        ValueType="http://schemas.microsoft.com/5.0.0.0/
ConfigurationManager/Enrollment/DeviceEnrollmentUserToken"

```

```

        EncodingType="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-
secect-1.0.xsd#base64binary">
        <!-- Security token removed -->
        </wsse:BinarySecurityToken>
    </wsse:Security>
</s:Header>
<s:Body
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <GetPolicies xmlns="http://schemas.microsoft.com/windows/pki/2009/01/enrollmentpolicy">
    <Client>
      <lastUpdate>0001-01-01T00:00:00</lastUpdate>
      <preferredLanguage xsi:nil="true"></preferredLanguage>
    </Client>
    <requestFilter xsi:nil="true"></requestFilter>
  </GetPolicies>
</s:Body>
</s:Envelope>

```

4.2.2 GetPolicies Example: Response

The following snippet demonstrates the call to the **GetPoliciesResponse** (section [3.3.4.1.1.2](#)) message.

```

<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/enrollmentpolicy/IPolicy/GetPoliciesResponse
    </a:Action>
  </s:Header>
  <s:Body
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema">
    <GetPoliciesResponse
  xmlns="http://schemas.microsoft.com/windows/pki/2009/01/enrollmentpolicy">
      <response>
        <policies>
          <policy>
            <attributes>
              <policySchema>3</policySchema>
              <privateKeyAttributes>
                <minimalKeyLength>2048</minimalKeyLength>
                <algorithmOIDReference xsi:nil="true"/>
              </privateKeyAttributes>
              <hashAlgorithmOIDReference xsi:nil="true"></hashAlgorithmOIDReference>
            </attributes>
          </policy>
        </policies>
      </response>
    <oIDs>
      <oID>
        <value>1.3.6.1.4.1.311.20.2</value>
        <group>1</group>
        <oIDReferenceID>5</oIDReferenceID>
        <defaultName>Certificate Template Name</defaultName>
      </oID>
    </oIDs>
  </GetPoliciesResponse>
</s:Body>
</s:Envelope>

```

```

        </oID>
    </oIDs>
</GetPoliciesResponse>
</s:Body>
</s:Envelope>

```

4.3 RequestSecurityToken Example

The following example is a full request/response sequence where the caller requests a security token (provisioning document) for the device type "CIMClient_Windows".

4.3.1 RequestSecurityToken Example: Request

The following snippet demonstrates the call to the **RequestSecurityToken** (section [3.4.4.1.1.1](#)) message.

```

<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>
    <wsse:Security>
      <wsse:BinarySecurityToken
        ValueType=http://schemas.microsoft.com/5.0.0.0/
ConfigurationManager/Enrollment/DeviceEnrollmentUserToken
        EncodingType="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-
secext-1.0.xsd#base64binary">
        <!-- Token Removed -->
      </wsse:BinarySecurityToken>
    </wsse:Security>
  </s:Header>
  <s:Body xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema">
    <wst:RequestSecurityToken xmlns="http://docs.oasis-open.org/ws-sx/ws-trust/200512">
      <wst:TokenType>
"http://schemas.microsoft.com/5.0.0.0/ConfigurationManager/Enrollment/DeviceEnrollmentToken"
      </wst:TokenType>
      <wst:RequestType>
        http://docs.oasis-open.org/ws-sx/ws-trust/200512/Issue
      </wst:RequestType>
      <wsse:BinarySecurityToken
        EncodingType="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-
secext-1.0.xsd#base64binary"
        ValueType="http://schemas.microsoft.com/windows/pki/2009/01/ enrollment#PKCS10"
        xmlns="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-
1.0.xsd">
        <!-- Token removed -->
      </wsse:BinarySecurityToken>
      <ac:AdditionalContext>
        <ac:ContextItem Name="DeviceType">
          <ac:Value>CIMClient_Windows</ac:Value>
        </ac:ContextItem>
    </wst:RequestSecurityToken>
  </s:Body>
</s:Envelope>

```



```

        </ac:AdditionalContext>
    </wst:RequestSecurityToken>
</s:Body>
</s:Envelope>

```

4.3.2 RequestSecurityToken Example: Response

The following snippet demonstrates the call to the **RequestSecurityTokenResponseCollection** (section [3.4.4.1.1.2](#)) message.

```

<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>
  </s:Header>
  <s:Body>
    <wst:RequestSecurityTokenResponseCollection
      xmlns="http://docs.oasis-open.org/ws-sx/ws-trust/200512">
      <wst:RequestSecurityTokenResponse>
        <wst:RequestedSecurityToken>
          <wst:TokenType>
            "http://schemas.microsoft.com/5.0.0.0/ConfigurationManager/Enrollment/DeviceEnrollmentToken"
          </wst:TokenType>
          <wsse:BinarySecurityToken
            ValueType="http://schemas.microsoft.com/5.0.0.0/Configuration
Manager/Enrollment/DeviceEnrollmentProvisionDoc"
            EncodingType="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-
wssecurity-secext-1.0.xsd#base64binary">

              <!-- base64 encoded provisioning document -->
            </wsse:BinarySecurityToken>
          </wst:RequestedSecurityToken>
        </wst:RequestSecurityTokenResponse>
      </wst:RequestSecurityTokenResponseCollection>
    </s:Body>
  </s:Envelope>

```

5 Security

5.1 Security Considerations for Implementers

MDE does not provide message-level signing or message-level encryption for any messages. Implementers should make use of transport protection as available in HTTPS to provide security to the client/server interaction.

MDE does not define a mechanism to limit a client's use of server resources, such as CPU, network bandwidth, and memory.

5.2 Index of Security Parameters

None.

6 Appendix A: Full WSDL

For ease of implementation, the full WSDL and schema are provided in this appendix.

```
<wsdl:definitions xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:soap12="http://schemas.xmlsoap.org/wsdl/soap12/"
xmlns:tns="http://schemas.microsoft.com/windows/management/2012/01/enrollment"
xmlns:wsaw="http://www.w3.org/2006/05/addressing/wsdl"
targetNamespace="http://schemas.microsoft.com/windows/management/2012/01/enrollment"
xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/">
  <wsdl:types>
    <xsd:schema elementFormDefault="qualified"
targetNamespace="http://schemas.microsoft.com/windows/management/2012/01/enrollment">
      <xsd:element name="Discover" nillable="true">
        <xsd:complexType>
          <xsd:sequence>
            <xsd:element minOccurs="1" maxOccurs="1" name="request" nillable="true"
type="tns:DiscoveryRequest"/>
          </xsd:sequence>
        </xsd:complexType>
      </xsd:element>
      <xsd:complexType name="DiscoveryRequest">
        <xsd:sequence>
          <xsd:element minOccurs="0" maxOccurs="1" name="EmailAddress" nillable="true"
type="xsd:string"/>
          <xsd:element minOccurs="0" maxOccurs="1" name="RequestVersion" nillable="true"
type="xsd:string"/>
        </xsd:sequence>
      </xsd:complexType>
      <xsd:element name="DiscoverResponse" nillable="true">
        <xsd:complexType>
          <xsd:sequence>
            <xsd:element minOccurs="1" maxOccurs="1" name="DiscoverResult" nillable="true"
type="tns:DiscoveryResponse"/>
          </xsd:sequence>
        </xsd:complexType>
      </xsd:element>
      <xsd:complexType name="DiscoveryResponse">
        <xsd:sequence>
          <xsd:element minOccurs="0" maxOccurs="1" name="AuthPolicy" nillable="true"
type="xsd:string"/>
          <xsd:element minOccurs="0" maxOccurs="1" name="EnrollmentPolicyServiceUrl"
nillable="true" type="xsd:string"/>
          <xsd:element minOccurs="0" maxOccurs="1" name="EnrollmentServiceUrl"
nillable="true" type="xsd:string"/>
          <xsd:element minOccurs="0" maxOccurs="1" name="AuthenticationServiceUrl"
nillable="true" type="xsd:string"/>
        </xsd:sequence>
      </xsd:complexType>
    </xsd:schema>
  </wsdl:types>
  <wsdl:message name="IDiscoveryService_Discover_InputMessage">
    <wsdl:part name="Discover" element="tns:Discover"/>
  </wsdl:message>
  <wsdl:message name="IDiscoveryService_Discover_OutputMessage">
    <wsdl:part name="DiscoverResponse" element="tns:DiscoverResponse"/>
  </wsdl:message>
  <wsdl:portType name="IDiscoveryService">
    <wsdl:operation name="Discover">
```

```
    <wsdl:input
wsaw:Action="http://schemas.microsoft.com/windows/management/2012/01/enrollment/IDiscoveryService/Discover" name="IDiscoveryService_Discover_InputMessage"
message="tns:IDiscoveryService_Discover_InputMessage"/>
    <wsdl:output
wsaw:Action="http://schemas.microsoft.com/windows/management/2012/01/enrollment/IDiscoveryService/DiscoverResponse" name="IDiscoveryService_Discover_OutputMessage"
message="tns:IDiscoveryService_Discover_OutputMessage"/>
    </wsdl:operation>
</wsdl:portType>
<wsdl:binding name="IDiscoveryServiceSoap12" type="tns:IDiscoveryService">
    <soap12:binding transport="http://schemas.xmlsoap.org/soap/http"/>
    <wsdl:operation name="Discover">
        <soap12:operation
soapAction="http://schemas.microsoft.com/windows/management/2012/01/enrollment/IDiscoveryService/Discover" style="document"/>
        <wsdl:input name="IDiscoveryService_Discover_InputMessage">
            <soap12:body use="literal"/>
        </wsdl:input>
        <wsdl:output name="IDiscoveryService_Discover_OutputMessage">
            <soap12:body use="literal"/>
        </wsdl:output>
    </wsdl:operation>
</wsdl:binding>
</wsdl:definitions>
```

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:

- Windows 8.1 operating system
- Windows Server 2012 R2 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.

8 Change Tracking

No table of changes is available. The document is either new or has had no changes since its last release.

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