[MS-WDSMSI]: Windows Deployment Services Multicast Session Initiation Protocol

Revision Summary

Date	Revision History	Revision Class	Comments
04/10/2009	0.1	Major	First Release.
05/22/2009	0.1.1	Editorial	Revised and edited the technical content.
07/02/2009	0.1.2	Editorial	Revised and edited the technical content.
08/14/2009	0.1.3	Editorial	Revised and edited the technical content.
09/25/2009	0.2	Minor	Updated the technical content.
11/06/2009	0.2.1	Editorial	Revised and edited the technical content.
12/18/2009	0.2.2	Editorial	Revised and edited the technical content.
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04/23/2010	0.2.5	Editorial	Revised and edited the technical content.
06/04/2010	0.2.6	Editorial	Revised and edited the technical content.
07/16/2010	0.2.6	No change	No changes to the meaning, language, or formatting of the technical content.
08/27/2010	0.2.6	No change	No changes to the meaning, language, or formatting of the technical content.
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02/11/2011	0.2.6	No change	No changes to the meaning, language, or formatting of the technical content.
03/25/2011	0.2.6	No change	No changes to the meaning, language, or formatting of the technical content.
05/06/2011	0.2.6	No change	No changes to the meaning, language, or formatting of the technical content.
06/17/2011	0.3	Minor	Clarified the meaning of the technical content.
09/23/2011	0.3	No change	No changes to the meaning, language, or formatting of the technical content.
12/16/2011	1.0	Major	Significantly changed the technical content.

Date	Revision History	Revision Class	Comments
03/30/2012	1.0	No change	No changes to the meaning, language, or formatting of the technical content.
07/12/2012	1.1	Minor	Clarified the meaning of the technical content.
10/25/2012	1.2	Minor	Clarified the meaning of the technical content.
01/31/2013	1.3	Minor	Clarified the meaning of the technical content.
08/08/2013	2.0	Major	Significantly changed the technical content.
11/14/2013	2.0	No change	No changes to the meaning, language, or formatting of the technical content.

Contents

1 Introduction

The Multicast Session Initiation Protocol specifies communication between a client and a Windows Deployment Services server to initiate a Multicast Session. It is a client/server protocol which specifies two mechanisms for the client to request initiation of a Multicast Session from the server.

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]:

globally unique identifier (GUID)
little-endian
security identifier (SID)
Unicode

The following terms are specific to this document:

Client Security Mode: Specifies the mechanism used by the client to add validation information to each packet sent by the client to the server using the WDS Multicast Transport Protocol.

Configuration String: A Unicode string that is used by multicast namespace to instruct the content provider about the content required to be exposed.

Content: Identified by a unique name under a given multicast namespace. The **content metadata** cannot change during the lifetime of a multicast session, and is required to allow random access to the data.

Content Metadata: Specifies an opaque binary data that is associated with the content.

Content Provider: A module that is loaded by the server and is responsible for providing access to the data for the content under a multicast namespace.

Multicast: The ability of a transport protocol (User Datagram Protocol) to deliver messages to a group of recipients simultaneously without duplication of message unless the link to recipients split.

Multicast Address: A recipient subscribes to the network address to receive packets sent using multicast.

Multicast Namespace: Hosts multiple content that are available to clients using multicast sessions. Identification by a unique name is required.

Multicast Session: A session setup by the server to transmit content to multiple clients using the WDS Multicast Application Protocol and the WDS Multicast Transport Protocol.

Security Mode: Specifies the mechanism used by server and clients to validate the packets sent using the WDS Multicast Transport Protocol.

Server Security Mode: Specifies the mechanism used by server to add validation information to each packet sent by server to clients using the WDS Multicast Transport Protocol.

RSA Key: A public/private key pair generated using RSA algorithm. The private key is used to sign the packets for the WDS Multicast Transport Protocol and the public key is used by clients to validate the signatures.

WDS Server: Clients communicate to Windows Deployment Services (WDS) server to request initiation/setup of multicast sessions for content available in multicast namespace on server.

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-DTYP] Microsoft Corporation, "Windows Data Types".

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

[MS-WDSC] Microsoft Corporation, "Windows Deployment Services Control Protocol".

[MS-WDSMT] Microsoft Corporation, "Windows Deployment Services Multicast Transport Protocol".

[RFC2104] Krawczyk, H., Bellare, M., and Canetti, R., "HMAC: Keyed-Hashing for Message Authentication", RFC 2104, February 1997, http://www.ietf.org/rfc/rfc2104.txt

[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

1.2.2 Informative References

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

1.3 Overview

A typical interaction between client and server involves the following:

1. The client has already obtained the following information.
   - Name or IP address of server.
   - Name of **multicast namespace**.

- Name of the content in multicast namespace.

2. The client uses the Multicast Session Initiation Protocol to request content in the multicast namespace be set up for delivery using **multicast** transmission.

3. On receiving the request, the server sets up the **multicast session** for the specified content in the multicast namespace and sends the details of the multicast session to the client.

1.4 Relationship to Other Protocols

The Multicast Session Initiation Protocol specifies two mechanisms for clients to request initiation of a multicast session. One uses the WDS Control Protocol, and the other uses UDP. Both are described in the following subsections.

1.4.1 Using the WDS Control Protocol

The Multicast Session Initiation Protocol uses the WDS Control Protocol to send a request to the server, which allows the user identity to be transported to the server with the request. The following diagram illustrates the relationship of the Multicast Session Initiation Protocol and how it relates to the WDS Control Protocol.

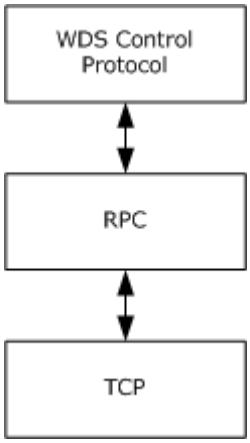


Figure 1: Protocol relationships

1.4.2 Using UDP

The clients can use UDP as a transport to send requests to a server<1>, but this limits all requests to being unauthenticated. The following diagram illustrates the relationship of the Multicast Session Initiation Protocol and the UDP Protocol.

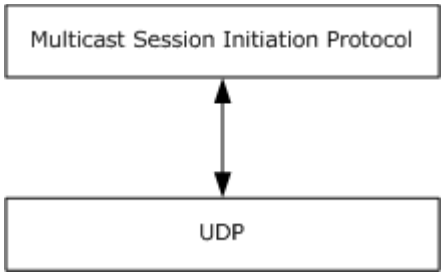


Figure 2: WDSMSI relationship to UDP

1.5 Prerequisites/Preconditions

The WDS Multicast Session Initiation Protocol assumes the client has obtained the following:

1. Name or IP address of the server.
2. Name of the multicast namespace.
3. Name of the **content** in the multicast namespace.
4. Authentication requirements for the content.

If the server requires a user identity to control access to the content, then the client MUST use the WDS Multicast Session Initiation Protocol over the WDS Control Protocol; otherwise the client MAY use the Multicast Session Initiation Protocol over UDP.

The content MAY have associated **content metadata**, which clients MUST understand in order to consume the content. The server is responsible for transporting the content metadata from server to clients but treats it as opaque binary data.

An agreement MUST exist between the multicast namespace and the **content provider** on the format of the **configuration string**, which is used by the multicast namespace to instruct the content provider to expose the appropriate content for the multicast namespace.

1.6 Applicability Statement

This protocol is applicable when a client is required to download content from a server using multicast session, and uses the WDS Multicast Session Initiation Protocol to request that the server set up the content for delivery over the multicast session.

1.7 Versioning and Capability Negotiation

This document covers versioning issues in the following areas.

- Supported Transports: This protocol can be implemented on top of the WDS Control Protocol and the User Datagram Protocol (UDP).
- Security and Authentication Methods: The WDS Multicast Session Initiation Protocol over the WDS Control Protocol supports authentication. The security requirements are specified in section 2.2.
- Localization: The protocol does not support localization, and as such acts as a pass-through for all strings.
- Capability Negotiation: The protocol does explicit capability negotiations for certain Endpoint **GUID** and OpCodes as specified in the following section.

Capability	Section
WDSMC_OP_INITIATE	Section 2.2.1

1.8 Vendor-Extensible Fields

The protocol does not provide any vendor-extensible fields.

This protocol uses Win32 error codes as defined in [MS-ERREF] section 2.2. Vendors SHOULD reuse those values with their indicated meaning. Choosing any other value runs the risk of a collision in the future.

1.9 Standards Assignments

Parameter	Value	Reference
Multicast Session Initiation Endpoint GUID	6f13a317-3687-4b54-81a5-504daa9062fa	[MS-WDSC], (section 2.1.2)
Multicast Session Initiation UDP Port	5041	None.

2 Messages

2.1 Transport

The Multicast Session Initiation Protocol over the WDS Control Protocol MUST use the byte-order as specified in [MS-WDSC].

The Multicast Session Initiation Protocol over UDP MUST use network-byte-order unless noted otherwise.

2.2 Message Syntax

WDS servers MUST support the following OpCodes under Multicast Session Initiation **Endpoint GUID**, as specified in [MS-WDSC] (section 2.1.2).

OpCode	Authentication Requirements	Description
WDSMC_OP_INITIATE 0x00000006	Authenticated	This OpCode is used by clients to request that the server set up specified content for delivery using multicast session.

The WDS server MAY support incoming requests on UDP Port as specified in section 1.9.<2>

2.2.1 WDSMC_OP_INITIATE OpCode

The client uses this OpCode under the Multicast Session Initiation Endpoint GUID to request setup of content for delivery using multicast session.

The request packet MUST include the following variables.

Namespace (**WDSCPL_VAR_WSTRING**): MUST be set to the name of the multicast namespace.

Content (**WDSCPL_VAR_WSTRING**): MUST be set to the name of content under the multicast namespace.

Client (**WDSCPL_VAR_WSTRING**): MUST be set to the machine name of the client. The maximum character length for the machine name MUST NOT exceed 16 characters including the null character.

The request packet MAY include the following variables.

Cap (**WDSCPL_VAR_ULONG**): Specifies a bitwise value of the following flags:<3>

Flag	Description
WDSMC_CLIENT_CAP_CHECKSUM 0x00000001	Specifies that clients support checksum handling for packets using the WDS Multicast Transport Protocol.
WDSMC_CLIENT_CAP_IPV6 0x00000002	Specifies that clients support the IPv6 protocol and is capable of receiving multicast packets using the IPv6 protocol for the WDS Multicast Transport Protocol.
WDSMC_CLIENT_CAP_BOOT_DEVICE 0x00000004	Specifies that the client is operating in a pre-OS environment.

The reply packet MUST include the following variables.

TpMcAddress.Port (**WDSCPL_VAR_ULONG**): MUST be set to the UDP port being used by multicast session to send packets using multicast.

TpMcAddress.Address (**WDSCPL_VAR_BLOB**): MUST be set to the multicast IP address being used by the multicast session and MUST be specified in network byte order.

For a multicast session using an IPv4 **multicast address**, this variable MUST be set to 4 bytes specifying the IPv4 multicast address.

For a multicast session using an IPv6 multicast address, this variable MUST be set to 16 bytes specifying the IPv6 multicast address.

TpUniAddress.Port (**WDSCPL_VAR_ULONG**): MUST be set to the same value as specified for the **TpMcAddress.Port** variable.

TpUniAddress.Address (**WDSCPL_VAR_BLOB**): MUST be set to the IP address of the network interface card being used by multicast session on the server and MUST be specified in network byte order.

For a multicast session using an IPv4 address, this variable MUST be set to 4 bytes specifying the IPv4 address.

For a multicast session using an IPv6 address, this variable MUST be set to 16 bytes specifying the IPv6 address.

SessionId (**WDSCPL_VAR_ULONG**): MUST be set to a numeric value that uniquely identifies the multicast session on the server.

ContentSize (**WDSCPL_VAR_ULONG64**): MUST be set to the total size of the content, in bytes.

BlockSize (**WDSCPL_VAR_ULONG**): Content is divided into equal-sized blocks of data by WDS Multicast Transport Protocol. This variable specifies the size of each block in bytes. The last block of data for content MAY be smaller in size because the total size of content MAY NOT be equally divisible by the **BlockSize**.

TotalBlocks (**WDSCPL_VAR_ULONG64**): MUST be set to the total number of blocks that the content has been divided into.

ContentMetadata (**WDSCPL_VAR_BLOB**): Specifies any metadata associated with the content. If the content does not have any associated metadata, then this variable MUST be set to zero length.

The reply packet MAY include the following variables.

SymKey (**WDSCPL_VAR_BLOB**): Specifies the shared cryptographic key to use to compute and/or validate the hash of the packets using the Hash Message Authentication Code (HMAC) algorithm ([RFC2104]) specified by the **HMACAlgId** variable for WDS Multicast Transport Protocol [MS-WDSMT].

When this variable is specified, **HashAlgId** and **HMACAlgId** variables MUST be specified as well.

Section 2.2.1.1 specifies the rules to determine the **client security mode** and section 2.2.1.2 specifies the rules to determine the server security mode.

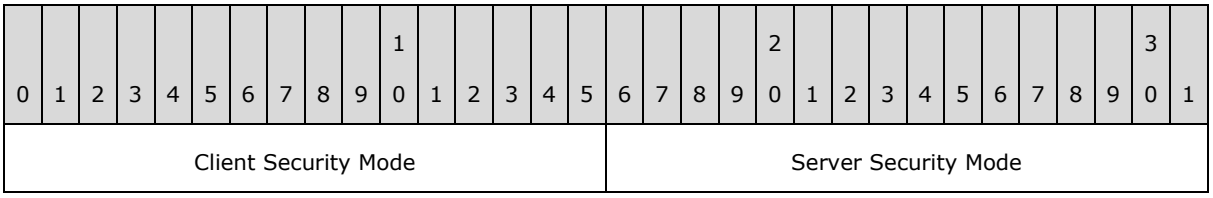
SignKey (**WDSCPL_VAR_BLOB**): Specifies the public **RSA key** to use to validate the signature of packets sent by server.

Section 2.2.1.1 specifies the rules to determine the client security mode and section 2.2.1.2 specifies the rules to determine the server security mode.

HashAlgId (**WDSCPL_VAR_ULONG**): Specifies the Hashing algorithm to use to compute the hash for packets.

HMACAlgId (**WDSCPL_VAR_ULONG**): HMAC algorithm to use to compute the HMAC hash for the packets.

SecMode (**WDSCPL_VAR_ULONG**): The value for variable has the following format:<4>



When this variable is specified in the reply packet, it controls the mechanism used by the client and server to validate packets before further processing. The values for client security mode and server security mode MUST be set to one of the following for each.

Security Mode	Description
WDSMCTP_SEC_NONE 0x0000	Specifies that packets MUST not include any security/validation information.
WDSMCTP_SEC_HASH 0x0001	Specifies that packets MUST use the specified hash algorithm for the packet.
WDSMCTP_SEC_SIGN 0x0002	Specifies that packet MUST be signed.
WDSMCTP_SEC_CHECKSUM 0x0003	Specifies that packet MUST include the checksum for the packet.

UserSid (**WDSCPL_VAR_BLOB**): MUST be set to the **security identifier**, as specified in [MS-DTYP], (section 2.4.2), of the user.<5>

2.2.1.1 Determine Client Security Mode

The following flowchart specifies the logic to be followed by the client to determine the client security mode for the WDS Multicast Transport Protocol.

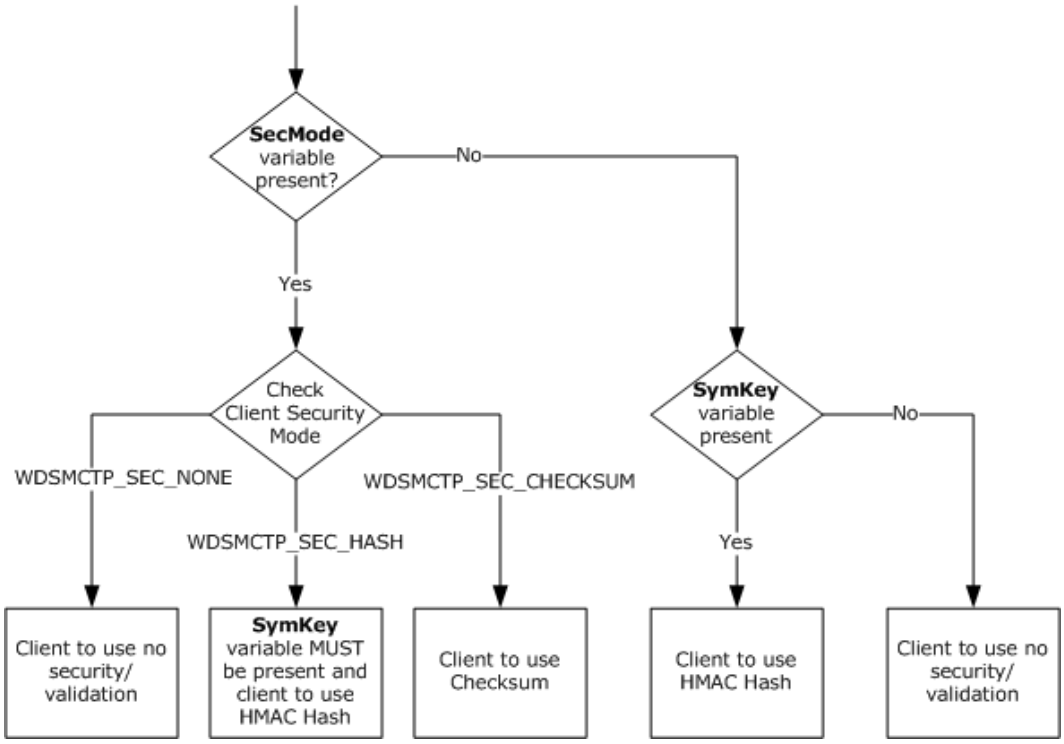


Figure 3: Client security mode flowchart

2.2.1.2 Determine Server Security Mode

The following flowchart specifies the logic to be followed by the client to determine the **server security mode** for [WDS Multicast Transport Protocol].

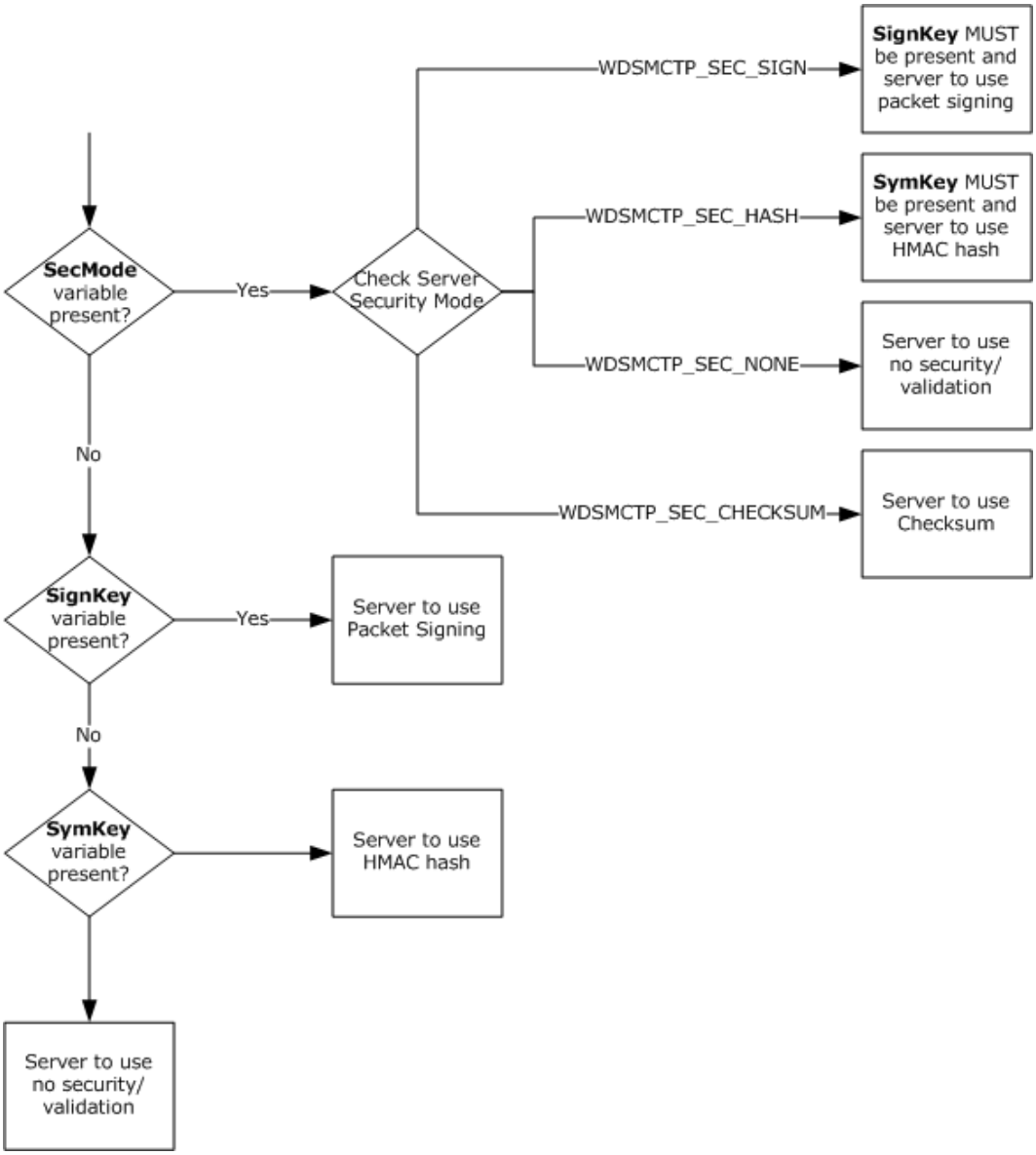
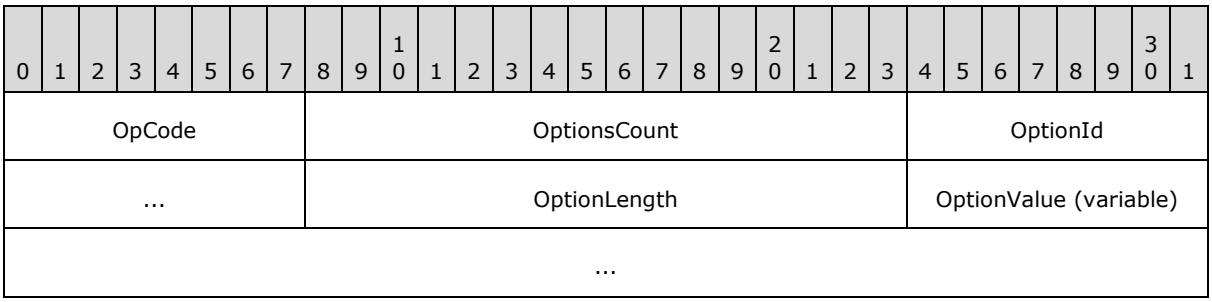


Figure 4: Server security mode flowchart

2.2.2 Session Initiation Packets for UDP

The WDS Multicast Session Initiation Protocol over UDP uses a single packet format. The packet format supports options and depending on the type of packet, a different set of options are specified in the packet.

The format for all packets is as follows.



OpCode (1 byte): MUST be set to the type of packet as specified below.

OpCode	Meaning
WDSMCSE_OP_REQUEST 0x01	Multicast Session Initiation Request Packet. Section 2.2.2.1 specifies options that MUST be specified.
WDSMCSE_OP_REPLY 0x02	Multicast Session Initiation Reply Packet. Section 2.2.2.2 specifies options that MUST be specified.

OptionsCount (2 bytes): MUST be set to the number of Options specified in the packet.

The set of these three fields, **OptionId**, **OptionLength**, and **OptionValue**, are used to specify value for each option.

OptionId (2 bytes): Specifies a numeric value that uniquely identifies the option.

OptionLength (2 bytes): Specifies the length, in bytes, for the value of the option.

OptionValue (variable): Specifies the value for the option. The length for this field is specified by the **OptionLength** field.

2.2.2.1 Multicast Session Initiation Request Packet

This packet is sent by the client to server on the UDP port specified in section 1.9. This packet is used to request the server to set up specified content for delivery using multicast session.

The format for this packet is specified in section 2.2.2. The request packet MUST include the Options specified below.

Option Id	Description
WDSMCSE_OPT_NAMESPACE 0x0601	Specifies the name for multicast namespace. The value MUST be a Unicode string with the individual characters of the string specified in little-endian format. The last character of the Unicode string MUST be a null character.
WDSMCSE_OPT_CONTENT 0x0602	Specifies the name for content under a multicast namespace. The value MUST be a Unicode string with individual characters of the string specified in little-endian format. The last character for the value MUST be a null character.
WDSMCSE_OPT_MAC_ADDRESS 0x050C	Specifies the MAC address of the network interface card being used by the client to communicate with server.

The request packet MAY specify the following Options: <6>

Option Id	Description
WDSMCSE_OPT_IPV6_CAPABLE 0x010D	A single-byte value that MUST be set to 1 if the client is capable of receiving multicast packets using the IPv6 protocol; otherwise the value MUST be set to zero.

If a request packet does not specify WDSMCSE_OPT_IPV6_CAPABLE option, the server MUST assume that the client is not capable of receiving IPv6 multicast packets.

2.2.2.2 Multicast Session Initiation Reply Packet

The server sends this packet in response to Multicast Session Initiation Request Packet when the requested content has been set up for delivery using multicast session. The reply packet MUST be sent using the UDP port specified in section 1.9 by the server. If an error occurs that prevents the server from setting up the content for delivery using multicast session, then the server sends the reply packet as specified in section 2.2.2.3.

The format for this packet is specified in section 2.2.2. The packet MUST include the options specified below.

Option Id	Description
WDSMCSE_OPT_MULTICAST_ADDR 0x0503	Specifies the multicast IP address for the multicast session. The value MUST specify a 4-byte address for an IPv4 multicast address, and a 16-byte address for an IPv6 multicast address.
WDSMCSE_OPT_SERVER_ADDR 0x0504	Specifies the IP address of the network interface card being used by the multicast session. The value MUST specify a 4-byte address for an IPv4 address and a 16-byte address for an IPv6 address.
WDSMCSE_OPT_MULTICAST_PORT 0x0205	MUST be set to the UDP port being used by the multicast session to transmit packets to the multicast address specified by the **WDSMCSE_OPT_MULTICAST_ADDR** field. The value MUST be a 2-byte unsigned numeric value.
WDSMCSE_OPT_SERVER_PORT 0x0206	MUST be set to the same value as the **WDSMCSE_OPT_MULTICAST_PORT** field.
WDSMCSE_OPT_CONTENT_SIZE 0x0407	Specifies the total size, in bytes, for the content. The value is a 64-bit unsigned numeric value.
WDSMCSE_OPT_BLOCK_SIZE 0x0309	Content is divided into equal blocks of data by the WDS Multicast Transport Protocol. This variable specifies the size of each block in bytes. The last block of data for content MAY be smaller in size because the size of content MAY NOT be fully divisible by the **WDSMCSE_OPT_BLOCK_SIZE** field. The value is a 32-bit unsigned numeric value.
WDSMCSE_OPT_TOTAL_BLOCKS 0x0408	MUST be set to the total number of blocks the content has been divided into. The value is a 64-bit unsigned numeric value.

Option Id	Description
WDSMCSE_OPT_SESSION_ID 0x030A	MUST be set to a numeric value that uniquely identifies the multicast session on the server. The value is a 32-bit unsigned numeric value.

2.2.2.3 Multicast Session Initiation Error Packet

This packet is sent by the server in response to the Multicast Session Initiation Request Packet if an error occurs that prevents the server from setting up the Multicast Session for the requested content.

The format for this packet is specified in section 2.2.2. The request packet MUST include the options specified below.

Option Id	Description
WDSMCSE_OPT_ERROR 0x030B	MUST be set to the Win32 error code that prevented the server from setting up the Multicast Session. The value MUST be a 32 bit numeric value.

3 Protocol Details

3.1 Server Details

This section specifies the WDS Deployment Protocol behavior for WDS server.

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.

Registered content providers: Specifies a list of content providers registered with the WDS server. Each registered content provider has configuration data associated with it, as specified in section 3.1.1.1.

Registered multicast namespaces: Specifies the collection of multicast namespaces that are registered on the server and are available for clients. Each Registered multicast namespace has configuration data associated with it, as specified in section 3.1.1.2.

WDS serverconfiguration: Configuration information for the server, in persistent storage, in the form of (name, value) pairs. The list of configuration parameters are specified in section 3.1.1.3.

3.1.1.1 Registered Content Provider Configuration

The following properties are stored for each registered content provider in persistent storage.

Name: Specifies a unique name for the content provider.

ModulePath: Specifies the path to the module for the content provider.

AllowUnauthenticated: A Boolean value which, when set to TRUE (0x00000001), specifies that the content provider allows unauthenticated clients to request content using the WDS Multicast Session Initiation Protocol over UDP.

3.1.1.2 Registered Multicast Namespaces Configuration

The following properties are stored in persistent storage for each registered multicast namespace.

Name: Specifies a unique name for the multicast namespace.

ContentProvider: Specifies the name for the content provider that will be providing information and data for contents available using the multicast namespace.

ConfigurationString: Specifies a configuration string that instructs the content provider about the types of content to make available for the multicast namespace.

3.1.1.3 WDS Server Configuration

The following properties are stored for WDS server configuration.

AllowUDP: A Boolean value that, when set to TRUE (0x00000001), specifies that the server MUST listen for WDS Multicast Session Initiation Protocol packets on the UDP port (section 1.9).

ServerSecurityMode: A numeric value that specifies the server security mode (section 2.2.1). Section 3.1.5.1 specifies the list of supported security mode.

ClientSecurityMode: A numeric value that specifies the client security mode (section 2.2.1). Section 3.1.5.1 specifies the list of supported security modes.

SignKey: An RSA public/private key pair that is used by the server if the **ServerSecurityMode** field is set to WDSMCTP_SEC_SIGN.

HashKey: A cryptographic key that is used by the server when **ServerSecurityMode** is set to WDSMCTP_SEC_HASH or WDSMCTP_SEC_SIGN. This key is also used by the client when the **ClientSecurityMode** field is set to WDSMCTP_SEC_HASH.

HashAlgId: A numeric value that specifies the Cryptographic Hash algorithm to use if security mode is set to WDSMCTP_SEC_HASH or WDSMCTP_SEC_SIGN.

HMACAlgId: A numeric value that specifies the Cryptographic HMAC algorithm to use if security mode is set to WDSMCTP_SEC_HASH.

3.1.2 Timers

None.

3.1.3 Initialization

On initialization, the WDS server MUST register a Multicast Session Initiation Endpoint GUID as specified in section 1.9. If **AllowUDP** (section 3.1.1.2) is set to TRUE (0x00000001), the server MUST also listen for incoming packets on the UDP port specified in section 1.9.

The server MUST read information for all registered content providers, along with the associated registered content provider configuration (section 3.1.1.1) for each, and MUST initialize each content provider.

In order to initialize each multicast namespace, the server MUST follow the steps below.

1. Read the collection of registered multicast namespaces and associated registered multicast namespace configuration (section 3.1.1.2) for each.
2. Validate that the **ContentProvider** (section 3.1.1.2) exists and is initialized.
3. Provide the **ConfigurationString** (section 3.1.1.2) to the content provider so appropriate content can be made available for the multicast namespace.

The server MUST also validate that the security modes specified by the **ServerSecurityMode** field and the **ClientSecurityMode** field are valid as specified in section 3.1.5.1.

3.1.4 Higher-Layer Triggered Events

None.

3.1.5 Message Processing Events and Sequencing Rules

3.1.5.1 Supported Security Modes

The server MUST support the following combination of security modes.

Pre-OS Client	Server Security Mode	Client Security Mode
Yes	WDSMCTP_SEC_CHECKSUM	WDSMCTP_SEC_CHECKSUM
No	WDSMCTP_SEC_SIGN	WDSMCTP_SEC_HASH
No	WDSMCTP_SEC_HASH	WDSMCTP_SEC_HASH
No	WDSMCTP_SEC_CHECKSUM	WDSMCTP_SEC_CHECKSUM
No	WDSMCTP_SEC_NONE	WDSMCTP_SEC_NONE

3.1.5.1.1 Pre-OS Client

The server MUST assume that the client is running in a pre-OS environment if a request packet is received using the UDP port.

For requests received using the WDS Control Protocol, the server MUST assume that the client is running in pre-OS environment if the **Cap** variable specifies the WDSMC_CLIENT_CAP_BOOT_DEVICE flag.

3.1.5.2 WDSMC_OP_INITIATE

This OpCode is used by clients to request set up of content under a multicast namespace for delivery using multicast session.

The server MUST follow the steps in the following section for setting up the content for delivery using multicast session.

1. MUST match the value of **Namespace** variable to the **Name** property (section 3.1.1.1) of registered multicast namespaces.
2. MUST query the content provider identified by **ContentProvider** property (section 3.1.1.2) for the content specified by the **Content** variable in the request packet to validate that client has access to content.

If the request packet includes the **Cap** variable, and it specifies WDSMC_CLIENT_CAP_IPV6, then if the server is capable of setting up multicast session for IPv6, the server MUST setup the multicast session using IPv6; otherwise, the server MUST set up the multicast session using IPv4.

If the client is running in a pre-OS environment (section 3.1.5.1.1), the server MUST set both the server and client security modes to WDSMCTP_SEC_CHECKSUM for the multicast session.

If the client is not running in a pre-OS environment, the server MUST set the security modes as specified for the **ServerSecurityMode** and **ClientSecurityMode** fields (section 3.1.1.3) for the multicast session. The server MUST provide both the **SignKey** and **HashKey** fields to the multicast session if required by security modes.

The server MUST query the multicast session and add the following variables to the reply packet.

TpMcAddress.Port,**TpMcAddress.Address**, **TpUniAddress.Port**, **TpUniAddress.Address**, **SessionId**, **BlockSize**, **TotalBlocks**, **ContentSize**

The server MUST query the associated content provider for any metadata associated with the content, and add it to the reply packet using the **ContentMetadata** variable. If no metadata exists for the content, the server MUST not add the **ContentMetadata** variable to the reply packet.

The server MUST validate that when server or client security mode is set to WDSMCTP_SEC_CHECKSUM, the request packet MUST include the **Cap** variable. **Cap** MUST specify the WDSMC_CLIENT_CAP_CHECKSUM.

If the server security mode being used by the multicast session is WDSMCTP_SEC_SIGN, then the server MUST:

- add the **SignKey** field (section 3.1.1.3) to the reply packet, using the value of the **SignKey** variable
- add the **SymKey** field (section 3.1.1.3) to the reply packet, using the value of the **SymKey** variable.

If the security mode (either client or server) being used by multicast session is WDSMCTP_SEC_HASH, then the server MUST add the following to the reply packet:

- the **HashKey** field (section 3.1.1.3) to the reply packet using the **SymKey** variable.
- the **HashAlgId** field (section 3.1.1.3) to the reply packet using the **HashAlgId** variable.
- the **HMACAlgId** field (section 3.1.1.3) to the reply packet using the **HMACAlgId** variable.

The server MUST construct the security mode (section 2.2.1) and add it to the reply packet using the **SecMode** variable.

The server MUST get the user security identifier and add it to the reply packet using the **UserSid** variable.

3.1.5.3 Over UDP

The Multicast Session Initiation Request Packet is received by the server on the UDP port specified in section 1.9.

The server MUST validate that the request packet specifies WDSMCSE_OPT_NAMESPACE, WDSMCSE_OPT_CONTENT and WDSMCSE_OPT_MAC_ADDRESS options.

The server:

MUST match the value of the **Namespace** variable to the **Name** property (section 3.1.1.1) of registered multicast namespaces.

MUST verify that **AllowUnauthenticated** (section 3.1.1.1) is set to TRUE (0x00000001).

MUST query the content provider identified by the **ContentProvider** property (section 3.1.1.2) for the content specified by the Content variable in the request packet, in order to validate that the client is allowed access to content.

If the request packet specifies WDSMCSE_OPT_IPV6_CAPABLE, and it is set to 1, and the server is capable of setting up multicast session for IPv6, then the server MUST set up the multicast session using IPv6; otherwise the server MUST set up the multicast session using IPv4.

The server MUST set the server and client security modes to WDSMCTP_SEC_CHECKSUM.

The server MUST query the multicast session and add the following options to the reply packet:

WDSMCSE_OPT_MULTICAST_ADDR, WDSMCSE_OPT_MULTICAST_PORT, WDSMCSE_OPT_SERVER_ADDR, WDSMCSE_OPT_SERVER_PORT, WDSMCSE_OPT_CONTENT_SIZE, WDSMCSE_OPT_TOTAL_BLOCKS, WDSMCSE_OPT_BLOCK_SIZE, WDSMCSE_OPT_SESSION_ID.

3.1.6 Timer Events

When using the WDS Multicast Session Initiation Protocol over UDP, the client MUST wait for 1 second for the reply from the server before sending the request packet again.

3.1.7 Other Local Events

None.

4 Protocol Examples

4.1 WDS Multicast Session Initiation Protocol over WDS Control Protocol

The Request Packet includes following variables.

Namespace (**WDSCPL_VAR_WSTRING**): "WDS:default/install.wim/1"

Content (**WDSCPL_VAR_WSTRING**): "install.wim"

Client (**WDSCPL_VAR_WSTRING**): "TestMachine"

Cap (**WDSCPL_VAR_ULONG**): 0x00000003 (WDSMC_CLIENT_CAP_CHECKSUM | WDSMC_CLIENT_CAP_IPV6)

The reply packet includes the following variables.

TpMcAddress.Port (**WDSCPL_VAR_ULONG**): 0x0000FA84

TpMcAddress.Address (**WDSCPL_VAR_BLOB**): EF00006F

TpUniAddress.Port (**WDSCPL_VAR_ULONG**): 0x0000FA84

TpUniAddress.Address (**WDSCPL_VAR_BLOB**): C0A800C8

ContentSize (**WDSCPL_VAR_ULONG64**): 0x00000000EF8B56EC

TotalBlocks (**WDSCPL_VAR_ULONG64**): 0x6FB00

BlockSize (**WDSCPL_VAR_ULONG**): 0x00002251

SessionId (**WDSCPL_VAR_ULONG**): 0x6D19EE7E

SymKey (**WDSCPL_VAR_BLOB**):
080200000366000180000002F15F82AE0683EF79E6D62A70BDC519D2A3246E0FDB354E9

SymKey (**WDSCPL_VAR_BLOB**):
080200000366000180000002F15F82AE0683EF79E6D62A70BDC519D2A3246E0FDB354E9

UserSid (**WDSCPL_VAR_BLOB**):
010500000000000515000000 6BE79ECE8F2C9599DC2F39DCF4010000

HMACAlgId (**WDSCPL_VAR_ULONG**): 0x00008009

HashAlgId (**WDSCPL_VAR_ULONG**): 0x0000800C

SecMode (**WDSCPL_VAR_ULONG**): 0x00010001

5 Security

5.1 Security Considerations for Implementers

None.

5.2 Index of Security Parameters

Security Parameter	Section
Endpoint GUID, OpCodes, and Security	Section 2.2

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 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 1.4.2: Windows Server 2008 R2 supports the WDS Multicast Session Initiation Protocol using UDP.

<2> Section 2.2: Windows Server 2008 R2, Windows Server 2012, and Windows Server 2012 R2 listen for incoming requests on the UDP port.

<3> Section 2.2.1: Windows 7, Windows 8, and Windows 8.1 send the **Cap** variable.

<4> Section 2.2.1: Windows Server 2008 R2, Windows Server 2012, and Windows Server 2012 R2 send the **SecMode** variable.

<5> Section 2.2.1: Windows Server 2008 R2, Windows Server 2012, and Windows Server 2012 R2 send the **UserSid** variable in the reply packet.

<6> Section 2.2.2.1: Windows clients do not send this Option.

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

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