

[MS-HVRS]:

Hyper-V Remote Storage Profile

Intellectual Property Rights Notice for Open Specifications Documentation

- **Technical Documentation.** Microsoft publishes Open Specifications documentation (“this documentation”) for protocols, file formats, data portability, computer languages, and standards support. Additionally, overview documents cover inter-protocol relationships and interactions.
- **Copyrights.** This documentation is covered by Microsoft copyrights. Regardless of any other terms that are contained in the terms of use for the Microsoft website that hosts this documentation, you can make copies of it in order to develop implementations of the technologies that are described in this documentation and can distribute portions of it in your implementations that use these technologies or in your documentation as necessary to properly document the implementation. You can also distribute in your implementation, with or without modification, any schemas, IDLs, or code samples that are included in the documentation. This permission also applies to any documents that are referenced in the Open Specifications documentation.
- **No Trade Secrets.** Microsoft does not claim any trade secret rights in this documentation.
- **Patents.** Microsoft has patents that might cover your implementations of the technologies described in the Open Specifications documentation. Neither this notice nor Microsoft's delivery of this documentation grants any licenses under those patents or any other Microsoft patents. However, a given Open Specifications document might be covered by the Microsoft [Open Specifications Promise](#) or the [Microsoft Community Promise](#). If you would prefer a written license, or if the technologies described in this documentation are not covered by the Open Specifications Promise or Community Promise, as applicable, patent licenses are available by contacting iplg@microsoft.com.
- **License Programs.** To see all of the protocols in scope under a specific license program and the associated patents, visit the [Patent Map](#).
- **Trademarks.** The names of companies and products contained in this documentation might be covered by trademarks or similar intellectual property rights. This notice does not grant any licenses under those rights. For a list of Microsoft trademarks, visit www.microsoft.com/trademarks.
- **Fictitious Names.** The example companies, organizations, products, domain names, email addresses, logos, people, places, and events that are depicted in this documentation are fictitious. No association with any real company, organization, product, domain name, email address, logo, person, place, or event is intended or should be inferred.

Reservation of Rights. All other rights are reserved, and this notice does not grant any rights other than as specifically described above, whether by implication, estoppel, or otherwise.

Tools. The Open Specifications documentation does not require the use of Microsoft programming tools or programming environments in order for you to develop an implementation. If you have access to Microsoft programming tools and environments, you are free to take advantage of them. Certain Open Specifications documents are intended for use in conjunction with publicly available standards specifications and network programming art and, as such, assume that the reader either is familiar with the aforementioned material or has immediate access to it.

Support. For questions and support, please contact dochelp@microsoft.com.

Revision Summary

Date	Revision History	Revision Class	Comments
7/14/2016	1.0	New	Released new document.
3/16/2017	2.0	Major	Significantly changed the technical content.
6/1/2017	2.0	None	No changes to the meaning, language, or formatting of the technical content.
9/15/2017	3.0	Major	Significantly changed the technical content.
12/1/2017	3.0	None	No changes to the meaning, language, or formatting of the technical content.
9/12/2018	4.0	Major	Significantly changed the technical content.
4/7/2021	5.0	Major	Significantly changed the technical content.
6/25/2021	6.0	Major	Significantly changed the technical content.

Table of Contents

1	Introduction	4
1.1	Glossary	4
1.2	References	4
1.2.1	Normative References	4
1.2.2	Informative References	4
1.3	Microsoft Implementations	4
1.4	Standards Support Requirements	5
1.5	Notation.....	5
2	Standards Support Statements.....	6
2.1	Normative Variations	6
2.2	Clarifications	6
2.2.1	[MS-SMB2] Server Message Block (SMB) Protocols Version 2 and 3	6
2.2.2	[MS-FSA] File System Algorithms	6
2.2.3	[MS-RSVD] Remote Shared Virtual Disk Protocol	7
2.2.4	[MS-SQOS] Storage Quality of Service Protocol	8
2.2.5	[MS-FSRVP] File Server Remote VSS Protocol	8
2.3	Error Handling	8
2.4	Security	8
3	Change Tracking.....	9
4	Index.....	10

1 Introduction

Microsoft Hyper-V supports virtual machines whose associated files are hosted on Server Message Block (SMB) Version 3 shares. These files can include virtual machine configuration files, virtual machine saved-state files, and virtual hard-disk files. The Hyper-V Remote Storage Profile clarifies the level of support that Hyper-V requires from SMB Version 3 servers that host these types of files.

1.1 Glossary

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

1.2 References

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

1.2.1 Normative References

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

[MS-FSA] Microsoft Corporation, "[File System Algorithms](#)".

[MS-FSCC] Microsoft Corporation, "[File System Control Codes](#)".

[MS-FSRVP] Microsoft Corporation, "[File Server Remote VSS Protocol](#)".

[MS-RSVD] Microsoft Corporation, "[Remote Shared Virtual Disk Protocol](#)".

[MS-SMB2] Microsoft Corporation, "[Server Message Block \(SMB\) Protocol Versions 2 and 3](#)".

[MS-SQOS] Microsoft Corporation, "[Storage Quality of Service Protocol](#)".

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

1.2.2 Informative References

None.

1.3 Microsoft Implementations

- Windows 8 operating system
- Windows Server 2012 operating system
- Windows 8.1 operating system
- Windows Server 2012 R2 operating system
- Windows 10 operating system
- Windows Server 2016 operating system

- Windows Server operating system
- Windows Server 2019 operating system
- Windows Server 2022 operating system
- Windows 11 operating system

1.4 Standards Support Requirements

The conformance requirements for [\[MS-SMB2\]](#), [\[MS-FSA\]](#), [\[MS-RSVD\]](#), [\[MS-SQOS\]](#), and [\[MS-FSRVP\]](#) are that all required portions of the specifications are implemented according to the specification, and any optional portions that are included are implemented according to the specification.

1.5 Notation

The following notations are used to identify clarifications in section [2.2](#):

Notation	Explanation
C####	This notation identifies a clarification of ambiguity in the target specification. This includes imprecise statements, omitted information, discrepancies, and errata. This does not include data formatting clarifications.

2 Standards Support Statements

2.1 Normative Variations

None.

2.2 Clarifications

The following subsections identify clarifications relative to [\[MS-SMB2\]](#), [\[MS-FSA\]](#), [\[MS-RSVD\]](#), [\[MS-SQOS\]](#) and [\[MS-FSRVPI\]](#).

2.2.1 [MS-SMB2] Server Message Block (SMB) Protocols Version 2 and 3

C0001:

Windows 8.1 operating system, Windows Server 2012 R2 operating system, Windows 10 operating system, Windows Server 2016 operating system, Windows Server operating system, Windows Server 2019 operating system, Windows Server 2022 operating system, and Windows 11 operating system

The server MUST support the SMB 3.0 or higher dialect, as described in [\[MS-SMB2\]](#) section 1.7.

C0002:

Windows 8.1, Windows Server 2012 R2, Windows 10, Windows Server 2016, Windows Server operating system, Windows Server 2019, Windows Server 2022, and Windows 11

The server MUST support persistent handles.

C0003:

Windows 8 operating system, Windows Server 2012 operating system, Windows 8.1, Windows Server 2012 R2, Windows 10, Windows Server 2016, Windows Server operating system, Windows Server 2019, Windows Server 2022, and Windows 11

The server MUST support the FSCTL_LMR_REQUEST_RESILIENCY command.

2.2.2 [MS-FSA] File System Algorithms

C0004:

Windows 8, Windows Server 2012, Windows 8.1, Windows Server 2012 R2, Windows 10, Windows Server 2016, Windows Server operating system, Windows Server 2019, Windows Server 2022, and Windows 11

If the server doesn't support the FSCTL_OFFLOAD_READ and FSCTL_OFFLOAD_WRITE commands, as specified in [\[MS-FSA\]](#) sections 2.1.5.9.20 and 2.1.5.9.21, then any small computer system interface (SCSI) ODX commands initiated by the virtual machine operating system fail.

If the server supports the FSCTL_OFFLOAD_READ and FSCTL_OFFLOAD_WRITE commands, then Hyper-V can issue these commands to optimize the performance of virtual disk creation, merge, compaction, and mirroring operations.

C0005:

Windows 8, Windows Server 2012, Windows 8.1, Windows Server 2012 R2, Windows 10, Windows Server 2016, Windows Server operating system, Windows Server 2019, Windows Server 2022, and Windows 11

If the server supports the FSCTL_SET_ZERO_DATA command, as specified in [MS-FSA] section 2.1.5.9.39, then Hyper-V can issue this command to optimize the performance of virtual-disk-creation operations.

C0006:

Windows 8, Windows Server 2012, Windows 8.1, Windows Server 2012 R2, Windows 10, Windows Server 2016, Windows Server operating system, Windows Server 2019, Windows Server 2022, and Windows 11

If the server doesn't support the FSCTL_FILE_LEVEL_TRIM command, as specified in [MS-FSA] section 2.1.5.9.6:

- Support for the SCSI UNMAP command is still advertised to the virtual machine operating system in the response to SCSI INQUIRY commands.
- SCSI UNMAP requests initiated by the virtual machine operating system are still completed successfully to the virtual machine operating system, but they have no side effects (they are not translated into corresponding file system requests to release space allocated to the files backing the virtual disks attached to the virtual machine).

C0007:

Windows 10, Windows Server 2016, Windows Server operating system, Windows Server 2019, and Windows Server 2022

If the server advertises the FILE_SUPPORTS_BLOCK_REFCOUNTING flag for a given Open (as defined in FILE_FS_ATTRIBUTE_INFORMATION), the server MUST support the FSCTL_DUPLICATE_EXTENTS_TO_FILE command, as specified in [MS-FSA] section 2.1.5.9.4.

C0008:

Windows 8, Windows Server 2012, Windows 8.1, Windows Server 2012 R2, Windows 10, Windows Server 2016, Windows Server operating system, Windows Server 2019, Windows Server 2022, and Windows 11

Hyper-V doesn't support virtual disk files with any of the following flags set, as specified in [\[MS-FSCC\]](#) section 2.6:

- FILE_ATTRIBUTE_COMPRESSED
- FILE_ATTRIBUTE_ENCRYPTED
- FILE_ATTRIBUTE_SPARSE_FILE

C0009:

Windows 10 v1703 operating system, Windows Server operating system, Windows Server 2019, and Windows Server 2022

If the server advertises the FILE_SUPPORTS_SPARSE_VDL flag for a given Open (as specified in [MS-FSCC] section 2.5.1), Hyper-V will support virtual disk files with the FILE_ATTRIBUTE_SPARSE_FILE flag set, as specified in [MS-FSCC] section 2.6.

2.2.3 [MS-RSVD] Remote Shared Virtual Disk Protocol

C0010:

Windows 8.1, Windows Server 2012 R2, Windows 10, Windows Server 2016, Windows Server operating system, Windows Server 2019, Windows Server 2022, and Windows 11

If the server doesn't support the Remote Shared Virtual Disk Protocol [\[MS-RSVD\]](#):

- The operation of configuring a Hyper-V virtual machine to be attached to a remote shared virtual disk fails.
- The operation of starting a Hyper-V virtual machine configured to be attached to a remote shared virtual disk fails.

If the server doesn't support version 2 of the Remote Shared Virtual Disk Protocol [\[MS-RSVD\]](#):

- The backup operation of a remote shared virtual disk, including checkpoints and resilient change tracking, fails.
- The replica operation of a remote shared virtual disk fails.
- Resizing a remote shared virtual disk fails.

2.2.4 [\[MS-SQOS\]](#) Storage Quality of Service Protocol

C0011:

Windows 10 Windows Server 2016, Windows Server operating system, Windows Server 2019, and Windows Server 2022

If the server doesn't support the Storage Quality of Service Protocol [\[MS-SQOS\]](#), then any storage Quality of Service policies associated with the virtual disks of a Hyper-V virtual machine are ignored and never enforced. However, this doesn't prevent the virtual machine from successfully starting.

2.2.5 [\[MS-FSRVP\]](#) File Server Remote VSS Protocol

C0012:

Windows 8, Windows Server 2012, Windows 8.1, Windows Server 2012 R2, Windows 10, Windows Server 2016, Windows Server operating system, Windows Server 2019, Windows Server 2022, and Windows 11

If the server doesn't support the File Server Remote VSS Protocol [\[MS-FSRVP\]](#):

- The operation of a Hyper-V host-initiated backup of a virtual machine attached to a remote shared virtual disk fails.

2.3 Error Handling

None.

2.4 Security

None.

3 Change Tracking

This section identifies changes that were made to this document since the last release. Changes are classified as Major, Minor, or None.

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.
- A document revision that captures changes to protocol functionality.

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 **None** means that no new technical changes were introduced. Minor editorial and formatting changes may have been made, but the relevant technical content is identical to the last released version.

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

Section	Description	Revision class
1.3 Microsoft Implementations	Updated for this version of Windows Client.	Major
2.2.1 [MS-SMB2] Server Message Block (SMB) Protocols Version 2 and 3	Updated for this version of Windows Client.	Major
2.2.2 [MS-FSA] File System Algorithms	Updated for this version of Windows Client.	Major
2.2.3 [MS-RSVD] Remote Shared Virtual Disk Protocol	Updated for this version of Windows Client.	Major
2.2.5 [MS-FSRVP] File Server Remote VSS Protocol	Updated for this version of Windows Client.	Major

4 Index

C

[Change tracking](#) 9

G

[Glossary](#) 4

I

[Informative references](#) 4

[Introduction](#) 4

N

[Normative references](#) 4

R

References

[informative](#) 4

[normative](#) 4

T

[Tracking changes](#) 9