

# [MS-RCMP]: Remote Certificate Mapping Protocol

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## Revision Summary

Date	Revision History	Revision Class	Comments
03/02/2007	1.0	Major	Updated and revised the technical content.
04/03/2007	1.1	Minor	Updated the technical content.
05/11/2007	1.2	Minor	Addressed EU feedback
06/01/2007	1.3	Minor	Updated the technical content.
07/03/2007	1.3.1	Editorial	Revised and edited the technical content.
08/10/2007	1.3.2	Editorial	Revised and edited the technical content.
09/28/2007	1.3.3	Editorial	Revised and edited the technical content.
10/23/2007	2.0	Major	Converted document to unified format.
01/25/2008	2.0.1	Editorial	Revised and edited the technical content.
03/14/2008	2.0.2	Editorial	Revised and edited the technical content.
06/20/2008	2.1	Minor	Updated the technical content.
07/25/2008	2.2	Minor	Updated the technical content.
08/29/2008	2.2.1	Editorial	Revised and edited the technical content.
10/24/2008	2.2.2	Editorial	Revised and edited the technical content.
12/05/2008	3.0	Major	Updated and revised the technical content.
01/16/2009	3.0.1	Editorial	Revised and edited the technical content.
02/27/2009	3.0.2	Editorial	Revised and edited the technical content.
04/10/2009	3.0.3	Editorial	Revised and edited the technical content.
05/22/2009	4.0	Major	Updated and revised the technical content.
07/02/2009	5.0	Major	Updated and revised the technical content.
08/14/2009	5.0.1	Editorial	Revised and edited the technical content.
09/25/2009	5.1	Minor	Updated the technical content.
11/06/2009	5.1.1	Editorial	Revised and edited the technical content.
12/18/2009	6.0	Major	Updated and revised the technical content.
01/29/2010	6.1	Minor	Updated the technical content.
03/12/2010	6.1.1	Editorial	Revised and edited the technical content.

<b>Date</b>	<b>Revision History</b>	<b>Revision Class</b>	<b>Comments</b>
04/23/2010	6.1.2	Editorial	Revised and edited the technical content.
06/04/2010	7.0	Major	Updated and revised the technical content.
07/16/2010	7.0	No change	No changes to the meaning, language, or formatting of the technical content.
08/27/2010	7.0	No change	No changes to the meaning, language, or formatting of the technical content.
10/08/2010	7.0	No change	No changes to the meaning, language, or formatting of the technical content.
11/19/2010	7.0	No change	No changes to the meaning, language, or formatting of the technical content.
01/07/2011	7.0	No change	No changes to the meaning, language, or formatting of the technical content.
02/11/2011	7.0	No change	No changes to the meaning, language, or formatting of the technical content.
03/25/2011	7.0	No change	No changes to the meaning, language, or formatting of the technical content.
05/06/2011	7.0	No change	No changes to the meaning, language, or formatting of the technical content.
06/17/2011	7.1	Minor	Clarified the meaning of the technical content.
09/23/2011	7.1	No change	No changes to the meaning, language, or formatting of the technical content.
12/16/2011	8.0	Major	Significantly changed the technical content.
03/30/2012	8.0	No change	No changes to the meaning, language, or formatting of the technical content.
07/12/2012	8.0	No change	No changes to the meaning, language, or formatting of the technical content.
10/25/2012	9.0	Major	Significantly changed the technical content.
01/31/2013	9.0	No change	No changes to the meaning, language, or formatting of the technical content.
08/08/2013	10.0	Major	Significantly changed the technical content.

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# 1 Introduction

This document specifies the Remote Certificate Mapping Protocol. The Remote Certificate Mapping Protocol is used by servers that authenticate users via X.509 certificates, as specified in [\[X509\]](#). This protocol allows the server to use a directory, database, or other technology to map the user's X.509 certificate to a **security principal**. This protocol returns the authorization information associated with the security principal in the form of a **privilege attribute certificate (PAC)**, as specified in [\[MS-PAC\]](#), that represents the user's identity and group memberships. Throughout this document, **little-endian** format applies unless otherwise stated.

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 RFC 2119. Sections 1.5 and 1.9 are also normative but cannot contain those terms. All other sections and examples in this specification are informative.

## 1.1 Glossary

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

**Active Directory**  
**distinguished name (DN)**  
**domain**  
**domain controller (DC)**  
**domain name (2)**  
**issuer name**  
**little-endian**  
**object (2)**  
**object identifier (OID)**  
**principal**  
**privilege attribute certificate (PAC)**  
**remote procedure call (RPC)**  
**RPC transport**  
**security principal**  
**service principal name (SPN)**  
**Unicode**  
**user principal name (UPN)**

The following terms are specific to this 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](mailto: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-ADA1] Microsoft Corporation, "[Active Directory Schema Attributes A-L](#)".

[MS-ADA3] Microsoft Corporation, "[Active Directory Schema Attributes N-Z](#)".

[MS-ADTS] Microsoft Corporation, "[Active Directory Technical Specification](#)".

[MS-DTYP] Microsoft Corporation, "[Windows Data Types](#)".

[MS-ERREF] Microsoft Corporation, "[Windows Error Codes](#)".

[MS-KILE] Microsoft Corporation, "[Kerberos Protocol Extensions](#)".

[MS-NRPC] Microsoft Corporation, "[Netlogon Remote Protocol](#)".

[MS-PAC] Microsoft Corporation, "[Privilege Attribute Certificate Data Structure](#)".

[MS-UCODEREF] Microsoft Corporation, "[Windows Protocols Unicode Reference](#)".

[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>

[RFC4556] Zhu, L., and Tung, B., "Public Key Cryptography for Initial Authentication in Kerberos", RFC 4556, June 2006 <http://www.ietf.org/rfc/rfc4556.txt>

[RFC5280] Cooper, D., Santesson, S., Farrell, S., et al., "Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile", RFC 5280, May 2008, <http://www.ietf.org/rfc/rfc5280.txt>

[X509] ITU-T, "Information Technology - Open Systems Interconnection - The Directory: Public-Key and Attribute Certificate Frameworks", Recommendation X.509, August 2005, <http://www.itu.int/rec/T-REC-X.509/en>

**Note** There is a charge to download the specification.

[X690] ITU-T, "Information Technology - ASN.1 Encoding Rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)", Recommendation X.690, July 2002, <http://www.itu.int/rec/T-REC-X.690/en>

**Note** There is a charge to download the specification.

## 1.2.2 Informative References

[GUTMANN] Gutmann, P., "X.509 Style Guide", October 2000, <http://www.cs.auckland.ac.nz/~pgut001/pubs/x509guide.txt>

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

[MS-RPCE] Microsoft Corporation, "[Remote Procedure Call Protocol Extensions](#)".

[RFC2246] Dierks, T., and Allen, C., "The TLS Protocol Version 1.0", RFC 2246, January 1999, <http://www.ietf.org/rfc/rfc2246.txt>

[RFC2716] Aboba, B., and Simon, D., "PPP EAP TLS Authentication Protocol", RFC 2716, October 1999, <http://www.ietf.org/rfc/rfc2716.txt>

### 1.3 Overview

The Remote Certificate Mapping Protocol is used in deployments where users rely on X.509 [\[X509\]](#) certificates to gain access to resources. After a client authenticates itself to a server using an X.509 certificate, the server uses the Remote Certificate Mapping Protocol to contact a directory to determine the authorization information to use, such as group memberships. The Remote Certificate Mapping Protocol returns a privilege attribute certificate (PAC), as specified in [\[MS-PAC\]](#), that represents the user's identity and group memberships, suitable for making authorization decisions.

There are three methods by which a certificate can be associated with an account for the purposes of authorization.

1. First, the **subjectAltName** field of the X.509 certificate should be treated as a **user principal name (UPN)** and used as the key, in the database sense, to locate the account record and corresponding authorization information.
2. Second, the issuer and subject names should be taken together as a key, again in the database sense, to locate the account record.
3. Third, the **issuer name** alone should be used as the lookup key when locating the account record.

The Remote Certificate Mapping Protocol itself consists of a single request/response message pair: [SSL\\_CERT\\_LOGON\\_REQ \(section 2.2.1\)](#) and [SSL\\_CERT\\_LOGON\\_RESP \(section 2.2.2\)](#). This request/response pair is transferred by using the generic pass-through capability of the Netlogon Remote Protocol, as specified in [\[MS-NRPC\]](#) section 3.2.4.1. The client creates an `SSL_CERT_LOGON_REQ` message that contains the X.509 certificate for which the client wants to obtain the corresponding authorization information and specifies which (or all) of the methods described in the preceding paragraph should be applied. The Remote Certificate Mapping Protocol server uses attributes of this X.509 certificate and the indicated methods by the client to determine the authorization information. Assuming an account is found, the Remote Certificate Mapping Protocol server then creates and returns a PAC, as specified in [\[MS-PAC\]](#), that contains the authorization information in the `SSL_CERT_LOGON_RESP` message to the Remote Certificate Mapping Protocol client.

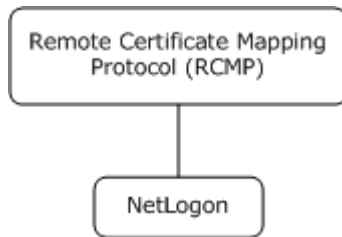
The Remote Certificate Mapping Protocol specification uses common fields from X.509, as specified in [\[X509\]](#), including **subjectName**, **subjectAltName**, and **issuerName**. An implementer of the Remote Certificate Mapping Protocol must be familiar with X.509 certificates, in particular the verification and parsing of the certificate to extract the fields listed earlier. For more information about X.509, see [\[GUTMANN\]](#).

### 1.4 Relationship to Other Protocols

Any protocol that authenticates clients based on public key certificates can make use of the Remote Certificate Mapping Protocol to obtain authorization information about the client. The [Netlogon Remote Protocol](#) serves as the transport for Remote Certificate Mapping Protocol messages.

The Remote Certificate Mapping Protocol can be used to implement the Secure Sockets Layer/Transport Layer Security (SSL/TLS) protocol, as specified in [\[RFC2246\]](#), and Extensible Authentication (EAP) TLS protocol, as specified in [\[RFC2716\]](#), when client authentication by means

of an X.509 certificate is selected as part of the TLS handshake. In the SSL/TLS, authentication of client is optional and is only done when requested by the SSL/TLS server. If the client authentication option is chosen, the SSL/TLS client authenticates itself to the SSL/TLS server using an X.509 certificate.



**Figure 1: Protocol relationship diagram.**

## 1.5 Prerequisites/Preconditions

The Remote Certificate Mapping Protocol requires that users have X.509 certificates available to them for authentication. The Remote Certificate Mapping Protocol also requires that a means exists to associate a certificate with a set of authorization data, commonly some form of an account database. <1>

## 1.6 Applicability Statement

The Remote Certificate Mapping Protocol is applicable in deployments where users have been issued X.509 certificates, as specified in [X509], and a common database for user and machine authorization information. In this type of environment, the Remote Certificate Mapping Protocol is used between the authentication step and authorization step. It enables the server that uses an authentication protocol using X.509 certificates to obtain a PAC, as specified in [MS-PAC], that represents the user's identity and group memberships, suitable for making authorization decisions.

## 1.7 Versioning and Capability Negotiation

The Remote Certificate Mapping Protocol does not have any versioning or capability negotiation.

## 1.8 Vendor-Extensible Fields

The Remote Certificate Mapping Protocol does not have any vendor-extensible fields.

## 1.9 Standards Assignments

There are no standards assignments in the Remote Certificate Mapping Protocol beyond the standards assignments as specified in [MS-NRPC].



## 2 Messages

### 2.1 Transport

The Remote Certificate Mapping Protocol messages are embedded in [Netlogon Remote Protocol](#) messages in the logon interface. As a result, the Remote Certificate Mapping Protocol uses the Netlogon **RPC transport**, as specified in [\[MS-NRPC\]](#) section 2.1.

### 2.2 Message Syntax

Remote Certificate Mapping Protocol messages are encoded as opaque Binary Large Objects (BLOB) and transported by the generic pass-through capability of the [Netlogon Remote Protocol](#), as specified in [\[MS-NRPC\]](#) section 3.2.4.1.

#### 2.2.1 SSL\_CERT\_LOGON\_REQ Message

The SSL\_CERT\_LOGON\_REQ structure defines a request to map a client certificate to a security principal for the purpose of retrieving the authorization information. All member fields MUST be encoded in little-endian format.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
MessageType																															
Length																															
OffsetCertificate																															
CertLength																															
Flags																															
IssuerCount																															
NameInfo (variable)																															
...																															
Payload (variable)																															
...																															

**MessageType (4 bytes):** A 32-bit unsigned integer that defines the Remote Certificate Mapping Protocol message type. This member MUST be 0x00000002.

**Length (4 bytes):** A 32-bit unsigned integer that defines the length, in bytes, of the SSL\_CERT\_LOGON\_REQ request message, including the variable length **NameInfo** and **Payload** sections.

**OffsetCertificate (4 bytes):** A 32-bit unsigned integer that defines the offset, in bytes, from the beginning of the SSL\_CERT\_LOGON\_REQ request structure to the X.509 certificate, as specified in [X509], in the **Payload** member.

**CertLength (4 bytes):** A 32-bit unsigned integer that defines the length, in bytes, of the X.509 certificate in the **Payload** member.

**Flags (4 bytes):** A 32-bit unsigned integer that defines mapping behaviors. The value of this member is any combination of the flags as specified in the following diagram.

All other bits MUST be set to 0 by the Remote Certificate Mapping Protocol client and ignored on receipt.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Where the bits are defined as:

Value	Description
A REQ_UPN_MAPPING	When set, this indicates that the Remote Certificate Mapping Protocol client requests the Remote Certificate Mapping Protocol server to use the <b>subjectAltName</b> from the X.509 certificate in the <b>Payload</b> member to locate the authorization information, as specified in section 3.5. If not set, the <b>subjectAltName</b> extension SHOULD NOT be used during the lookup operation.
B REQ_SUBJECT_MAPPING	When set, the Remote Certificate Mapping Protocol client requests the Remote Certificate Mapping Protocol server to use the <b>issuer</b> and <b>subject</b> names from the X.509 certificate in the <b>Payload</b> member together to locate the authorization information, as specified in section 3.5. If not set, the <b>issuer</b> and <b>subject</b> fields SHOULD NOT be used during the lookup operation.
C REQ_ISSUER_MAPPING	When set, the Remote Certificate Mapping Protocol client requests the Remote Certificate Mapping Protocol server to use the <b>issuer</b> from the X.509 certificate in the <b>Payload</b> member to locate the authorization information, as specified in section 3.5. If not set, the issuer name SHOULD NOT be used during the lookup operation.
D REQ_ISSUER_CHAIN_MAPPING	When set, the Remote Certificate Mapping Protocol client requests the Remote Certificate Mapping Protocol server to use the chain of issuing authorities for the X.509 certificate in the <b>Payload</b> member to locate the authorization information, as specified in section 3.5. If not set, the chain of issuers SHOULD NOT be used during the lookup operation.

**IssuerCount (4 bytes):** A 32-bit unsigned integer that defines the number of **NameInfo** elements.

**NameInfo (variable):** An array of **IssuerOffset** and **IssuerLength** pairs, as defined in the following diagram. The issuers MUST be in the same order as the chain of issuing authorities

for the X.509 certificate in the **Payload** section. That is, if the certificate was issued by A, and certificate authority A was in turn issued by B, the order would be A B.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
IssuerOffset																															
IssuerLength																															

**IssuerOffset (4 bytes):** A 32-bit unsigned integer that defines the byte offset from the start of the packet to an **IssuerName** in the **Payload** member.

**IssuerLength (4 bytes):** A 32-bit unsigned integer that defines the length, in bytes, of an **IssuerName** in the **Payload** member.

**Payload (variable):** A byte-array that contains the data referred to by the **OffsetCertificate** and **IssuerOffset** members. The **IssuerName** members in the **Payload** section has no guaranteed order; order is defined by the **NameInfo** array listed previously. Thus, the data may be packed into the buffer as "Issuer1, Issuer3, Certificate, Issuer2", but the **NameInfo** array would list them as "Issuer1, Issuer2, Issuer3." The actual order is specified in section [3.5.1](#). The number of issuer names encoded into the **Payload** section is determined by the **IssuerCount** member. Each **IssuerName** MUST be 2-byte aligned.

**Certificate:** The client's BER-encoded X.509 certificate referred to by the **OffsetCertificate** member. The format of an X.509 certificate is specified in ASN.1 per the X.509 standard, as specified in [\[X509\]](#). BER encoding is specified in [\[X690\]](#).

**IssuerName:** The BER-encoded certificate issuer name referred to by an **IssuerOffset**. Each **IssuerName** corresponds to the **issuerName** member of an X.509 certificate in the certificate chain, as specified in [\[X509\]](#). Only the issuer name is present, not the complete issuer certificate.

## 2.2.2 SSL\_CERT\_LOGON\_RESP Message

The SSL\_CERT\_LOGON\_RESP structure defines a successful response to an [SSL\\_CERT\\_LOGON\\_REQ](#) request. It contains the PAC that is returned to the caller. All member fields MUST be encoded in little-endian order.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
MessageType																															
Length																															
OffsetAuthData																															
AuthDataLength																															
Flags																															

OffsetDomain
DomainLength
Align
Payload (variable)
...

**MessageType (4 bytes):** A 32-bit unsigned integer that defines the Remote Certificate Mapping Protocol message type. This member MUST be 0x00000002, matching SSL\_CERT\_LOGON\_REQ.

**Length (4 bytes):** A 32-bit unsigned integer that defines the length, in bytes, of the SSL\_CERT\_LOGON\_RESP response structure, including the variable **Payload** section.

**OffsetAuthData (4 bytes):** A 32-bit unsigned integer that defines the offset, in bytes, from the beginning of the SSL\_CERT\_LOGON\_RESP response structure to the PAC, as specified in [\[MS-PAC\]](#), contained in the **Payload** field. This MUST be aligned to an 8-byte boundary.

**AuthDataLength (4 bytes):** A 32-bit unsigned integer that defines the length, in bytes, of the PAC, as specified in [MS-PAC], contained in the **Payload** field.

**Flags (4 bytes):** A 32-bit unsigned integer that MUST be 0, and ignored upon receipt. This field was intended for future expansion but was not used.

**OffsetDomain (4 bytes):** A 32-bit unsigned integer that defines the offset, in bytes, from the beginning of the SSL\_CERT\_LOGON\_REQ request structure to a string of 16-bit **Unicode** characters comprising the name of the **domain** used for retrieving the authorization information. The domain name MUST be the NetBIOS name of the account domain.

**DomainLength (4 bytes):** A 32-bit unsigned integer that defines the length, in bytes, of the domain name referred to by the **OffsetDomain** member. The length does not include any trailing NULL character; because the string is counted, there need not be a trailing NULL.

**Align (4 bytes):** A 32-bit unsigned integer used to maintain 64-bit alignment. This member MUST be 0x00000000.

**Payload (variable):** This field contains the PAC, as specified in [MS-PAC], referred to by the **OffsetAuthData** field, and the domain name referred to by the **OffsetDomain** field.

## 2.3 Constants

The following constants are used in this specification.

Symbolic Name	Value	Definition
STATUS_LOGON_FAILURE	0xC000006D	A logon failure occurred.

## 2.4 Directory Service Schema Elements

The Remote Certificate Mapping Protocol (RCMP) accesses the Directory Service schema classes and attributes listed in the following table.

For the syntactic specifications of the following **<Class>** or **<Class><Attribute>** pairs, refer to [\[MS-ADTS\]](#), [\[MS-ADA1\]](#), [\[MS-ADA3\]](#).

<b>Class</b>	<b>Attribute</b>
computer	servicePrincipalName userPrincipalName
user	altSecurityIdentities servicePrincipalName userPrincipalName

## 3 Protocol Details

The Remote Certificate Mapping Protocol utilizes the generic pass-through mechanism, as specified in [\[MS-NRPC\]](#) section 3.2.4.1, using Microsoft Unified Security Protocol Provider. The exchanged messages are [SSL\\_CERT\\_LOGON\\_REQ](#) and [SSL\\_CERT\\_LOGON\\_RESP](#). When the account is found, the associated authorization data (for example, group memberships) is encoded as a PAC, as specified in [\[MS-PAC\]](#), and sent back to the Remote Certificate Mapping Protocol client. If no matching account is found, an error is returned to the client, as specified in section [3.5.2](#).

### 3.1 Abstract Data Model

The Remote Certificate Mapping Protocol requires that the server have available to it a database or directory of accounts with authorization information and associated name strings that will be used to query the database. The server will issue queries against this database based on strings extracted from the X.509 certificate.

It should be noted that a degenerate, but legal, server could map any certificate to a single set of authorization data. Or, all certificates could map to a small set of authorization data. For example, a web server could have three levels of service (bronze, silver, and gold) managed by three certificate issuers; the Remote Certificate Mapping Protocol server would then merely map the certificates based on the issuer to one of three possible authorization levels and dispense with a full database.

### 3.2 Timers

There are no timers for the Remote Certificate Mapping Protocol.

### 3.3 Initialization

There is no initialization that is specific to the Remote Certificate Mapping Protocol.

### 3.4 Higher-Layer Triggered Events

The Remote Certificate Mapping Protocol message exchange is triggered by a Remote Certificate Mapping Protocol client that requires user authentication via an X.509 certificate. After this authentication takes place, the Remote Certificate Mapping Protocol client sends the [SSL\\_CERT\\_LOGON\\_REQ](#) message to the Remote Certificate Mapping Protocol server to obtain authorization information.

### 3.5 Processing Events and Sequencing Rules

The Remote Certificate Mapping Protocol in itself is a stateless protocol with request/response semantics. The general model is:

- The Remote Certificate Mapping Protocol client **MUST** determine the validity of the certificate by whatever means appropriate to the Remote Certificate Mapping Protocol client when the Remote Certificate Mapping Protocol is used to obtain a **principal's** authorization information on the basis of which access control is performed. The Remote Certificate Mapping Protocol server has three mechanisms, as specified in sections [3.5.1](#), [3.5.2](#), and [3.5.3](#), for determining the authorization information.
- Upon receiving the [SSL\\_CERT\\_LOGON\\_REQ](#) message, if the Remote Certificate Mapping Protocol server is able to map the user's X.509 certificate to a particular account and authorization information, it **MUST** send an [SSL\\_CERT\\_LOGON\\_RESP](#) message to the Remote Certificate

Mapping Protocol client. Otherwise, it MUST return an error status in the Netlogon generic passthrough function, as specified in [\[MS-NRPC\]](#) section 3.2.4.1.

### 3.5.1 Client Generation of SSL\_CERT\_LOGON\_REQ Message

The client constructs the [SSL\\_CERT\\_LOGON\\_REQ](#) message by setting the user's X.509 certificate, the mapping method by which the server looks up the user's account (expressed via Flags as specified in section [2.2.1](#)) and the X.509 certificate issuing authorities (expressed via **Payload** as specified in section [2.2.1](#)). The issuing authorities are set in anchor last order. Anchor last order is defined as the leaf certification authority that issued the client's X.509 certificate is first, followed by the next certification authority in the certificate chain, and the next certification authority, and so on. The name of the root certification authority SHOULD be included in the SSL\_CERT\_LOGON\_REQ message when the user's certificate has been directly issued by the root certification authority.

The Remote Certificate Mapping Protocol client request, SSL\_CERT\_LOGON\_REQ, is packed as a contiguous buffer and the encoded data is sent in the **LogonData** field in the NETLOGON\_GENERIC\_INFO structure, as specified in [\[MS-NRPC\]](#) section 2.2.1.4.2, via the generic passthrough capability of Netlogon, as specified in [\[MS-NRPC\]](#) section 3.2.4.1. The **PackageName** field in the NETLOGON\_GENERIC\_INFO structure, as specified in [\[MS-NRPC\]](#), MUST be a [RPC\\_UNICODE\\_STRING](#) structure with the string value being "Microsoft Unified Security Protocol Provider".

### 3.5.2 Server Processing of SSL\_CERT\_LOGON\_REQ Message

Upon receipt of the [SSL\\_CERT\\_LOGON\\_REQ](#) message at the server, the server decodes the request. The server MUST examine the requested flags from the client for the **REQ\_UPN\_MAPPING**, **REQ\_SUBJECT\_MAPPING**, and **REQ\_ISSUER\_MAPPING** flags. These correspond to the following methods:

- Method 1: Mapping via the **userPrincipalName** attribute. The Remote Certificate Mapping Protocol client requests this mapping scheme from the Remote Certificate Mapping Protocol server by setting the **REQ\_UPN\_MAPPING** flag in the SSL\_CERT\_LOGON\_REQ message. If this mapping scheme is allowed by the Remote Certificate Mapping Protocol server's local policy, the Remote Certificate Mapping Protocol server looks up the authorization information by using the **subjectAltName** field, as specified in [\[X509\]](#), contained in the X.509 certificate in the request.

The DC SHOULD perform the following based on the type of certificates in the request:

- For certificates that contain the FQDN (dNSName) in the Subject Alternative Extension ([\[RFC5280\]](#) section 4.2.1.6).

The DC prefixes the FQDN with "host/" to form the **service principal name (SPN)** name form "host/machinename" and searches within the forest directory for an account that contains this SPN in the servicePrincipalName attribute ([\[MS-ADA3\]](#) section 2.253).

- For certificates that contain the UPN in the Subject Alternative Extension ([\[RFC5280\]](#) section 4.2.1.6).

In X.509 certificates, the UPN is encoded in the subject alternative name extension with object identifier (OID) 1.3.6.1.4.1.311.20.2.3. The character encoding is in UTF8 format if the characters are not U.S. ASCII characters. Details are specified in Appendix C of [\[RFC4556\]](#).

The DC searches within the forest directory for an account containing the UPN in the userPrincipalName attribute ([\[MS-ADA3\]](#) section 2.349).

If successful, the Remote Certificate Mapping Protocol RCMP server constructs a PAC [MS-PAC], containing the authorization information. For more information about the initial population of the PAC structures, see the sections under [MS-KILE] section 3.3.5.6.2.

- Method 2: Mapping via the certificate's subject and issuer **distinguished names (DNs)**. The Remote Certificate Mapping Protocol client requests this mapping scheme from the Remote Certificate Mapping Protocol server, by setting the **REQ\_SUBJECT\_MAPPING** flag in the SSL\_CERT\_LOGON\_REQ message. If this mapping scheme is allowed by the Remote Certificate Mapping Protocol server's local policy, the Remote Certificate Mapping Protocol server looks up the authorization information by using the subject name and issuer name contained in the X.509 certificate in the request. To match strings, the [GetWindowsSortKey algorithm \(section 3.1.5.2.4\)](#) [MS-UCODEREF] with the following flags **NORM\_IGNORECASE**, **NORM\_IGNOREKANATYPE**, **NORM\_IGNORENONSPACE** and **NORM\_IGNOREWIDTH** SHOULD be used, then the [CompareSortKey algorithm \(section 3.1.5.2.2\)](#) ([MS-UCODEREF]) SHOULD be used to compare strings. If successful, the Remote Certificate Mapping Protocol server constructs a PAC [MS-PAC], containing the authorization information. For more information about the initial population of the PAC structures, see the sections under [MS-KILE] section 3.3.5.6.2. <2>
- Method 3: Mapping via the certificate's issuer DN. The Remote Certificate Mapping Protocol client requests this mapping scheme from the Remote Certificate Mapping Protocol server, by setting the **REQ\_ISSUER\_MAPPING** flag in the SSL\_CERT\_LOGON\_REQ message. If this mapping scheme is allowed by the Remote Certificate Mapping Protocol server's local policy, the Remote Certificate Mapping Protocol server looks up the account by using the issuer name that is contained in the X.509 certificate in the request. If the additional **REQ\_ISSUER\_CHAIN\_MAPPING** flag is set, the other issuer names from the SSL\_CERT\_LOGON\_REQ message are also used for the search. Each name from the chain of issuers need to be used as the lookup key until a match is found, in the order from the SSL\_CERT\_LOGON\_REQ message. If successful, the Remote Certificate Mapping Protocol server constructs a PAC [MS-PAC], containing the authorization information. For more information about the initial population of the PAC structures, see the sections under [MS-KILE] section 3.3.5.6.2. <3>
- The server SHOULD try these methods in order as listed in the previous methods; a client MUST NOT rely on the processing order. If none of the methods specified as acceptable by the client can determine the appropriate account to use, the mapping request cannot be satisfied. In this event, there is no [SSL\\_CERT\\_LOGON\\_RESP](#) message constructed, and the Netlogon generic passthrough method, as specified in [MS-NRPC] section 3.2.4.1, MUST return error code STATUS\_LOGON\_FAILURE (0xC000006D), as specified in [MS-ERREF], indicating this failure condition. There is no specific error frame or status code in the SSL\_CERT\_LOGON\_RESP message.

If none of the requested methods are successful, the server does not generate an SSL\_CERT\_LOGON\_RESP message, and instead only returns the error code STATUS\_LOGON\_FAILURE (0xC000006D) to the client via the return code of the Netlogon generic pass-through, as specified in [MS-NRPC] section 3.2.4.1.

### 3.5.3 Server Generation of the SSL\_CERT\_LOGON\_RESP Message

The [SSL\\_CERT\\_LOGON\\_RESP](#) message is constructed by the server in the event that the certificate was associated successfully with an account, and authorization information can be retrieved. The Remote Certificate Mapping Protocol server constructs a PAC, as specified in [MS-PAC], containing the authorization information. Also, if the Remote Certificate Mapping Protocol server is not authoritative over the user's account, it uses Remote Certificate Mapping Protocol to contact the Remote Certificate Mapping Protocol server that is authoritative, and asks it to build the PAC. The



response message supplies the name of the domain that contained the account used as the source of the authorization information.

The response, `SSL_CERT_LOGON_RESP` (section 2.2.2), is packed as a contiguous buffer and the encoded data is sent in the **LogonData** field in the `NETLOGON_GENERIC_INFO` structure, as specified in [\[MS-NRPC\]](#) section 2.2.1.4.2.

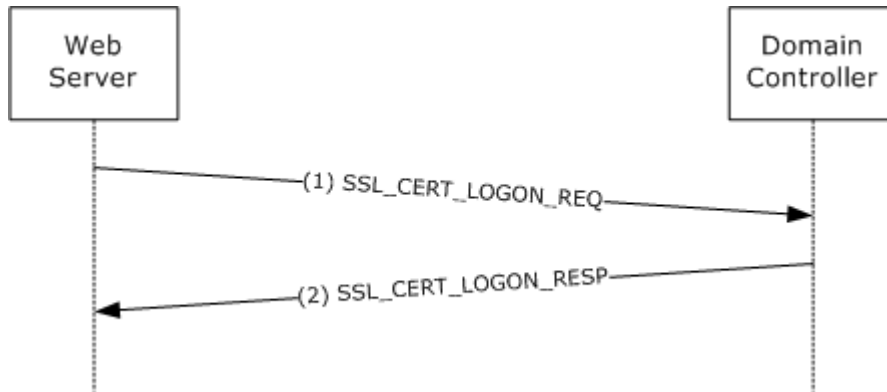
### 3.6 Timer Events

There are no timer events for the Remote Certificate Mapping Protocol. All associated timer events are specified in the [Netlogon Remote Protocol](#), which serves as the transport for Remote Certificate Mapping Protocol messages.

### 3.7 Other Local Events

There are no other local events that affect the operation of this protocol.

## 4 Protocol Examples



**Figure 2: Obtaining a PAC that corresponds to an X.509 certificate**

1. A web server requires clients to authenticate via an X.509 certificate. During the Transport Layer Security (TLS) handshake, the client sends the user's X.509 certificate to the server and proves knowledge of the corresponding private key. On completing the handshake, the server side of the TLS implementation builds the [SSL\\_CERT\\_LOGON\\_REQ](#) message (which contains the user's X.509 certificate) and sends it to the Remote Certificate Mapping Protocol server, in this example, located on a **domain controller**.
2. The Remote Certificate Mapping Protocol server on the domain controller parses the incoming request and uses the X.509 certificate attributes to look up the user's account in **Active Directory**. On a successful lookup, the domain controller generates the [SSL\\_CERT\\_LOGON\\_RESP](#) message, which includes the user's PAC, as specified in [\[MS-PAC\]](#), and sends the message back via the [Netlogon Remote Protocol](#). On receiving this message, the server will generate a Windows access token ([\[MS-DTYP\]](#) section 2.5.2) for the client, which it can then use to access resources on the user's behalf.

## 5 Security

### 5.1 Security Considerations for Implementers

The Remote Certificate Mapping Protocol enables a user with an X.509 certificate and corresponding private key to gain access to resources based on group information associated with a given Active Directory account. Prior to performing the Remote Certificate Mapping Protocol, the Remote Certificate Mapping Protocol client has to first authenticate the user using the X.509 certificate because the authorization information returned by the Remote Certificate Mapping Protocol server enables the user to gain access to various resources.

The Remote Certificate Mapping Protocol itself does not have any built-in security mechanisms to provide authentication and assure the confidentiality and integrity of the Remote Certificate Mapping Protocol client/Remote Certificate Mapping Protocol server message exchange. Instead, it relies on security mechanisms, as specified in [\[MS-RPCE\]](#), used to protect Netlogon **remote procedure call (RPC)**, as specified in [\[MS-NRPC\]](#), that transport Remote Certificate Mapping Protocol request/response messages.

### 5.2 Index of Security Parameters

There are no security parameters for the Remote Certificate Mapping Protocol. All associated security parameters are specified in the [Netlogon Remote Protocol](#), which provides all security for Remote Certificate Mapping Protocol messages.

## 6 Appendix A: 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 NT operating system
- Windows 2000 operating system
- Windows XP operating system
- Windows Server 2003 operating system
- Windows Vista operating system
- Windows Server 2008 operating system
- 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

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 1.5:](#) Windows 2000, Windows XP, Windows Server 2003, Windows Vista, Windows Server 2008, Windows 7, Windows Server 2008 R2, Windows 8, Windows Server 2012, Windows 8.1, and Windows Server 2012 R2 use Active Directory as the database for the authorization. Active Directory uses the distinguished name (DN) of the security principal **object** and the **userPrincipalName** and **altSecurityIdentities** attributes on the security principal objects for establishing the relationship between the certificates and the authorization information, as specified in [\[MS-ADTS\]](#).

[<2> Section 3.5.2:](#) The Windows 2000, Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, and Windows Server 2012 R2 domain controller extracts the issuer DN and the subject DN from the X.509 certificate, and constructs the following string: "<I>[value of issuer]<S>[value of the subject DN]". The resulting string is evaluated against the **altSecurityIdentities** attribute of all user and machine account objects, and the scope of this evaluation is the entire forest. The **altSecurityIdentities** attribute is a multiple-value attribute.

[<3> Section 3.5.2:](#) The Windows 2000, Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, and Windows Server 2012 R2 domain controller extracts the issuer DN from the X.509 certificate, and constructs the following string: "<I>[value of issuer]". The

resulting string is evaluated against the **altSecurityIdentities** attribute of all user and machine account objects, and the scope of this evaluation is the entire forest. Note that the **altSecurityIdentities** attribute is a multiple-value attribute.

## 7 Change Tracking

This section identifies changes that were made to the [MS-RCMP] protocol document between the January 2013 and August 2013 releases. 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.
- An extensive rewrite, addition, or deletion of major portions of content.
- The removal of a document from the documentation set.
- Changes made for template compliance.

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 language and 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 or language changes were introduced. The technical content of the document is identical to the last released version, but minor editorial and formatting changes, as well as updates to the header and footer information, and to the revision summary, may have been made.

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.
- New content added for template compliance.
- Content updated for template compliance.
- Content removed for template compliance.
- 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 [protocol@microsoft.com](mailto:protocol@microsoft.com).

Section	Tracking number (if applicable) and description	Major change (Y or N)	Change type
<a href="#">6</a> <a href="#">Appendix A: Product Behavior</a>	Modified this section to include references to Windows 8.1 operating system and Windows Server 2012 R2 operating system.	Y	Content updated.

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