INTERNATIONAL STANDARD

ISO/IEC 24775-7

Second edition
2021-03

Information technology — Storage management —

Part 7: Host elements



Reference number
ISO/IEC 24775-7:2021(E)

© ISO/IEC 2021



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see http://patents.iec.ch).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by SNIA (as Storage Management Technical Specification, Part 7 Host Elements, Version 1.8.0, Revision 5) and drafted in accordance with its editorial rules. It was adopted, under the JTC 1 PAS procedure, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*.

This second edition cancels and replaces the first edition (ISO/IEC 24775-7:2014), which has been technically revised.

The main changes compared to the previous edition are as follows:

— USAGE text was revised to address code (now included in the front matter for all SNIA specifications)

— All recipes and their references were deleted.

— Instances of subprofile were changed to profile. In the annex, instances of subprofile were changed to component profile (TSG meeting voice vote).

— Profile versions and related text were updated. (TSG meeting voice vote).

— Indications have been replaced by DMTF Indications, and all affected clauses updated. (TSG meeting voice vote).

— Instances of Experimental within profiles already labeled as Experimental were removed to avoid confusion and redundancy. (Editorial change)

— CIM/XML was changed to CIM-XML (Response to ballot comments).

© ISO/IEC 2021 – All rights reserved

— Annex: SMI-S Information Model.

— The CIM schema version was changed to 2.51 for V1.8.0 Rev3.

— Disk Partition Profile

  — Added descriptions of the references in CIM_BasedOn (Partition to Extent), CIM_BasedOn (Partition to Partition), CIM_LogicalDiskBasedOnPartition (LogicalDisk to Partition) and CIM_SystemDevice (System to LogicalDisk).
  — Made CIM_LogicalDiskBasedOnPartition (LogicalDisk to Partition) and CIM_SystemDevice (System to LogicalDisk) Conditional (rather than Optional), since CIM_LogicalDisk is Optional. Storage HBA Profile (SMI TWG Reviews).
  — Fixed the version numbers on the Related Profiles to match what the profiles claim.
  — Added Descriptions to the references in CIM_ProductElementComponent, CIM_Realizes and CIM_SystemDevice.

— FC HBA Profile

  — Removed the profile content and added text re it being Deprecated. (CORE-SMIS-SCR-000).

— Host Discovered Resources Profile

  — Promoted the maturity level from DRAFT to EXPERIMENTAL for update to remove SNIA_ classes and use DMTF CIM_ classes.
  — Added the related profiles table to the spec.
  — Moved NameFormat from LogicalDevice to LogicalDisk to match the mof.
  — Moved NameNamespace from LogicalDevice to LogicalDisk to match the mof.
  — Added descriptions on the References for CIM_HostedAccessPoint and CIM_SystemDevice.
  — Marked the SB Multipath Management Related Profile as Deprecated (SMIS-180-Errata-SCR00002).

— Host Hardware RAID Controller Profile

  — Fixed the version numbers on the Related Profiles to match what the profiles claim.
  — Added two ElementSoftwareIdentity associations to cover the 3 SoftwareIdentity classes (one Mandatory and one Optional).
  — Added descriptions on the References for CIM_AssociatedAlarm, CIM_ProductPhysicalComponent, CIM_ProtocolControllerForUnit (Extent or MediaAccessDevice), CIM_Realizes (Associates PhysicalPackage to PortController) and CIM_SAPAvailableForElement.
  — Fixed the description of Dependent in CIM_ControlledBy.
  — Added Key properties to the CIM_SoftwareIdentity CIM Element tables.
  — Changed the version of the profile to 1.7.0.

— iSCSI Initiator

  — Removed all occurrences of “(Host Hardware RAID Controller)” (CORE-SMIS-SCR-000).
  — Removed MATURITY="Draft" from the Launch In Context supported profile.
  — Added Descriptions for References in 2 CIM_BindsTo associations, CIM_ControlledBy, 2 CIM_DeviceSAPImplementations and CIM_ElementSoftwareIdentity.
  — Added Descriptions for References in 2 CIM_EndpointOfNetworkPipes, CIM_NetworkPipeComposition, CIM_ProductPhysicalComponent and CIM_Realizes.

 © ISO/IEC 2021 – All rights reserved

— Added Descriptions for references in CIM_SAPAvailableForElement.
— Added Keys to CIM_PhysicalPackage.
— Changed the Central Class from PortController to CIM_ComputerSystem (TSG-SMIS-SCR00333).

— Memory Configuration Profile

— Updated due to class and property name changes in DMTF Multi-type Memory profile (SMIS-170-Draft-SCR00006).
— Introduced staged request concept.
— Added use cases.
— Addressed comments from internal and partner reviews.
— Changed diagrams approved in Core TWG 3/23/15.
— Changed SystemCreateClassName in class CIM_MemoryConfigurationService to SystemCreationClassName.
— Changed RemainingCapacity in class CIM_ResourcePool to CurrentlyConsumedResource.
— Changed ChangeableType in class CIM_MemoryAllocationSettingData to ResourceType.
— Fixed the description of Replication in class CIM_MemoryAllocationSettingData.
— Added a description for ChannelCount in class CIM_MemoryAllocationSettingData.

— Persistent Memory Configuration Profile

— Added new material (most of profile content) to manage NVDIMMs (SMIS-170-Draft-SCR00006).
— Changed diagrams approved in Core TWG 3/23/15- Changed RemainingCapacity in class CIM_ResourcePool to Reserved.
— Changed SecurityFeatues in class CIM_PersistentMemoryCapabilities to SecurityFeatures.
— Removed ChannelCount in class CIM_PersistentMemoryNamespaceSettingData, since it is not in the mof and not referenced anywhere in the profile text.
— Added three methods to CIM_PersistentMemoryService to support the profile text.
— Fixed the ManagedElement reference in CIM_ElementConformsToProfile.
— Fixed the references in CIM_SystemDevice.
— Fixed the references in CIM_BasedOn.

— SB Multipath Management Profile

— Promoted the maturity level from DRAFT to EXPERIMENTAL for update to remove SNIA_ classes and use DMTF CIM_ classes (TSG-SMIS-SCR00315.001).
— Added reference to SMI-S Version 1.6.1 Revision 5. No content in this deprecated profile SB Multipath.

— SCSI Multipath Management Profile

— Added keys to CIM_SCSIMultipathConfigurationCapabilities and CIM_SCSIMultipathSettings (SMIS-170-Draft-SCR00006).

— Annex A (informative) SMI-S Information Model

— DMTF's CIM schema version changed to 2.45.0.

— References

© ISO/IEC 2021 – All rights reserved

— Added DMTF DSP1054 v1.2.2, Indications Profile (and changed version to 1.2.2 throughout book).
— Updated DSP 1071, Multi-type System Memory Profile reference here and in profiles.
— Added reference to DSP 1119, 1.0.0b Diagnostics Job Control Profile.
— Removed reference to DSP 1119\.
— Removed 2.3.

A list of all parts in the ISO/IEC 24775 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

© ISO/IEC 2021 – All rights reserved

INTENDED AUDIENCE

This document is intended for use by individuals and companies engaged in developing, deploying, and promoting interoperable multi-vendor SANs through the Storage Networking Industry Association (SNIA) organization.

CHANGES TO THE SPECIFICATION

Each publication of this specification is uniquely identified by a three-level identifier, comprised of a version number, a release number and an update number. The current identifier for this specification is version 1.8.0. Future publications of this specification are subject to specific constraints on the scope of change that is permissible from one publication to the next and the degree of interoperability and backward compatibility that should be assumed between products designed to different publications of this standard. The SNIA has defined three levels of change to a specification:

- Major Revision: A major revision of the specification represents a substantial change to the underlying scope or architecture of the SMI-S API. A major revision results in an increase in the version number of the version identifier (e.g., from version 1.x.x to version 2.x.x). There is no assurance of interoperability or backward compatibility between releases with different version numbers.

- Minor Revision: A minor revision of the specification represents a technical change to existing content or an adjustment to the scope of the SMI-S API. A minor revision results in an increase in the release number of the specification's identifier (e.g., from x.1.x to x.2.x). Minor revisions with the same version number preserve interoperability and backward compatibility.

- Update: An update to the specification is limited to minor corrections or clarifications of existing specification content. An update will result in an increase in the third component of the release identifier (e.g., from x.x.1 to x.x.2). Updates with the same version and minor release levels preserve interoperability and backward compatibility.

TYPOGRAPHICAL CONVENTIONS

Maturity Level

In addition to informative and normative content, this specification includes guidance about the maturity of emerging material that has completed a rigorous design review but has limited implementation in commercial products. This material is clearly delineated as described in the following sections. The typographical convention is intended to provide a sense of the maturity of the affected material, without altering its normative content. By recognizing the relative maturity of different sections of the standard, an implementer should be able to make more informed decisions about the adoption and deployment of different portions of the standard in a commercial product.

This specification has been structured to convey both the formal requirements and assumptions of the SMI-S API and its emerging implementation and deployment lifecycle. Over time, the intent is that all content in the specification will represent a mature and stable design, be verified by extensive implementation experience, assure consistent support for backward compatibility, and rely solely on content material that has reached a similar level of maturity. Unless explicitly labeled with one of the subordinate maturity levels defined for this specification, content is assumed to satisfy these requirements and is referred to as "Finalized". Since much of the evolving specification

content in any given release will not have matured to that level, this specification defines three subordinate levels of implementation maturity that identify important aspects of the content's increasing maturity and stability. Each subordinate maturity level is defined by its level of implementation experience, its stability and its reliance on other emerging standards. Each subordinate maturity level is identified by a unique typographical tagging convention that clearly distinguishes content at one maturity model from content at another level.

© ISO/IEC 2021 – All rights reserved

Experimental Maturity Level

No material is included in this document unless its initial architecture has been completed and reviewed. Some content included in this document has complete and reviewed design, but lacks implementation experience and the maturity gained through implementation experience. This content is included in order to gain wider review and to gain implementation experience. This material is referred to as “Experimental”. It is presented here as an aid to implementers who are interested in likely future developments within the SMI specification. The contents of an Experimental profile may change as implementation experience is gained. There is a high likelihood that the changed content will be included in an upcoming revision of the specification. Experimental material can advance to a higher maturity level as soon as implementations are available. Figure 1 is a sample of the typographical convention for Experimental content.

EXPERIMENTAL

Experimental content appears here.

EXPERIMENTAL

Figure 1 - Experimental Maturity Level Tag

Implemented Maturity Level

Profiles for which initial implementations have been completed are classified as “Implemented”. This indicates that at least two different vendors have implemented the profile, including at least one provider implementation. At this maturity level, the underlying architecture and modeling are stable, and changes in future revisions will be limited to the correction of deficiencies identified through additional implementation experience. Should the material become obsolete in the future, it must be deprecated in a minor revision of the specification prior to its removal from subsequent releases. Figure 2 is a sample of the typographical convention for Implemented content.

IMPLEMENTED

Implemented content appears here.

IMPLEMENTED

Figure 2 - Implemented Maturity Level Tag

Stable Maturity Level

Once content at the Implemented maturity level has garnered additional implementation experience, it can be tagged at the Stable maturity level. Material at this maturity level has been implemented by three different vendors, including both a provider and a client. Should material that has reached this maturity level become obsolete, it may only be deprecated as part of a minor revision to the specification. Material at this maturity level that has been deprecated may only be removed from the specification as part of a major revision. A profile that has reached this maturity level is guaranteed to preserve backward compatibility from one minor specification revision to the next. As a result, Profiles at or above the Stable

© ISO/IEC 2021 – All rights reserved

maturity level shall not rely on any content that is Experimental. Figure 3 is a sample of the typographical convention for Implemented content.

STABLE

Stable content appears here.

STABLE

Figure 3 - Stable Maturity Level Tag

Finalized Maturity Level

Content that has reached the highest maturity level is referred to as “Finalized.” In addition to satisfying the requirements for the Stable maturity level, content at the Finalized maturity level must solely depend upon or refine material that has also reached the Finalized level. If specification content depends upon material that is not under the control of the SNIA, and therefore not subject to its maturity level definitions, then the external content is evaluated by the SNIA to assure that it has achieved a comparable level of completion, stability, and implementation experience. Should material that has reached this maturity level become obsolete, it may only be deprecated as part of a major revision to the specification. A profile that has reached this maturity level is guaranteed to preserve backward compatibility from one minor specification revision to the next. Over time, it is hoped that all specification content will attain this maturity level. Accordingly, there is no special typographical convention, as there is with the other, subordinate maturity levels. Unless content in the specification is marked with one of the typographical conventions defined for the subordinate maturity levels, it should be assumed to have reached the Finalized maturity level.

Deprecated Material

Non-Experimental material can be deprecated in a subsequent revision of the specification. Sections identified as “Deprecated” contain material that is obsolete and not recommended for use in new development efforts. Existing and new implementations may still use this material, but shall move to the newer approach as soon as possible. The maturity level of the material being deprecated determines how long it will continue to appear in the specification. Implemented content shall be retained at least until the next revision of the specialization, while Stable and Finalized material shall be retained until the next major revision of the specification. Providers shall implement the deprecated elements as long as it appears in the specification in order to achieve backward compatibility. Clients may rely on deprecated elements, but are encouraged to use non-deprecated alternatives when possible.

Deprecated sections are documented with a reference to the last published version to include the deprecated section as normative material and to the section in the current specification with the replacement. Figure 4 contains a sample of the typographical convention for deprecated content.

DEPRECATED

Content that has been deprecated appears here.

DEPRECATED

Figure 4 - Deprecated Tag

© ISO/IEC 2021 – All rights reserved

Contents

List of Figures 15
List of Tables 17
Foreword 23
1 Scope 25
2 Normative References 27
2.1 Overview 27
2.2 Approved references 27
2.3 References under development 27
3 Terms, Definitions, Symbols, Abbreviations, and Conventions 29
3.1 General 29
3.2 Terms and Definitions 29
4 Disk Partition Profile 31
4.1 Description 31
4.2 Health and Fault Management Considerations 37
4.3 Supported Profiles and Packages 38
4.4 Methods of the Profile 38
4.5 Client Considerations and Recipes 39
4.6 CIM Elements 39
5 FC HBA Profile 49
6 Storage HBA Profile 51
6.1 Synopsis 51
6.2 Description 51
6.3 Implementation 51
6.4 Methods of the Profile 57
6.5 Use Cases 58
6.6 CIM Elements 58
7 Host Discovered Resources Profile 63
7.1 Description 63
7.2 Health and Fault Management Considerations 68
7.3 Cascading Considerations 68
7.4 Extrinsic Methods of the Profile 68
7.5 Use Cases 69
7.6 CIM Elements 69
8 Host Hardware RAID Controller Profile 79
8.1 Synopsis 79
8.2 Description 80
8.3 Implementation 80
8.4 Methods 94
8.5 Use Cases 94
8.6 CIM Elements 94
9 iSCSI Initiator Profile 109
9.1 Description 109
9.2 Health and Fault Management Considerations 112
9.3 Methods of the Profile 112
9.4 Use Cases 112
9.5 CIM Elements 113

© ISO/IEC 2021 – All rights reserved

10 SCSI Multipath Management Profile 125
10.1 Description 125
10.2 Health and Fault Management Considerations 128
10.3 Methods of the Profile 128
10.4 Use Cases 129
10.5 CIM Elements 129
11 SB Multipath Management Profile 137
12 Memory Configuration Profile 139
12.1 Synopsis 139
12.2 Description 139
12.3 Implementation 141
12.4 Methods 143
12.5 Use Cases 148
12.6 CIM Elements 153
13 Persistent Memory Configuration Profile 161
13.1 Synopsis 161
13.2 Overview 161
13.3 Implementation 163
13.4 Methods 164
13.5 Use Cases 171
13.6 CIM Elements 175
Annex A (informative) SMI-S Information Model 183
Annex B (Informative) Host Profile Deployment Guidelines 185

© ISO/IEC 2021 – All rights reserved

LIST OF FIGURES

Figure 1 - Experimental Maturity Level Tag 10
Figure 2 - Implemented Maturity Level Tag 10
Figure 3 - Stable Maturity Level Tag 11
Figure 4 - Deprecated Tag 11
Figure 5 - Disk Partition Class Hierarchy 32
Figure 6 - Disk Partition Class Diagram 33
Figure 7 - Disk MBR Partition Example 34
Figure 8 - MBR Partition Instance Diagram 35
Figure 9 - MBR and VTOC Partition Instance Diagram 36
Figure 10 - Partition Instance Diagram for Size/Address Rules 37
Figure 11 - Model Overview 52
Figure 12 - Profile Registration Profile 53
Figure 13 - Software Inventory Profile in Storage HBA 55
Figure 14 - HBA Card with Physical Classes 56
Figure 15 - Host Discovered Resources Block Diagram 64
Figure 16 - Host Discovered Resources Class Diagram 66
Figure 17 - Single SPI Disk Model 66
Figure 18 - Three FCP Logical Unit Instance Diagram 67
Figure 19 - ATA Discovered Resource Model 67
Figure 20 - SB Host Discovered Resources 68
Figure 21 - Host Hardware RAID Controller Package Diagram 80
Figure 22 - Host Hardware RAID resources scoped to HHRC ComputerSystem 81
Figure 23 - Alarms in Host Hardware RAID Controller 82
Figure 24 - Profile Registration with Host Hardware RAID Controller and Base Server Profiles 83
Figure 25 - Implementation of Physical Asset Profile 84
Figure 26 - Block Services Package in Host Hardware RAID Controller 85
Figure 27 - DAPort Profile in Host Hardware Controller 87
Figure 28 - Software Inventory Profile in Host Hardware RAID Controller 87
Figure 29 - Initiator Port profiles and Disk Drive Lite Profile 88
Figure 30 - Model for Imported Disks 89
Figure 31 - Imported Virtual Volumes 90
Figure 32 - Device “Pass Through” Example 91
Figure 33 - Example of Mutli-Function Controllers 93
Figure 34 - iSCSI Product and Package Model 110
Figure 35 - iSCSI Sessions and Connections Model 111
Figure 36 - iSCSI Initiator Node 112
Figure 37 - Multipath Management Class Diagram 126
Figure 38 - Four Path Instance Diagram 127
Figure 39 - Memory Configuration Class Diagram 140
Figure 40 - Use Case - Profile Registration 148
Figure 41 - Use Case - Memory Configuration Capabilities 149
Figure 42 - Use Case - Memory Capability Discovery 149
Figure 43 - Use Case - Allocation 150
Figure 44 - Use Case - Allocation Complete 151

© ISO/IEC 2021 – All rights reserved

Figure 45 - Use Case - Before Deallocation 152
Figure 46 - Use Case - After Deallocation 152
Figure 47 - Persistent Memory Configuration: Class Diagram 162
Figure 48 - Use Case: Profile Registration 172
Figure 49 - Use Case - Detect Capabilities 173
Figure 50 - Use Case - Create Namespace 174
Figure B.1 Profile Registration and FC HBA Profiles 186
Figure B.2 Profile Registration and Storage HBA Profiles 187
Figure B.3 Profile Registration and Host Hardware RAID Controller Profiles 188
Figure B.4 Deploying FC HBA with Storage HBA (SAS) Profiles 189

© ISO/IEC 2021 – All rights reserved

LIST OF TABLES

Table 1 - Capabilities Properties....36
Table 2 - CIM Elements for Disk Partition....39
Table 3 - SMI Referenced Properties/Methods for CIM_BasedOn (Partition to Extent)....40
Table 4 - SMI Referenced Properties/Methods for CIM_BasedOn (Partition to Partition)....41
Table 5 - SMI Referenced Properties/Methods for CIM_DiskPartition....41
Table 6 - SMI Referenced Properties/Methods for CIM_DiskPartitionConfigurationCapabilities....42
Table 7 - SMI Referenced Properties/Methods for CIM_DiskPartitionConfigurationService....42
Table 8 - SMI Referenced Properties/Methods for CIM_ElementCapabilities....43
Table 9 - SMI Referenced Properties/Methods for CIM_ElementConformsToProfile (DiskPartitionConfigurationService to Disk Partition RegisteredProfile)43
Table 10 - SMI Referenced Properties/Methods for CIM_GPTDiskPartition....43
Table 11 - SMI Referenced Properties/Methods for CIM_GenericDiskPartition....44
Table 12 - SMI Referenced Properties/Methods for CIM_HostedService....44
Table 13 - SMI Referenced Properties/Methods for CIM_InstalledPartitionTable (Capabilities to Extent)....45
Table 14 - SMI Referenced Properties/Methods for CIM_InstalledPartitionTable (Capabilities to Partition)....45
Table 15 - SMI Referenced Properties/Methods for CIM_LogicalDisk....45
Table 16 - SMI Referenced Properties/Methods for CIM_LogicalDiskBasedOnPartition (LogicalDisk to Partition)46
Table 17 - SMI Referenced Properties/Methods for CIM_StorageExtent....46
Table 18 - SMI Referenced Properties/Methods for CIM_SystemDevice (System to Extent)....47
Table 19 - SMI Referenced Properties/Methods for CIM_SystemDevice (System to LogicalDisk)....47
Table 20 - SMI Referenced Properties/Methods for CIM_SystemDevice (System to Partition)....47
Table 21 - SMI Referenced Properties/Methods for CIM_VTOCDiskPartition....48
Table 22 - Related Profiles for Storage HBA....51
Table 23 - CIM_PortController....57
Table 24 - CIM_SystemDevice....58
Table 25 - CIM Elements for Storage HBA....58
Table 26 - SMI Referenced Properties/Methods for CIM_ControlledBy....59
Table 27 - SMI Referenced Properties/Methods for CIM_PortController....59
Table 28 - SMI Referenced Properties/Methods for CIM_Product....60
Table 29 - SMI Referenced Properties/Methods for CIM_ProductElementComponent....60
Table 30 - SMI Referenced Properties/Methods for CIM_Realizes....60
Table 31 - SMI Referenced Properties/Methods for CIM_SystemDevice....61
Table 32 - Related Profiles for HostDiscoveredResources....63
Table 33 - CIM Elements for Host Discovered Resources....69
Table 34 - SMI Referenced Properties/Methods for CIM_ATAInitiatorTargetLogicalUnitPath....70
Table 35 - SMI Referenced Properties/Methods for CIM_ATAProtocolEndpoint....71
Table 36 - SMI Referenced Properties/Methods for CIM_ElementConformsToProfile (LogicalDevice to Host Discovered Resources RegisteredProfile)71
Table 37 - SMI Referenced Properties/Methods for CIM_HostedAccessPoint....72
Table 38 - SMI Referenced Properties/Methods for CIM_LogicalDevice (LogicalDevice)....72
Table 39 - SMI Referenced Properties/Methods for CIM_LogicalDisk (LogicalDevice)....72
Table 40 - SMI Referenced Properties/Methods for CIM_SCSIArbitraryLogicalUnit (LogicalDevice)....73
Table 41 - SMI Referenced Properties/Methods for CIM_SCSIInitiatorTargetLogicalUnitPath....74
Table 42 - SMI Referenced Properties/Methods for CIM_SCSIProtocolEndpoint....74
Table 43 - SMI Referenced Properties/Methods for CIM_StorageExtent (LogicalDevice)....75
Table 44 - SMI Referenced Properties/Methods for CIM_SystemDevice....75

© ISO/IEC 2021 – All rights reserved

Table 45 - SMI Referenced Properties/Methods for CIM_TapeDrive (LogicalDevice) 75
Table 46 - SMI Referenced Properties/Methods for CIM_SBInitiatorTargetLogicalUnitPath 76
Table 47 - SMI Referenced Properties/Methods for CIM_SBProtocolEndpoint 77
Table 48 - Related Profiles for Host Hardware RAID Controller 79
Table 49 - CIM Elements for Host Hardware RAID Controller 94
Table 50 - SMI Referenced Properties/Methods for CIM_AlarmDevice 96
Table 51 - SMI Referenced Properties/Methods for CIM_AssociatedAlarm 96
Table 52 - SMI Referenced Properties/Methods for CIM_ComputerSystem (Host Hardware RAID Controller)97
Table 53 - SMI Referenced Properties/Methods for CIM_ComputerSystemPackage (Associates PhysicalPackage to ComputerSystem)97
Table 54 - SMI Referenced Properties/Methods for CIM_ControlledBy 98
Table 55 - SMI Referenced Properties/Methods for CIM_ElementCapabilities (ImplementationCapabilities to System)98
Table 56 - SMI Referenced Properties/Methods for CIM_ImplementationCapabilities (ImplementationCapabilities)99
Table 57 - SMI Referenced Properties/Methods for CIM_LogicalIdentity 99
Table 58 - SMI Referenced Properties/Methods for CIM_MediaAccessDevice 100
Table 59 - SMI Referenced Properties/Methods for CIM_PortController 100
Table 60 - SMI Referenced Properties/Methods for CIM_Product 101
Table 61 - SMI Referenced Properties/Methods for CIM_ProductPhysicalComponent 101
Table 62 - SMI Referenced Properties/Methods for CIM_ProtocolControllerForUnit (Extent or MediaAccessDevice)101
Table 63 - SMI Referenced Properties/Methods for CIM_ProtocolControllerForUnit (Volume) 102
Table 64 - SMI Referenced Properties/Methods for CIM_Realizes (Associates PhysicalPackage to PortController)102
Table 65 - SMI Referenced Properties/Methods for CIM_SAPAvailableForElement 103
Table 66 - SMI Referenced Properties/Methods for CIM_SCSIProtocolController 103
Table 67 - SMI Referenced Properties/Methods for CIM_SoftwareIdentity (Driver) 103
Table 68 - SMI Referenced Properties/Methods for CIM_SoftwareIdentity (FCode/BIOS) 104
Table 69 - SMI Referenced Properties/Methods for CIM_SoftwareIdentity (Firmware) 104
Table 70 - SMI Referenced Properties/Methods for CIM_StorageExtent 104
Table 71 - SMI Referenced Properties/Methods for CIM_SystemComponent 105
Table 72 - SMI Referenced Properties/Methods for CIM_SystemDevice (Associates System to AlarmDevice)105
Table 73 - SMI Referenced Properties/Methods for CIM_SystemDevice (Associates controller system to PortController)106
Table 74 - SMI Referenced Properties/Methods for CIM_SystemDevice (System to SCSIProtocolController) .106
Table 75 - SMI Referenced Properties/Methods for CIM_ElementSoftwareIdentity (Driver) 107
Table 76 - SMI Referenced Properties/Methods for CIM_ElementSoftwareIdentity (Firmware or FCode/BIOS)107
Table 77 - Supported Profiles for iSCSI Initiator 109
Table 78 - iSCSI Terminology 109
Table 79 - OperationalStatus Values 112
Table 80 - CIM Elements for iSCSI Initiator 113
Table 81 - SMI Referenced Properties/Methods for CIM_BindsTo (TCPProtocolEndpoint to IPProtocolEndpoint)114
Table 82 - SMI Referenced Properties/Methods for CIM_BindsTo (iSCSIProtocolEndpoint to TCPProtocolEndpoint)114
Table 83 - SMI Referenced Properties/Methods for CIM_ComputerSystem 114
Table 84 - SMI Referenced Properties/Methods for CIM_ControlledBy 115

© ISO/IEC 2021 – All rights reserved

Table 85 - SMI Referenced Properties/Methods for CIM_DeviceSAPImplementation (EthernetPort to IPProtocolEndpoint)115
Table 86 - SMI Referenced Properties/Methods for CIM_DeviceSAPImplementation (EthernetPort to iSCSIProtocolEndpoint)116
Table 87 - SMI Referenced Properties/Methods for CIM_ElementSoftwareIdentity....116
Table 88 - SMI Referenced Properties/Methods for CIM_EndpointOfNetworkPipe (Between iSCSI Session and iSCSIProtocolENdpoint)116
Table 89 - SMI Referenced Properties/Methods for CIM_EndpointOfNetworkPipe (Between iSCSI connection and TCPProtocolEndpoint)117
Table 90 - SMI Referenced Properties/Methods for CIM_InstalledSoftwareIdentity 117
Table 91 - SMI Referenced Properties/Methods for CIM_NetworkPipeComposition 117
Table 92 - SMI Referenced Properties/Methods for CIM_PhysicalPackage 118
Table 93 - SMI Referenced Properties/Methods for CIM_PortController 118
Table 94 - SMI Referenced Properties/Methods for CIM_Product 118
Table 95 - SMI Referenced Properties/Methods for CIM_ProductPhysicalComponent 119
Table 96 - SMI Referenced Properties/Methods for CIM_Realizes....119
Table 97 - SMI Referenced Properties/Methods for CIM_SAPAvailableForElement 119
Table 98 - SMI Referenced Properties/Methods for CIM_SCSIProtocolController 120
Table 99 - SMI Referenced Properties/Methods for CIM_SoftwareIdentity....120
Table 100 - SMI Referenced Properties/Methods for CIM_SystemDevice (to EthernetPort) 120
Table 101 - SMI Referenced Properties/Methods for CIM_SystemDevice (to PortController) 121
Table 102 - SMI Referenced Properties/Methods for CIM_SystemDevice (to ProtocolController)....121
Table 103 - SMI Referenced Properties/Methods for CIM_iSCSIConnection 121
Table 104 - SMI Referenced Properties/Methods for CIM_iSCSISession....123
Table 105 - CIM Elements for SCSI Multipath Management....129
Table 106 - SMI Referenced Properties/Methods for CIM_ConcreteComponent....130
Table 107 - SMI Referenced Properties/Methods for CIM_ConcreteDependency....130
Table 108 - SMI Referenced Properties/Methods for CIM_ElementCapabilities....131
Table 109 - SMI Referenced Properties/Methods for CIM_ElementConformsToProfile (SCSIPathConfigurationService to SCSI Multipath Management RegisteredProfile)131
Table 110 - SMI Referenced Properties/Methods for CIM_ElementSettingData....131
Table 111 - SMI Referenced Properties/Methods for CIM_ElementSoftwareIdentity (Driver)....132
Table 112 - SMI Referenced Properties/Methods for CIM_ElementSoftwareIdentity (MP API Plugin) 132
Table 113 - SMI Referenced Properties/Methods for CIM_HostedService 132
Table 114 - SMI Referenced Properties/Methods for CIM_MemberOfCollection....133
Table 115 - SMI Referenced Properties/Methods for CIM_Product 133
Table 116 - SMI Referenced Properties/Methods for CIM_SCSIMultipathConfigurationCapabilities....133
Table 117 - SMI Referenced Properties/Methods for CIM_SCSIMultipathSettings....134
Table 118 - SMI Referenced Properties/Methods for CIM_SCSIPathConfigurationService....134
Table 119 - SMI Referenced Properties/Methods for CIM_SCSITargetPortGroup 135
Table 120 - SMI Referenced Properties/Methods for CIM_ServiceAvailableToElement....135
Table 121 - SMI Referenced Properties/Methods for CIM_SoftwareIdentity (Driver)....136
Table 122 - SMI Referenced Properties/Methods for CIM_SoftwareIdentity (MP API Plugin) 136
Table 123 - Related Profiles 139
Table 124 - Operations: CIM_MemoryConfigurationService 143
Table 125 - CIM_MemoryConfigurationService.AllocateFromPool() Method: Return Code Values....143
Table 126 - CIM_MemoryConfigurationService.AllocateFromPool() Method: Parameters 144
Table 127 - CIM_MemoryConfigurationService.ReturnToPool() Method: Return Code Values....144
Table 128 - CIM_MemoryConfigurationService.ReturnToPool() Method: Parameters....144
Table 129 - Operations: CIM_ResourcePool....145

© ISO/IEC 2021 – All rights reserved

Table 130 - Operations: CIM_MemoryCapabilities 145
Table 131 - Operations: CIM_MemoryConfigurationCapabilities 145
Table 132 - Operations: CIM_MemoryAllocationSettingData 146
Table 133 - Operations: CIM_ElementCapabilities 146
Table 134 - Operations: CIM_ServiceAffectsElement 146
Table 135 - Operations: CIM_ConcreteComponent 147
Table 136 - Operations: CIM_ElementAllocatedFromPool 147
Table 137 - Operations: CIM_HostedService 147
Table 138 - Operations: CIM_ElementSettingData 147
Table 139 - Operations: CIM_ElementConformsToProfile 148
Table 140 - CIM Elements 153
Table 141 - Class: CIM_RegisteredProfile 153
Table 142 - Class: CIM_MemoryConfigurationService 154
Table 143 - Class: CIM_ResourcePool 154
Table 144 - Class: CIM_MemoryCapabilities 155
Table 145 - Class: CIM_MemoryConfigurationCapabilities 155
Table 146 - Class: CIM_MemoryAllocationSettingData 156
Table 147 - Class: CIM_ElementSettingData - Use 1 157
Table 148 - Class: CIM_ElementSettingData - Use 2 157
Table 149 - Class: CIM_HostedService 158
Table 150 - Class: CIM_ElementAllocatedFromPool 158
Table 151 - Class: CIM_ConcreteComponent 159
Table 152 - Class: CIM_ElementCapabilities use 1 159
Table 153 - Class CIM_ElementCapabilities use 2 160
Table 154 - Related Profiles 161
Table 155 - Operations: CIM_ResourcePool 164
Table 156 - Operations: CIM_PersistentMemoryCapabilities 165
Table 157 - Operations: CIM_PersistentMemoryService 165
Table 158 - AllocateFromPool() Method: Return Code Values 166
Table 159 - AllocateFromPool() Method: Parameters 166
Table 160 - ReturnToPool() Method: Return Code Values 166
Table 161 - ReturnToPool() Method: Parameters 167
Table 162 - ModifyNamespace() Method: Return Code Values 167
Table 163 - ModifyNamespace() Method: Parameters 168
Table 164 - Operations: CIM_PersistentConfigurationCapabilities 168
Table 165 - Operations: CIM_PersistentMemoryNamespace 168
Table 166 - Operations: CIM_PersistentMemoryNamespaceSettingData 169
Table 167 - Operations: CIM_ElementCapabilities 169
Table 168 - Operations: CIM_ServiceAffectsElement 170
Table 169 - Operations: CIM_ConcreteComponent 170
Table 170 - Operations: CIM_ElementAllocatedFromPool 170
Table 171 - Operations: CIM_HostedService 170
Table 172 - Operations: CIM_ElementSettingData 171
Table 173 - Operations: CIM_ElementConformsToProfile 171
Table 174 - Operations: CIM_SystemDevice 171
Table 175 - CIM Elements for Persistent Memory Configuration 175
Table 176 - Class: CIM_RegisteredProfile 175
Table 177 - Class: CIM_ResourcePool 176
Table 178 - Class: CIM_PersistentMemoryCapabilities 176

© ISO/IEC 2021 – All rights reserved

Table 179 - Class: CIM_PersistentMemoryService 177
Table 180 - Class: CIM_PersistentConfigurationCapabilities 177
Table 181 - Class: CIM_PersistentMemoryNamespace 178
Table 182 - Class: CIM_PersistentMemoryNamespaceSettingData 178
Table 183 - CIM_ElementCapabilities 179
Table 184 - CIM_ElementCapabilities 179
Table 185 - Class: CIM_ServiceAffectsElement 180
Table 186 - Class: CIM_ConcreteComponent 180
Table 187 - Class: CIM_ElementAllocatedFromPool 180
Table 188 - Class: CIM_HostedService 180
Table 189 - Class CIM_ElementSettingData 181
Table 190 - Class: CIM_ElementConformsToProfile 181
Table 191 - Class: CIM_SystemDevice 182
Table 192 - Class: CIM_BasedOn 182

© ISO/IEC 2021 – All rights reserved

FOREWORD

The host-based storage portion of the Storage Management Technical Specification contains profiles and other clauses for management of host-based storage devices. Host-based storage devices provide storage capabilities to a host computer system. Examples of these devices include Fiber Channel Host Bus Adapters, Serial Attached SCSI Host Bus Adapters, RAID Controllers, JBODs (Just-A-Bunch-Of-Disks) and Operating System-discovered storage resources. The host-based profiles describe the manageability required for each device and the connectivity to the host computer system. The host-based profiles leverage existing profiles within this specification, as well as other profiles from the Distributed Management Task Force, where applicable, to create a comprehensive management model.

Parts of this Standard

This standard is subdivided in the following parts:

- *Storage Management Technical Specification, Part 1 Overview, 1.8.0 Rev 4*
- *Storage Management Technical Specification, Part 2 Common Architecture, 1.8.0 Rev 4*
- *Storage Management Technical Specification, Part 3 Common Profiles, 1.8.0 Rev 4*
- *Storage Management Technical Specification, Part 4 Block Devices, 1.8.0 Rev 4*
- *Storage Management Technical Specification, Part 5 Filesystems, 1.8.0 Rev 4*
- *Storage Management Technical Specification, Part 6 Fabric, 1.8.0 Rev 4*
- *Storage Management Technical Specification, Part 7 Host Elements, 1.8.0 Rev 4*
- *Storage Management Technical Specification, Part 8 Media Libraries, 1.8.0 Rev 4*

SNIA Web Site

Current SNIA practice is to make updates and other information available through their web site at http://www.snia.org

SNIA Address

Requests for interpretation, suggestions for improvement and addenda, or defect reports are welcome. They should be sent via the SNIA Feedback Portal at http://www.snia.org/feedback/ or by mail to the Storage Networking Industry Association, 4360 ArrowsWest Drive, Colorado Springs, Colorado 80907, U.S.A.

© ISO/IEC 2021 – All rights reserved

1 Scope

The host-base storage portion of the Storage Management Technical Specification defines management profiles for autonomous, component and abstract profiles for management of host-based storage devices. The autonomous profiles describe the management of a stand-alone host-based storage entity. The component profiles describe management of aspects of host-based storage entities that may be used by other autonomous profiles. Finally, this section describes abstract profiles that may be used as a basis for creating additional Host-based autonomous profiles.

This version of the Host-based Storage portion of the Storage Management Technical Specification includes autonomous profiles:

- "The Host Discovered Resources Profile

  This profile defines the model for the storage devices presented to an operating system running on a host computer system. In addition, this profile describes the map of storage associated to a host-computer system that a client application can discover.

- "The Fibre Channel HBA Profile

  This profile defines the model and functions of a Fibre Channel HBA that exports block storage to a host computer system from a SAN device (Fibre Channel switch, array, tape library, etc.).

- iSCSI Initiator Profile

  This profile defines the model and functions necessary to manage an iSCSI initiator.

Component profiles used by autonomous profiles to describe aspects of host-based storage elements and services. The component profiles defined in this version of the specification include:

- Host Hardware RAID Controller Profile

  This profile defines the model and functions of a host-based RAID controller that exports block storage to a host computer system from locally attached storage devices (internal hard drives, JBODs, etc.)

- Storage HBA Profile

  This profile defines the model and functions of a SAS, SATA, SPI, or Fibre Channel HBA that exports storage to a host computer system from a SAN device (Fibre Channel switch, array, tape library, etc.).

- Disk Partition Profile

  The Disk Partition profile models partition (or slice) configuration services provided by operating systems on some platforms.

- SB Multipath Management Profile

  The SB Multipath Management Profile models paths (connections between host controllers and device ports) for environments supporting the SB (Single Byte) command protocol.

- SCSI Multipath Management Profile

  The SCSI Multipath Management profile models paths (connections between host controllers, device ports, and logical units) for environments supporting the SCSI command protocol.

© ISO/IEC 2021 – All rights reserved

2 Normative References

2.1 Overview

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

2.2 Approved references

Systems Management: Data Storage Management (XDSM) API - ISBN: 1-85912-190-X

DMTF DSP1054 Indications Profile 1.2.2
http://www.dmtf.org/sites/default/files/standards/documents/DSP1054_1.2.2.pdf

2.3 References under development

EXPERIMENTAL

DMTF documents that are works in progress.

DMTF DSP1002, Diagnostics Profile 2.1.0
http://dmtf.org/sites/default/files/standards/documents/DSP1002_2.1.0a.pdf

DMTF DSP 1071, Multi-type System Memory Profile 1.0.0
http://www.dmtf.org/sites/default/files/standards/documents/DSP1071_1.0.0.pdf

DMTF DSP1104, FC HBA Diagnostics Profile 1.1.0a
http://dmtf.org/sites/default/files/standards/documents/DSP1104_1.1.0a.pdf

EXPERIMENTAL

Storage Management Technical Specification, Part 2 Common Architecture, 1.8.0 Rev 4

Storage Management Technical Specification, Part 3 Common Profiles, 1.8.0 Rev 4

© ISO/IEC 2021 – All rights reserved

3 Terms, Definitions, Symbols, Abbreviations, and Conventions

3.1 General

For the purposes of this document, the terms, definitions, symbols, abbreviations, and conventions given in *Storage Management Technical Specification, Part 2 Common Architecture, 1.8.0 Rev 4* and the following apply.

3.2 Terms and Definitions

3.2.1
Fibre Channel
a serial I/O bus capable of supporting multiple protocols, including access to open system storage (FCP protocol), access to mainframe storage (**FICON™**[1] protocol), and IP

3.2.2
Host Bus Adapter (HBA)
an I/O adapter that connects a host I/O bus to a computer's memory system

3.2.3
host computer system
any computer system to which disks, disk subsystems, or file servers are attached and accessible for data storage and I/O.

3.2.4
JBOD
an acronym for "Just a Bunch Of Disks." A cabinet or enclosure of disks

3.2.5
logical sisk
block storage on which file systems are built

A logical disk would be formatted for a particular file system.

3.2.6
Operating System (OS)
software that manages the resources of a host computer system.

3.2.7
RAID
an Acronym for Redundant Array of Independent Disks, a family of techniques for managing multiple disks to deliver desirable cost, data availability, and performance characteristics to host environments

3.2.8
storage device enclosure
a cabinet or enclosure of storage media devices.

Note 1 to entry: Example: JBOD

3.2.9
storage volume
unit of capacity served from a block storage device

1.FICON™ is an example of a suitable product available commercially. This information is given for the convenience of users of this standard and does not constitute an endorsement of this product by SNIA or any standards organization.

© ISO/IEC 2021 – All rights reserved