[MS-REMSI]:
Remote Media Streaming Initiation Protocol

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Revision Summary

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03/12/2010	0.1.1	Editorial	Revised and edited the technical content.
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08/08/2013	2.0	Major	Significantly changed the technical content.

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11/14/2013	2.0	No change	No changes to the meaning, language, or formatting of the technical content.

Contents

1 Introduction

This document specifies the Remote Media Streaming Initiation Protocol. This protocol enables access of a **Content Directory Service** on a **server** by a **client** across the Internet. The protocol also includes relevant extensions to the **UPnP** Device and Service templates.

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]:

certificate
certificate authority (CA) or certification authority
Hypertext Transfer Protocol (HTTP)
Hypertext Transfer Protocol over Secure Sockets Layer (HTTPS)
Secure Sockets Layer (SSL)
SOAP
Uniform Resource Locator (URL)
Universal Plug and Play (UPnP)
UTF-8
X.509
XML

The following terms are specific to this document:

Browse: A **CDS** action that allows for navigation of hierarchy of the Content Directory objects exposed by the **Content Directory Service**. For more details, see [UPNPCDS1].

Content Directory Service (CDS): This service provides a uniform mechanism for devices to **browse** the content on the server and to obtain detailed information about individual content objects. The Content Directory Service additionally provides a lookup/storage service that allows clients (e.g. UI devices) to locate (and possibly store) individual objects (for example, songs, movies, pictures, and so on) that the (server) device is capable of providing. For more details, see [UPNPCDS1].

Home network: A local area network that a **Remote Media Streaming Initiation Protocol Client** is attached to is referred to as the home network, when the **Remote Media Streaming Initiation Protocol Client** can discover the **Remote Media Streaming Initiation Protocol Server** using **Universal Plug and Play (UPnP)**.

Online ID: An identifier that identifies a user. The identifier is an arbitrary alphanumeric string. The **Online ID** is used as the Subject Name of **X.509 certificates** that are issued by a **CA**. The combination of an **Online ID** and a **CA** uniquely identifies a user.

Remote Media Streaming: A feature that enables access of a **Content Directory Service** on a **Remote Media Streaming Initiation Protocol Server** by a **Remote Media Streaming Initiation Protocol Client** across the Internet.

Remote Media Streaming Initiation Protocol Client: An entity that sends **Remote Media Streaming Initiation Protocol** requests to a **Remote Media Streaming Initiation Protocol Server**.

Remote Media Streaming Initiation Protocol IP address: The IPv4 or IPv6 address of a **Remote Media Streaming Initiation Protocol Server**.

Remote Media Streaming Initiation Protocol Port: The TCP port on which the **Remote Media Streaming Initiation Protocol Server** listens for requests from **Remote Media Streaming Initiation Protocol Clients**.

Remote Media Streaming Initiation Protocol Server: An entity that responds to **Remote Media Streaming Initiation** protocol requests from a **Remote Media Streaming Initiation Protocol Client**.

Remote Sharing Status: A **CDS** can be enabled or disabled for access via the **Remote Media Streaming Initiation Protocol**. This condition is known as the **Remote Sharing Status**.

Search: A **CDS** action that allows for search of the content directory for objects that match some search criteria. For more details, see [UPNPCDS1].

UPnP Device Description Document: The formal definition of a logical device, expressed in the **UPnP** Template Language. For more details, see [UPNPARCH1].

UPnP Device Template: The template that lists the device type, required embedded devices (if any), and required services. It is written in **XML** syntax and derived from the **UPnP** Template Language, which is defined by a **UPnP** Forum working committee. The template has a one-to-one relationship with standard device types. For more information, see [UPNPARCH1].

UPnP Service Description Document: The formal definition of a logical device, expressed in the **UPnP** Template Language. For more details, see [UPNPARCH1].

UPnP Service Template: The template that lists action names, the parameters for those actions, state variables, and the properties of those state variables. It is written in **XML** syntax and derived from the **UPnP** Template Language which is defined by a **UPnP** Forum working committee. The template has a one-to-one relationship with standard service types. For more information, see [UPNPARCH1].

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.

[DLNA] Digital Living Network Alliance, "The DLNA Networked Device Interoperability Guidelines", http://www.dlna.org/dlna-for-industry/about-dlna/guidelines

Note There is a charge to download the specification.

[MS-DLNHND] Microsoft Corporation, "Digital Living Network Alliance (DLNA) Networked Device Interoperability Guidelines: Microsoft Extensions".

[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

[RFC5234] Crocker, D., Ed., and Overell, P., "Augmented BNF for Syntax Specifications: ABNF", STD 68, RFC 5234, January 2008, http://www.rfc-editor.org/rfc/rfc5234.txt

[UPnP] UPnP Forum, "Standards", http://www.upnp.org/standardizeddcps/default.asp

[UPNPCDS1] UPnP Forum, "ContentDirectory:1 Service Template Version 1.01", June 2002, http://www.upnp.org/standardizeddcps/documents/ContentDirectory1.0.pdf

[UPNPARCH1] UPnP Forum, "UPnP Device Architecture 1.0", October 2008, http://www.upnp.org/specs/arch/UPnP-arch-DeviceArchitecture-v1.0.pdf

1.2.2 Informative References

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

1.3 Overview

The Remote Media Streaming Initiation Protocol enables access to Content Directory Services on a **Remote Media Streaming Initiation Protocol Server** across the Internet by a **Remote Media Streaming Initiation Protocol Client**.

The Remote Media Streaming Initiation Protocol Server provides access to one or more Content Directory Services. If the Remote Media Streaming Initiation Protocol Client is connected to the same Local Area Network as the Remote Media Streaming Initiation Protocol Server, then the Remote Media Streaming Initiation Protocol Client can use the Universal Plug and Play (UPnP) Protocol [UPnP] to discover the Content Directory Services. While connected to the same Local Area Network as the Remote Media Streaming Initiation Protocol Server, the Remote Media Streaming Initiation Protocol Client can query each Content Directory Service to determine if it enables **Remote Media Streaming** by using an extension to UPnP.

From a remote location across the Internet, the Remote Media Streaming Initiation Protocol Client can request the Remote Media Streaming Initiation Protocol Server to provide the list of Content Directory Services that have enabled Remote Media Streaming or the contents of a specific Content Directory Service or test the speed of the connection between the Remote Media Streaming Initiation Protocol Client and Remote Media Streaming Initiation Protocol Server.

1.4 Relationship to Other Protocols

The Remote Media Streaming Initiation Protocol relies upon the following protocols:

Digital Living Network Alliance (DLNA) Home Networked Device Interoperability Guidelines [DLNA]

The **DLNA** Protocol adds constraints and extensions to the UPnP Protocol. In addition, it defines protocols for exchanging media. The **Remote Media Streaming Initiation Protocol** uses **DLNA** when applicable.

IPv4/IPv6

The Remote Media Streaming Initiation Protocol supports both IPv4 and IPv6 addresses for the Remote Media Streaming Initiation Protocol Client and Remote Media Streaming Initiation Protocol Server.

UPnP

The Remote Media Streaming Initiation Protocol Client uses the UPnP Protocol [UPnP] to discover Content Directory Services shared out by a Remote Media Streaming Initiation Protocol Server on only the **Home network** and invoke actions on them. The Content Directory Service Protocol is defined in [UPNPCDS1].

SOAP

The Remote Media Streaming Initiation Protocol Client invokes actions on the Remote Media Streaming Initiation Protocol Server using the **SOAP** Protocol as specified in [UPnPARCH1]. Any reference to SOAP in this document refers to the particular implementation of SOAP defined in [UPnPARCH1]. This includes UPnP invocations on the Home network and across the Internet.

HTTPS

Communications across the Internet between the Remote Media Streaming Initiation Protocol Client and Remote Media Streaming Initiation Protocol Server are secured by **HTTPS**.

TCP

HTTP and HTTPS messages are carried over the TCP Protocol.

1.5 Prerequisites/Preconditions

It is a prerequisite that the Remote Media Streaming Initiation Protocol Client have the **Remote Media Streaming Initiation Protocol IP address** and **Remote Media Streaming Initiation Protocol Port** corresponding to the Remote Media Streaming Initiation Protocol Server for communicating with it. The Remote Media Streaming Initiation Protocol Client is required to have an **Online ID** and a **X.509 certificate** with the Online ID as the Subject name of the certificate, and the certificate is signed (directly or through a certificate chain) by a **CA**.

1.6 Applicability Statement

This protocol should be used to enable media access scenarios where the media source and consuming endpoint are separated by the Internet.

1.7 Versioning and Capability Negotiation

This document covers versioning issues in the following areas:

Supported Transport: This protocol is implemented on top of IPv4 and IPv6.

Protocol Versions: There is only one version of this protocol and the protocol does not include a versioning mechanism.

Security and Authentication Methods: This protocol uses HTTPS with client authentication (that is, the client is required to provide a X.509 certificate).

Localization: This protocol does not explicitly address localization. However, **XML** documents used by this protocol use the **UTF-8** character set, which allows the use of languages other than English.

Capability Negotiation: This protocol does not define a mechanism for capability negotiation.

1.8 Vendor-Extensible Fields

None.

1.9 Standards Assignments

None.

2 Messages

2.1 Transport

The Remote Media Streaming Initiation Protocol Client and Remote Media Streaming Initiation Protocol Server communicate using UPnP [UPnP], SOAP, and HTTP protocols on the Home network. Across the Internet they communicate using the UPnP [UPnP], SOAP and HTTPS protocols.

2.2 Message Syntax

2.2.1 Extension to UPnP Device Description Document for Content Directory Service

The **UPnP Device Description Document** is extended as specified below using ABNF [RFC5234].

```
;remoteconfig is a direct child of the device tag in device description document
remoteconfig = "<microsoft:remoteConfig xmlns:microsoft=” %x22
                 ”urn:schemas-microsoft-com:WMPNSS-1-0/” %x22 ">”
                  remoteConnections
               "</microsoft:remoteConfig>”

remoteConnections = 1*remoteConnection

remoteConnection =
      "<microsoft:remoteConnection>
        <microsoft:remoteUrl>”
            cdsUrl
       "</microsoft:remoteUrl>
      </microsoft:remoteConnection>”

cdsUrl = <Content Directory Service’s URL>
```

The **URL** specified in the *cdsUrl* parameter MUST use the "https" URL scheme.

2.2.2 Extensions to UPnP Content Directory Service

The service description template for the Content Directory Service is extended as specified below to include:

- X_RemoteSharingEnabled state variable.
- X_GetRemoteSharingStatus action.

This action and state variable MUST be described in the CDS service description document using the following XML fragments:

```
<actionList>
 <action>
    <name>X_GetRemoteSharingStatus</name>
    <argumentList>
      <argument>
```

```
        <name>Status</name>
        <direction>out</direction>
        <relatedStateVariable>X_RemoteSharingEnabled</relatedStateVariable>
      </argument>
    </argumentList>
  </action>
</actionList>
<serviceStateTable>
  <stateVariable sendEvents="yes">
    <name>X_RemoteSharingEnabled</name>
    <dataType>boolean</dataType>
  </stateVariable>
</serviceStateTable>
```

The action and state variables are defined as follows.

Action X_GetRemoteSharingStatus returns the current value of state variable X_RemoteSharingEnabled. Using the terminology and definitions of [UPNPCDS1], the action request (in) and response (out) arguments are defined as follows.

Argument	Direction	Data type	Related state variable	Description
Status	Out	Boolean	X_RemoteSharingEnabled	This argument returns the value of the related state variable.

State variable X_RemoteSharingEnabled indicates the **Remote Sharing Status** of a CDS. Using the terminology of [UPNPCDS1], this state variable adheres to the following definition.

Variable name	Data type	Allowed values	Default value	Evented
X_RemoteSharingEnabled	Boolean	0 (the CDS is not currently available using **Remote Media Streaming Initiation Protocol**) 1 (the CDS is currently available using **Remote Media Streaming Initiation Protocol**)	Not Applicable	No

MUST be sent by the Remote Media Streaming Initiation Protocol Client to the Remote Media Streaming Initiation Protocol Server using a SOAP encapsulation.

2.2.3 X_TestBandwidth Action

The following XML fragment specifies the action arguments using the notation defined in [UPNPCDS1]. This fragment MUST NOT be added to the **Service Description Document** of any of the Content Directory Services in the Remote Media Streaming Initiation Protocol Server.

```
  <action>
<name>X_TestBandwidth</name>
<argumentList>
  <argument>
    <name>RequestedBytes</name>
```

```
        <direction>in</direction>
      </argument>
      <argument>
        <name>TestData</name>
        <direction>out</direction>
      </argument>
    </argumentList>
  </action>
```

Action X_TestBandwidth is used to request a number of bytes to be used for bandwidth measurement. Using the terminology and definitions of [UPNPCDS1] the request (in) and response (out) arguments are defined as follows.

Argument	Direction	Data type	Related state variable	Description
RequestedBytes	In	ui4	N/A	This argument contains a nonzero positive integer value *N*. The requestor asks to receive a sequence of *N* bytes.
TestData	Out	sequence of bytes	N/A	This argument carries a sequence of *N* bytes in the response. The value of each byte is irrelevant.

This action MUST be invoked using SOAP over HTTPS.

2.2.4 Browse Action

Browse is a standard action defined in [UPNPCDS1] that is applicable to every instance of a Content Directory Service. The purpose of a Browse action is to obtain a list of containers, media items within containers, or metadata from a CDS.

2.2.5 Search Action

Search is a standard action defined in [UPNPCDS1] that is applicable to every instance of a Content Directory Service. The purpose of a Search action is to obtain a list of containers or media items from a CDS according to a specified set of search criteria.

2.2.6 GetRemoteLibInfo Request and Response

The GetRemoteLibInfo request is a HTTPS POST request. The URL in the POST request MUST adhere to the following definition of "libinfoURL", which is given using ABNF:

libinfoURL = "https://" ipaddress ":" portnumber wmpnss-locator

ipaddress = <The Remote Media Streaming Initiation Protocol IP address using standard notation for literal IPv4 and IPv6 addresses>

portnumber = <The Remote Media Streaming Initiation Protocol Port value (a TCP port value)>

wmpnss-locator = "/WMPNSSv4/LibraryInfo/?WMFriendlyName=" friendly-name

friendly-name = 1*VCHAR

The message body of the POST request MUST be empty.

The GetRemoteLibInfo response is the HTTPS response to the HTTPS POST request used for the GetRemoteLibInfo request. The message body of the HTTPS response contains a list of Content Directory Services available in the Remote Media Streaming Initiation Protocol Server.

The message body of the HTTPS response is an XML document that MUST adhere to the following ABNF syntax:

```
response =
"<xml version=” %x22 "1.0” %x22 "?>”
"<server xmlns=” %x22 "urn:schemas-microsoft-com:WMPNSSRME-1-0/” %x22 ">”
    1*library
    1*onlineid
"</server>”

library =
  "<library>”
    "<UDN>” library-udn ”</UDN>”
    "<friendlyName>” friendly-name "</friendlyName>”
    "<manufacturer>” manufacturer "</manufacturer>”
    "<modelName>” model-name "</modelName>”
    "<modelNumber>” model-number "</modelNumber>”
    "<serialNumber>” serial-number "</serialNumber>”
    1*remoteUrl
  "</library>”

remoteUrl =
    "<remoteUrl>” cdsUrl ”</remoteUrl>”

cdsUrl = <Content Directory Service’s URL>

onlineid =
  "<onlineID>” online-ID "</onlineID>”

library-udn = <The UDN for the UPnP MediaServer that hosts the CDS as defined by UPnP and
constrained by DLNA> ; each library defines information for one CDS.

friendly-name = 1*VCHAR ; a friendly name to characterize the CDS

manufacturer = *VCHAR ; a device manufacturer’s name

model-name = *VCHAR ; a model name for the host device

model-number = *VCHAR ; a model number for the host device

serial-number = *VCHAR ; a serial number for the host device

online-ID = 1*VCHAR ; an online identifier (for example, an email address) associated with a
CDS
```

UDN (Unique Device Name). For more information, see [UPNPARCH1].

3 Protocol Details

3.1 Client Details

The Remote Media Streaming Initiation Protocol Client MUST implement a **DLNA** Digital Media Player (DMP).

In addition, upon request from the higher layer, the Remote Media Streaming Initiation Protocol Client MUST be able to issue the request messages defined in section 3.1.4.

3.1.1 Abstract Data Model

The Remote Media Streaming Initiation Protocol is a stateless protocol.

3.1.2 Timers

The Remote Media Streaming Initiation Protocol Client request to the Remote Media Streaming Initiation Protocol Server times out in 30 seconds.

3.1.3 Initialization

None.

3.1.4 Higher-Layer Triggered Events

3.1.4.1 Request to Retrieve Remote Sharing Status

This event occurs when the higher layer requests to determine the Remote Sharing Status of a specific Content Directory Service that is currently accessible using UPnP. When this event is triggered, the Remote Media Streaming Initiation Protocol Client invokes the X_GetRemoteSharingStatus UPnP action as specified in 2.2.2 on the Content Directory Service specified by the higher-layer. The Remote Media Streaming Initiation Protocol Client MUST include the User-Agent header as specified in [MS-DLNHND] section 2.2.4.1. The numerical value in the devicecaps token in the User-Agent header MUST be 1024. The results of the action are returned to the higher layer.

3.1.4.2 Request to Get Remote Library Information

This event occurs when the higher layer requests enumeration of Content Directory Services shared out by a Remote Media Streaming Initiation Protocol Server across the Internet. The higher layer specifies the Remote Media Streaming Initiation Protocol IP address and Remote Media Streaming Initiation Protocol Port, the friendly name of the Remote Media Streaming Initiation Protocol Server, and the X.509 certificate for the HTTPS connection. The Remote Media Streaming Initiation Protocol Client sends a GetRemoteLibInfo request to the URL defined by "libinfoURL" in section 2.2.6.

The HTTPS headers in the GetRemoteLibInfo request MUST include the User-Agent header as specified in [MS-DLNHND] section 2.2.4.1. The numerical value in the devicecaps token in the User-Agent header MUST be 1024.

The message body of the GetRemoteLibInfo response is returned to the higher layer.

3.1.4.3 Request to Browse a Content Directory Service

This event occurs when the higher layer requests a Browse action of a specific Content Directory Service shared out by a Remote Media Streaming Initiation Protocol Server across the Internet. The higher layer specifies the Content Directory Service **URL**, X.509 certificate for HTTPS, and input arguments for Browse. The Remote Media Streaming Initiation Protocol Client invokes the Browse action as specified in 2.2.4 on the specified Content Directory Service and returns the results to the higher layer.

The HTTPS headers in the Browse action MUST include the User-Agent header as specified in [MS-DLNHND] section 2.2.4.1. The numerical value in the devicecaps token in the User-Agent header MUST be 1024.

3.1.4.4 Request to Search a Content Directory Service

This event occurs when the higher layer requests a Search action of a specific Content Directory Service shared out by a Remote Media Streaming Initiation Protocol Server across the Internet. The higher layer specifies the Content Directory Service URL, X.509 certificate for HTTPS, and input arguments for Search. The Remote Media Streaming Initiation Protocol Client invokes the Search action on the specified Content Directory Service and returns the results to the higher layer.

The HTTPS headers in the Search action MUST include the User-Agent header as specified in [MS-DLNHND] section 2.2.4.1. The numerical value in the devicecaps token in the User-Agent header MUST be 1024.

3.1.4.5 Request to Test Bandwidth

This event occurs when the higher layer requests to test the bandwidth of the connection. The higher layer specifies the Content Directory Service URL and the X.509 certificate to be used for HTTPS. The client invokes the X_TestBandwidth SOAP action specified in 2.2.3. The client returns the results of the action to the higher layer.

The HTTPS headers in the X_TestBandwidth action MUST include the User-Agent header as specified in [MS-DLNHND] section 2.2.4.1. The numerical value in the devicecaps token in the User-Agent header MUST be 1024.

3.1.5 Processing Events and Sequencing Rules

None.

3.1.6 Timer Events

None.

3.1.7 Other Local Events

None.

3.2 Server Details

The Remote Media Streaming Initiation Protocol Server MUST implement one or more **DLNA** Digital Media Servers (DMS). As defined in **DLNA**, each DMS exposes content via a CDS.

In addition, each of the CDS implementations capable of using the **Remote Media Streaming Initiation Protocol** MUST implement the state variables defined in section 2.2 and MUST respond

to action requests defined in section 2.2. The responses MUST adhere to the messages exchanged with the server's higher layer as defined in section 3.2.5.

Section 4.1 illustrates the Remote Media Streaming Initiation Protocol Server behavior when the Remote Sharing Status of a specific Content Directory Service is requested.

3.2.1 Abstract Data Model

None.

3.2.2 Timers

None.

3.2.3 Initialization

The Remote Media Streaming Initiation Protocol Server provides a self-signed X.509 certificate and listens for HTTPS requests on **TCP** port 10245.

3.2.4 Higher-Layer Triggered Events

None.

3.2.5 Processing Events and Sequencing Rules

3.2.5.1 Request for Remote Sharing Status

The Remote Media Streaming Initiation Protocol Server receives the X_GetRemoteSharingStatus action request from a Remote Media Streaming Initiation Protocol Client as defined in 2.2.2.

Upon receiving the request, the Remote Media Streaming Initiation Protocol Server obtains the Remote Sharing Status from the higher layer using the event defined in 3.2.7.5.

The Remote Media Streaming Initiation Protocol Server responds with status information to the Remote Media Streaming Initiation Protocol Client using the X_GetRemoteSharingStatus action response.

3.2.5.2 Request for Remote Library Information

The Remote Media Streaming Initiation Protocol Server receives from the Remote Media Streaming Initiation Protocol Client a request for **Remote Library Information** through the GetRemoteLibInfo request specified in 2.2.6.

Upon receiving the request, the Remote Media Streaming Initiation Protocol Server calls into the higher layer to validate the X.509 certificate provided in the HTTPS request through the event specified in 3.2.7.1.

If the validation fails, the Remote Media Streaming Initiation Protocol Server responds to the incoming request with HTTPS status code 401.

If the validation succeeds, the Remote Media Streaming Initiation Protocol Server calls into the higher layer using the event specified in 3.2.7.2 to obtain the set of **Device Description Documents** for all DMSs whose Content Directory Service is shared out through the Remote Media Streaming Initiation Protocol Server.

The Remote Media Streaming Initiation Protocol Server also calls into the higher layer to determine the set of Online IDs that can be authenticated by the higher layer through the event specified in 3.2.7.3.

Using the retrieved set of UPnP Device Description Documents and the set of Online IDs, the Remote Media Streaming Initiation Protocol Server responds to the Remote Media Streaming Initiation Protocol Client using the GetRemoteLibInfo response, as specified in section 2.2.6.

3.2.5.3 Browse

The Remote Media Streaming Initiation Protocol Server receives from a Remote Media Streaming Initiation Protocol Client a request through the Browse action specified in 2.2.4.

Upon receiving the Browse request, the Remote Media Streaming Initiation Protocol Server calls into the higher layer specifying the Content Directory Service URL and X.509 certificate in the incoming request through the event specified in 3.2.7.4 in order to retrieve the Content Directory Service corresponding to the URL.

The higher layer validates if the X.509 certificate is authorized for access to the specified Content Directory Service. If the validation succeeds, the higher layer returns the Content Directory Service to the Remote Media Streaming Initiation Protocol Server.

If the validation fails, the Remote Media Streaming Initiation Protocol Server responds to the incoming request with HTTPS status code 401.

The Remote Media Streaming Initiation Protocol Server then performs a local browse on the returned Content Directory Service, collects the results, and returns the results to the Remote Media Streaming Initiation Protocol Client using the Browse action response.

3.2.5.4 Search

The Remote Media Streaming Initiation Protocol Server receives from a Remote Media Streaming Initiation Protocol Client a request through the Search action specified in 2.2.5.

Upon receiving the Search request, the Remote Media Streaming Initiation Protocol Server calls into the higher-layer specifying the Content Directory Service URL and X.509 certificate in the incoming request through the event specified in 3.2.7.4 in order to retrieve the Content Directory Service corresponding to the URL.

The higher-layer validates if the X.509 certificate is authorized for access to the specified Content Directory Service. If the validation succeeds, the higher-layer returns the Content Directory Service to the Remote Media Streaming Initiation Protocol Server.

If the validation fails, the Remote Media Streaming Initiation Protocol Server responds to the incoming request with HTTPS status code 401.

The Remote Media Streaming Initiation Protocol Server then performs a local search on the returned Content Directory Service, collects the results, and returns the results to the Remote Media Streaming Initiation Protocol Client using the Search action response.

3.2.5.5 Request to Test Bandwidth

The Remote Media Streaming Initiation Protocol Server receives this request from a Remote Media Streaming Initiation Protocol Client through the X_TestBandwidth action specified in 2.2.3.

Upon receiving the request, the Remote Media Streaming Initiation Protocol Server calls into the higher layer to validate the X.509 certificate provided in the HTTPS request through the event specified in 3.2.7.1.

If the validation fails, the Remote Media Streaming Initiation Protocol Server responds to the incoming request with a HTTPS status code 401.

If the validation succeeds, the Remote Media Streaming Initiation Protocol Server responds to the Remote Media Streaming Initiation Protocol Client using the X_TestBandwidth action response.

3.2.6 Timer Events

None.

3.2.7 Other Local Events

3.2.7.1 Validate Remote Media Streaming Initiation Protocol Client X.509 Certificate

This event is triggered when the Remote Media Streaming Initiation Protocol Server calls into the higher layer to validate a specified X.509 certificate for access to the Remote Media Streaming Initiation Protocol Server. The higher layer returns success if the validation succeeds and failure if it fails.

3.2.7.2 Get All Local DMS UPnP Device Description Documents

This event is triggered when the Remote Media Streaming Initiation Protocol Server calls into the higher layer to obtain UPnP Device Description Documents corresponding to all DMSs (and their Content Directory Services) exposed by the Remote Media Streaming Initiation Protocol Server. The higher layer returns the requested set of UPnP Device Description Documents.

3.2.7.3 Get All Local Online IDs

This event is triggered when the Remote Media Streaming Initiation Protocol Server calls into the higher layer to obtain the set of Online IDs that can be authenticated by the higher layer.

3.2.7.4 Get Content Directory Service

This event is fired when the Remote Media Streaming Initiation Protocol Server calls into the higher layer specifying the Content Directory Service URL and an X.509 certificate. The higher layer validates the X.509 certificate for access to the Content Directory Service. If the validation succeeds, the higher layer returns the Content Directory Service corresponding to the URL passed in by the Remote Media Streaming Initiation Protocol Server.

3.2.7.5 Get Remote Sharing Status

This event is fired when the Remote Media Streaming Initiation Protocol Server calls into the higher layer specifying the Content Directory Service URL in a request to obtain the current Remote Sharing Status of the specified CDS. The higher layer responds with the current Remote Sharing Status.

4 Protocol Examples

The Remote Media Streaming Initiation Protocol specifies the interaction of a Remote Media Streaming Initiation Protocol Client and a Remote Media Streaming Initiation Protocol Server over a Home network or over the Internet.

The Remote Media Streaming Initiation Protocol Client communicates with a higher layer that exists on the host machine. This higher layer implements the user interface and triggers events to invoke the Remote Media Streaming Initiation Protocol messages.

4.1 Obtaining the Sharing Status of a CDS

The following diagram illustrates the process in a Remote Media Streaming Initiation Protocol Client to obtain the sharing status of a CDS in the Remote Media Streaming Initiation Protocol Server (that is, use of an X_GetRemoteSharingStatus action). In this case, the two machines interact over a Home network.

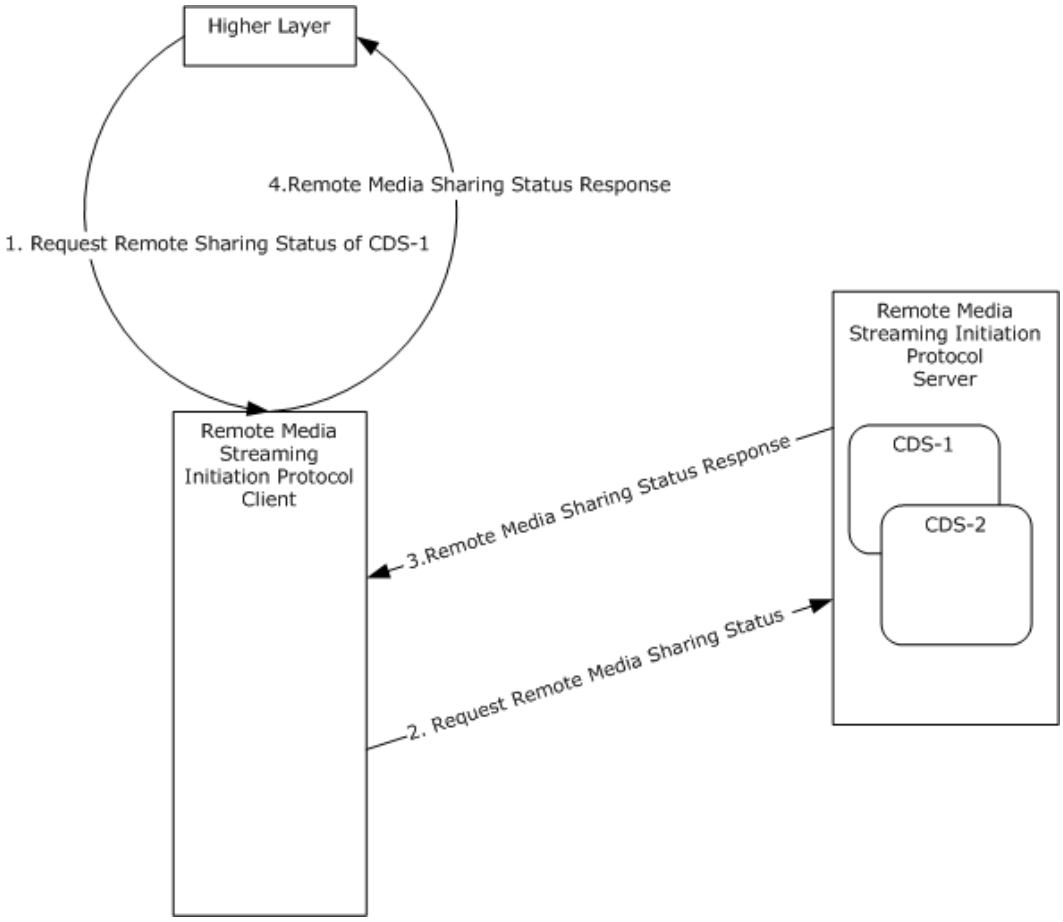

Figure 1: Illustration of Remote Media Streaming Initiation Protocol Client request/response to/from Remote Media Streaming Initiation Protocol Server in the Home network

The sequence shows a request to query the Remote Sharing Status of a CDS.

4.2 Browse or Search

The following diagram illustrates the process in a Remote Media Streaming Initiation Protocol Client to send a generic query (for example, Browse or Search) to the Remote Media Streaming Initiation Protocol Server over the Internet.

The Remote Media Streaming Initiation Protocol Server communicates with a higher layer that exists on the host machine. This higher layer manages media and metadata information available via UPnP, Remote Media Streaming Initiation Protocol, or any other protocol. When the Remote Media Streaming Initiation Protocol Server receives an external request, it triggers an event to communicate with the higher layer and obtain information. Upon collecting the information, the Remote Media Streaming Initiation Protocol Server responds to the external request.

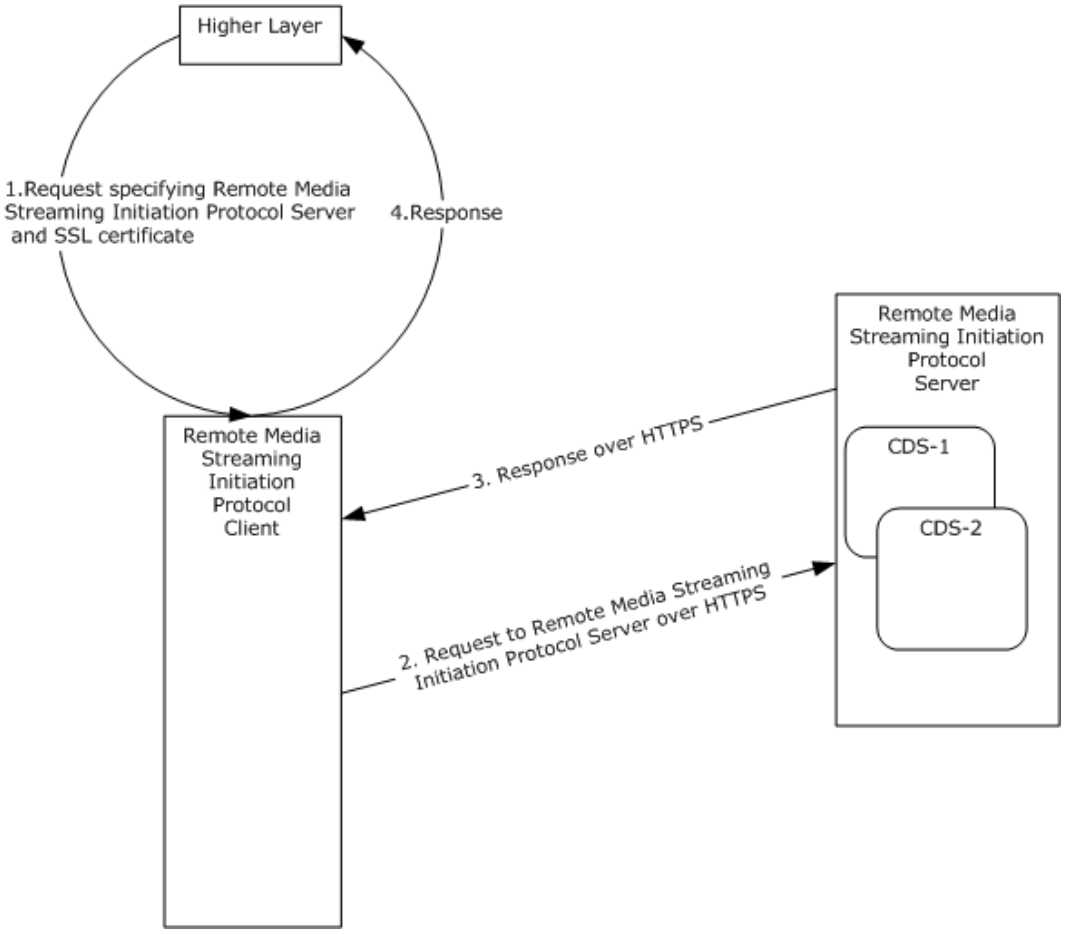

Figure 2: Illustration of Remote Media Streaming Initiation Protocol Client request/response to/from Remote Media Streaming Initiation Protocol Server across the Internet.

The above diagram shows the Remote Media Streaming Initiation Protocol Client request/response to/from Remote Media Streaming Initiation Protocol Server across the Internet. The sequence shows a generic CDS query.

4.3 Remote Media Streaming Initiation Protocol Server Response to a Request on Internet

The following diagram illustrates the process in a Remote Media Streaming Initiation Protocol Server to respond to a generic request received over the Internet. The request message triggers communications with the higher layer. Upon collecting information from the higher layer, the Remote Media Streaming Initiation Protocol Server returns data to the requestor.

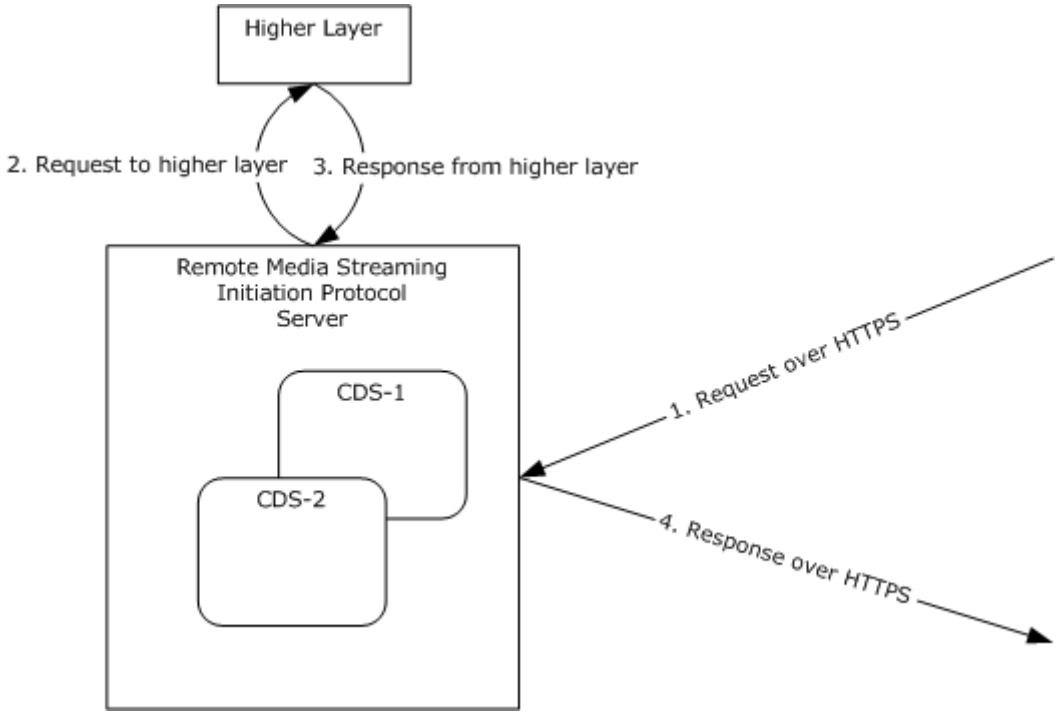

Figure 3: Illustration of request/response messages received/transmitted by the Remote Media Streaming Initiation Protocol Server over the Internet

The request message triggers communications between the Remote Media Streaming Initiation Protocol Server and the higher layer.

4.4 XML Examples

In the following example, Chris and Dana are two users on Contoso-PC who have shared out their media libraries over the Internet on a **server**. According to the specifications introduced in this document, each media library is associated with a DMS and a Content Directory Service.

The following example shows the relevant parts of the UPnP Device Description Document corresponding to Chris's DMS; including the extensions for the Remote Media Streaming Initiation Protocol.

```
<?xml version="1.0" ?>
<root xmlns="urn:schemas-upnp-org:device-1-0">
  <specVersion>
    <major>1</major>
    <minor>0</minor>
```

```
  </specVersion>
  <device>
    <UDN>uuid:49dde520-79be-4486-80a2-1a3345801d94</UDN>
    <friendlyName>CONTOSO-PC: Chris:</friendlyName>
    <deviceType>urn:schemas-upnp-org:device:MediaServer:1</deviceType>
    <manufacturer>Microsoft Corporation</manufacturer>
    <manufacturerURL>http://www.microsoft.com</manufacturerURL>
    <modelName>Windows Media Player Sharing</modelName>
    <modelNumber>12.0</modelNumber>
    <modelURL>http://go.microsoft.com/fwlink/?LinkId=105926</modelURL>
    <serialNumber>{AA108D93-B7F7-4155-8FA9-F6934A5B09D3}</serialNumber>
    <dlna:X_DLNADOC xmlns:dlna="urn:schemas-dlna-org:device-1-0">DMS-1.50</dlna:X_DLNADOC>
    <microsoft:remoteConfig xmlns:microsoft="urn:schemas-microsoft-com:WMPNSS-1-0/">
      <microsoft:remoteConnection>

<microsoft:remoteUrl>HTTPS://00180000801BDC98.devicedns.live.com:10245/WMPNSSv4/1327041672/</
microsoft:remoteUrl>
      </microsoft:remoteConnection>
      <microsoft:remoteConnection>
        <microsoft:remoteUrl>HTTPS://CONTOSO-
PC.contoso.com:10245/WMPNSSv4/1327041672/</microsoft:remoteUrl>
      </microsoft:remoteConnection>
    </microsoft:remoteConfig>
    <iconList>
        // ...
    </iconList>
    <serviceList>
      <service>
        <serviceType>urn:schemas-upnp-org:service:ConnectionManager:1</serviceType>
        <serviceId>urn:upnp-org:serviceId:ConnectionManager</serviceId>
        <controlURL>/upnphost/udhisapi.dll?control=uuid:49dde520-79be-4486-80a2-
1a3345801d94+urn:upnp-org:serviceId:ConnectionManager</controlURL>
        <eventSubURL>/upnphost/udhisapi.dll?event=uuid:49dde520-79be-4486-80a2-
1a3345801d94+urn:upnp-org:serviceId:ConnectionManager</eventSubURL>
        <SCPDURL>/upnphost/udhisapi.dll?content=uuid:f91364ed-56c5-4f65-b603-
869d3a3bcd02</SCPDURL>
      </service>
      <service>
        <serviceType>urn:schemas-upnp-org:service:ContentDirectory:1</serviceType>
        <serviceId>urn:upnp-org:serviceId:ContentDirectory</serviceId>
        <controlURL>/upnphost/udhisapi.dll?control=uuid:49dde520-79be-4486-80a2-
1a3345801d94+urn:upnp-org:serviceId:ContentDirectory</controlURL>
        <eventSubURL>/upnphost/udhisapi.dll?event=uuid:49dde520-79be-4486-80a2-
1a3345801d94+urn:upnp-org:serviceId:ContentDirectory</eventSubURL>
        <SCPDURL>/upnphost/udhisapi.dll?content=uuid:304c6192-acef-4dc4-8aaa-
667b8c50c4f9</SCPDURL>
      </service>
      <service>
        <serviceType>urn:microsoft.com:service:X_MS_MediaReceiverRegistrar:1</serviceType>
        <serviceId>urn:microsoft.com:serviceId:X_MS_MediaReceiverRegistrar</serviceId>
        <controlURL>/upnphost/udhisapi.dll?control=uuid:49dde520-79be-4486-80a2-
1a3345801d94+urn:microsoft.com:serviceId:X_MS_MediaReceiverRegistrar</controlURL>
        <eventSubURL>/upnphost/udhisapi.dll?event=uuid:49dde520-79be-4486-80a2-
1a3345801d94+urn:microsoft.com:serviceId:X_MS_MediaReceiverRegistrar</eventSubURL>
        <SCPDURL>/upnphost/udhisapi.dll?content=uuid:f4980ad3-9745-4bca-9f67-
6e7353390d60</SCPDURL>
      </service>
    </serviceList>
  </device>
```

```
</root>
```

The following example shows the relevant parts of the service description template for the Content Directory Service in Chris's DMS.

```
<?xml version="1.0" ?>
<scpd xmlns="urn:schemas-upnp-org:service-1-0">
  <specVersion>
    <major>1</major>
    <minor>0</minor>
  </specVersion>
  <actionList>
    // ...
    <action>
      <name>X_GetRemoteSharingStatus</name>
      <argumentList>
        <argument>
          <name>Status</name>
          <direction>out</direction>
          <relatedStateVariable>X_RemoteSharingEnabled</relatedStateVariable>
        </argument>
      </argumentList>
    </action>
  </actionList>
  <serviceStateTable>
    // ...
    <stateVariable sendEvents="yes">
      <name>X_RemoteSharingEnabled</name>
      <dataType>boolean</dataType>
    </stateVariable>
  </serviceStateTable>
</scpd>
```

The following example shows the XML document returned when an authorized client enumerates the Content Directory Services on the Remote Media Streaming Initiation Protocol Server.

```
<?xml version="1.0"?>
<server xmlns="urn:schemas-microsoft-com:WMPNSSRME-1-0/">
  <library>
    <UDN>uuid:0B332012-1B02-44EF-85CD-070EC5366776</UDN>
    <friendlyName>CONTOSO-PC: Dana:</friendlyName>
    <manufacturer>Microsoft Corporation</manufacturer>
    <modelName>Windows Media Player Sharing</modelName>
    <modelNumber>12.0</modelNumber>
    <serialNumber>{6D9A9C0D-AB1F-4B1D-9A21-0CE5C59709BB}</serialNumber>

<remoteUrl>http://00180000801BDC98.devicedns.live.com:10245/WMPNSSv4/856300835/</remoteUrl>
    <remoteUrl>http://CONTOSO-PC.contoso.com:10245/WMPNSSv4/856300835/</remoteUrl>
  </library>
  <library>
    <UDN>uuid:49DDE520-79BE-4486-80A2-1A3345801D94</UDN>
    <friendlyName>CONTOSO-PC: Chris:</friendlyName>
    <manufacturer>Microsoft Corporation</manufacturer>
    <modelName>Windows Media Player Sharing</modelName>
```

```
      <modelNumber>12.0</modelNumber>
      <serialNumber>{AA108D93-B7F7-4155-8FA9-F6934A5B09D3}</serialNumber>

  <remoteUrl>https://00180000801BDC98.devicedns.live.com:10245/WMPNSSv4/1327041672/</remoteUrl>
      <remoteUrl>http://CONTOSO-PC.contoso.com:10245/WMPNSSv4/1327041672/</remoteUrl>
    </library>
    <onlineID>john.doe@example.com</onlineID>
    <onlineID>dana.doe@example.com</onlineID>
  </server>
```

5 Security

5.1 Security Considerations for Implementers

The Remote Media Streaming Initiation Protocol requires the Remote Media Streaming Initiation Protocol Server to validate the X.509 certificate of a Remote Media Streaming Initiation Protocol Client.

Since the Remote Media Streaming Initiation Protocol uses **SSL**, the Remote Media Streaming Initiation Protocol Server also delivers a X.509 certificate to the Remote Media Streaming Initiation Protocol Client. The Remote Media Streaming Initiation Protocol specifications defined in this document do not define or require validation of the server's certificate but some implementations can require this procedure. If an implementation uses self-signed server certificates, the Remote Media Streaming Initiation Protocol Client is recommended to validate that at least one of the URLs in the GetRemoteLibInfo response specified in 2.2.6 matches the Remote Media Streaming Initiation Protocol IP address that the Remote Media Streaming Initiation Protocol Client has for the Remote Media Streaming Initiation Protocol Server.

5.2 Index of Security Parameters

None.

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 7 operating system
- Windows Home Server 2011 server software
- Windows 8 operating system
- Windows 8.1 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.

7 Change Tracking

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

8 Index