

Swordfish Working Draft Notice

Version 1.2.0

Publication of this *Working Draft* for review and comment has been approved by the Scalable Storage Management Technical Work Group. This draft represents a “best effort” attempt by the Scalable Storage Management Technical Work Group to reach preliminary consensus, and it may be updated, replaced, or made obsolete at any time. This document should not be used as reference material or cited as other than a “work in progress.” Suggestions for revision should be directed to <http://www.snia.org/feedback>.

SNIA Working Draft

May 29, 2020

**The following files are included in this Working Draft Release
(Swordfish_v1.2.0.zip):**

- **Swordfish_v1.2.0_WorkingDraft.pdf (this file)**
- **Swordfish_v1.2.0_Schema.zip**
- **Swordfish_v1.2.0_Specification.pdf**
- **Swordfish_v1.2.0_UserGuide.pdf**
- **Swordfish_v1.2.0_ErrorGuide.pdf**

USAGE

The SNIA hereby grants permission for individuals to use this document for personal use only, and for corporations and other business entities to use this document for internal use only (including internal copying, distribution, and display) provided that:

1. Any text, diagram, chart, table or definition reproduced must be reproduced in its entirety with no alteration, and,
2. Any document, printed or electronic, in which material from this document (or any portion hereof) is reproduced must acknowledge the SNIA copyright on that material, and must credit the SNIA for granting permission for its reuse.

Other than as explicitly provided above, you may not make any commercial use of this document, sell any or this entire document, or distribute this document to third parties. All rights not explicitly granted are expressly reserved to SNIA.

Permission to use this document for purposes other than those enumerated above may be requested by emailing tcmd@snia.org. Please include the identity of the requesting individual and/or company and a brief description of the purpose, nature, and scope of the requested use.

All code fragments, scripts, data tables, and sample code in this SNIA document are made available under the following license: BSD 3-Clause Software License

Copyright SNIA 2016-2020 The Storage Networking Industry Association.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- * Neither the name of The Storage Networking Industry Association (SNIA) nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

DISCLAIMER

The information contained in this publication is subject to change without notice. The SNIA makes no warranty of any kind with regard to this specification, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. The SNIA shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this specification.

Suggestions for revisions should be directed to <http://www.snia.org/feedback/>.

Copyright © 2016-2020 Storage Networking Industry Association.

Revision History

Revision	Date	Changes
V0.5	3/16/16	Initial work in progress release
V0.6	5/24/16	Updated to include content including replication for block services
V0.8	7/28/16	Updated to include content including filesystem schema, json schema
V0.9	8/30/16	<p>First draft of <i>Swordfish Scalable Storage Management API User's Guide</i>. First draft of <i>Swordfish Scalable Storage Management API Specification</i>. Changes to schema:</p> <ul style="list-style-type: none"> • Clarifications to use of Collections vs ResourceCollections and appropriate notation of Read/Write on Collections • Some updates to how LineOfService is represented in ClassOfService (to simplify hierarchy) • Clarifications in File System schemas
V1.0	9/19/16	<p>First Release of <i>Swordfish Scalable Storage Management API User's Guide</i>. First Release of <i>Swordfish Scalable Storage Management API Specification</i>. Schema changes:</p> <ul style="list-style-type: none"> • Simplified StorageServices • Updated descriptions and long descriptions • Changed GeographicScope to FailureDomainScope
V1.0.1	10/12/16	<p>Errata release v1.0.1. Mockup Overview document updated for clarity. Mockups updated to reflect changes in schema. Spec and schema updates:</p> <ul style="list-style-type: none"> • General clean up and formatting consistency • Clarify use of StorageGroup • Detail interactions between DefaultValue and Nullable in schema attributes • Set default values for Boolean attributes • Clarify appropriate EntitySet referencing • Improve descriptions for many schema attributes • Replace IsDefault with reference to ClassOfService in StoragePool and StorageService • Align Location with Redfish model • Change time values to conform to ISO 8601 • Collapse TargetEndpointGroup and InitiatorEndpointGroup into EndpointGroup • Property and enumeration deleted from StorageReplicaInfo to remove redundancy with ReplicaSyncType • Add DefaultClassOfService link to StoragePool and StorageVolume in lieu of ClassOfService.IsDefault • Remove invalid measurement annotation from DataProtectionLoSCapabilities • Moved schedule to Redfish <p>User's Guide:</p> <ul style="list-style-type: none"> • General clean up and formatting consistency • A discussion of unused CoS and LoS entries in ServiceCatalog • Improve purpose for many use cases
1.0.2	11/1/16	<p>Errata release v1.0.2 Specification and user's guide minor formatting fixes. Clarifications to specification language. Mockups updated to reflect changes in schema.</p>

Revision	Date	Changes
		<p>Spec and schema updates:</p> <ul style="list-style-type: none"> Change multiple collections' types from collections (arrays) to ResourceCollections to conform to Redfish usage guidelines: <ul style="list-style-type: none"> Capacity.CapacitySource ProvidingVolumes, ProvidingPools and ProvidingDrives StorageService.StorageService StorageGroups, ClientEndpointGroups and ServerEndpointGroups Change multiple collections' types from collections (arrays) to ResourceCollections to conform to Redfish usage guidelines and move NavigationProperties from Links section: <ul style="list-style-type: none"> EndpointGroup Endpoints FileShare EthernetInterfaces StoragePool ClassesOfService StorageService ClassesOfService
1.0.2a	11/8/16	<p>Schema changes to 5 files to fix include directories to specify http://redfish.dmtf.org/schemas/swordfish/v1 instead of http://redfish.dmtf.org/schemas/v1</p> <p>Updated schedule_v1 schema to 8601 format compliance.</p>
1.0.3	1/24/17	<p>Schema changes:</p> <ul style="list-style-type: none"> Move complex types and enum to versioned namespace Schedule schema: add property json schema fix (Swordfish to swordfish) <p>Specification enhancements, multiple areas</p> <p>User's guide: multiple new use cases and new document section</p>
1.0.4	4/25/17	<p>Errata release with minor updates to schema:</p> <ul style="list-style-type: none"> Move FileShare collection Integrate DMTF and SNIA versions of Volume Fix incorrect property references and update descriptions. <p>Update mockups.</p> <p>User's guide: Update cross-references.</p>
1.0.5	10/3/17	<p>Errata release with updates to schema:</p> <ul style="list-style-type: none"> Simplifications to StorageGroups and EndpointGroups based on implementation feedback. Addition of Swordfish Message Registry Addition of performance metrics, added to block Add DMTF Volume changes: Dedicated Spare collection <p>Fix inconsistencies in mockups.</p> <p>User's Guide:</p> <ul style="list-style-type: none"> Add introductory material to actors and management domain Minor fixes and updates to use cases
1.0.6	2/13/18	<p>Specification:</p> <ul style="list-style-type: none"> Updated Storage Systems model – added notion of Integrated Service Configuration in addition to (and named) Hosted Service Configuration. Added ComplexType common definition section. Added/updated common Redfish property definitions. Updates to conform to new SNIA templates. <p>Errata release with updates to schema:</p> <ul style="list-style-type: none"> Deprecated use of Swordfish Location schema in favor of Redfish Resource.Location Added support for PersistentMemory capacity source types New event message entries Moved enum and ComplexType definitions to unversioned namespaces (ensures proper json schema version generation from tools), cleaned up references to abstract types and unreferenced versions <p>Removed mockups from release bundle. Refer to snia.org/swordfish and swordfishmockups.com for mockup availability.</p> <p>User's Guide:</p>

Revision	Date	Changes
		<ul style="list-style-type: none"> Add on-demand replication use cases
1.0.7	10/12/18	<p>Specification:</p> <ul style="list-style-type: none"> Updated Enhanced Spare Capacity Management Model Deprecated Remaining Capacity Added OpenAPI support: schema references and OpenAPI YAML files Added iSCSI properties for CHAP Event usage enhancements and guidance Volume schema updates – RAID Type enum (deprecating VolumeType usage), add ReplicaTargets <p>Schema updates:</p> <ul style="list-style-type: none"> Annotations enhancements: Capabilities designations, owning entities, Redfish.Required usage Clarified and updated ClassOfService IsDefault property usage Updated Capabilities location in hierarchy Fix cardinality issue of StorageReplicaInfo usage in StorageGroups and Volume Consolidate Client and Server Endpoint Groups into single Endpoint Group entity (deprecate usage of separate Client Endpoint Group and Server Endpoint Group) Add MappedVolume construct to StorageGroup – adds LUN info and other properties <p>User's Guide:</p> <ul style="list-style-type: none"> Editorial cleanup of JSON
1.0.7a	11/8/18	<p>Specification:</p> <ul style="list-style-type: none"> Restored RAIDType property that was missing from 1.0.7 Minor correction to schema versioning Deprecated Remaining Capacity
1.1.0	8/22/19	<p>Added Features and Profiles Definitions</p> <ul style="list-style-type: none"> Defined required functionality to support multiple Swordfish features for block and file: Discovery, Event Notification, IO Performance, Provisioning, Capacity Management, Local and Remote Replication, Mapping and Masking (block only), EnergyStar reporting Add SupportedFeatures Registry definition Add SwordfishSupportedFeatures standard registry <p>Clarified support for use with and without class of service:</p> <ul style="list-style-type: none"> Added support for seamless extension of Redfish Storage model to Swordfish, using Swordfish schema attached to the Storage schema <p>Volume updates:</p> <ul style="list-style-type: none"> Added Collection of related Endpoints, StorageGroups and ConsistencyGroups Added new properties: ProvisioningPolicy, OwningStorageService, StripSizeBytes, ReadAheadPolicy, VolumeUsage, WritePolicy, CacheState, LogicalUnitNumber, MediaSpanCount, Deduplicated, Compressed, WriteHoleProtectionPolicy, and DisplayName. Added Actions for replication: AssignReplicaTarget, CreateReplicaTarget, RemoveReplicaRelationship, ResumeReplication, ReverseReplicationRelationship, SplitReplication, and SuspendReplication <p>StoragePool:</p> <ul style="list-style-type: none"> Added properties: SupportedRAIDTypes, SupportedProvisioningPolicies, Compressed, Deduplicated, Encrypted. <p>Class of Service / Line of Service model changes:</p> <ul style="list-style-type: none"> Changed to make abstract LineOfService be base class for both types Added SupportedProvisioningPolicies to StoragePool and Volume Clarified DataProtectionLineOfService usage in StorageReplicaInfo <p>Replication usage:</p> <ul style="list-style-type: none"> Changed use model to ReplicaTargets array in source, ReplicaInfo in target Clarified terminology / properties in StorageReplicaInfo structures

Revision	Date	Changes
		<p>Consistency Groups added for group volume management (manage multiple volumes as a single entity), and StorageGroups clarified to only manage Mapping and Masking (references to consistency in StorageGroups deprecated),</p> <ul style="list-style-type: none"> Replication capability added to Consistency Groups <p>Other Schema Fixes:</p> <ul style="list-style-type: none"> CSDL corrections throughout ReadWrite changes to multiple properties: ExportedShares and ImportedShares in FileSystem, CapacitySources made consistently ReadWrite in Volume/StoragePool/FileSystems Capabilities Annotations updated and added throughout Removed FileSystemPersistenceType enum (not used) Add Redfish.Uri annotations <p>User's Guide:</p> <ul style="list-style-type: none"> Restructured to add features and feature cross references, and many new use cases added: <ul style="list-style-type: none"> Create Volume for multiple scenarios (including Redfish Storage) Create Storage Pool for multiple scenarios Replication use cases using single Volume Replication use cases using Consistency Groups <p>Specification:</p> <ul style="list-style-type: none"> Restructured to add features and profiles <ul style="list-style-type: none"> Add description of SupportedFeatures usage and requirements Add requirements for subsets of features Add language to clarify support for use with and without the class of service (now an optional feature) <ul style="list-style-type: none"> Added descriptions of support for seamless extension of Redfish Storage model to Swordfish Add updated model diagrams to reflect new model permutations Added descriptions of new constructs (e.g., Consistency Groups) Cleaned up references to Redfish Specification based on latest version Add Status Codes clarification and constraints section
1.1.0 (TP)	11/12/19	Released as Technical Position
1.1.0a (TP Corrected)	11/12/19	<p>Released as Technical Position, Corrected</p> <p>User's Guide:</p> <ul style="list-style-type: none"> Formatting fixes – word wrap in pdf doc format to fix truncated lines Added cross referencing of Features to use cases Editorial changes and cleanup <p>Specification:</p> <ul style="list-style-type: none"> Formatting fixes – word wrap in pdf doc format to fix truncated lines Consistent object labeling in images (replace drive with disk) Editorial and grammar changes and cleanup to status code guidance section <p>Schema:</p> <ul style="list-style-type: none"> Add missing LinesOfService schema in StorageService Add missing Revision/Kind annotations to Actions added in 1.1.0 Fix issues in Redfish.Uri Add RDE Dictionary binaries and map types to published schema types Add additional enum to WriteCachePolicyTypes
1.1.0b	3/24/20	<p>Released as Technical Position, Corrected</p> <p>Specification:</p> <ul style="list-style-type: none"> TLS requirements now based on both ISO and SNIA standards Redfish references now based on both ISO and SNIA standards <p>Bibliography added</p>
1.2.0	5/29/20	Added support for NVMe and NVMe-oF: added concepts and enhancements to the Redfish and Swordfish models and schema, to support the management of NVMe and NVMe-oF devices and systems.

Revision	Date	Changes
		<p>Note: This release is done in conjunction with the DMTF's Redfish Forum Work-in-Progress June 2020 release of DSP-IS0014 (v0.95), which contains multiple schema to support this work. Both are released as Working Drafts / work-in-progress for public review, and plan simultaneous releases in early fall 2020 to support full technical specification level capability and availability.</p> <p>Functionality availability in Swordfish includes:</p> <ul style="list-style-type: none"> • Enhancements to Volume, StoragePools • New schema: NVMeDomain <p>Other supporting documentation released in conjunction with this specification and schema bundle:</p> <ul style="list-style-type: none"> • Multiple mockups reflecting multiple implementation permutation options (available on swordfishmockups.com) • Model overview documentation (NVMe to RF/SF Model Mapping Working Draft, dated May 2020) <p>Additional Enhancements in the Specification and schema:</p> <ul style="list-style-type: none"> • The addition of the Swordfish Standalone Configuration in the /Storage collection at the ServiceRoot. This simplification of the hierarchy features Storage systems at the ServiceRoot and makes standalone implementations easier to instrument. • Added support to Volume for new Actions: ChangeRAIDLAYOUT, ForceEnable. • Added InitializeMethod, IOPerfModeEnabled, and OwningStorageResource and link to JournalingMedia to Volume. • Enhanced CHAP definitions and usage in StorageGroup. • Fix multiple URI issues across various schema. • Add additional enum members: <ul style="list-style-type: none"> ○ None to RAIDType ○ Off to WriteCachePolicy • Enhanced support for RDE Dictionaries • Add LinesOfService to StorageService <p>Additional Documentation:</p> <ul style="list-style-type: none"> • Initial Release of the Swordfish SSM Error Handling Guide. The Swordfish Scalable Storage Management Error Handling Guide provides a summary of the preferred handling of errors and error messages in a Swordfish implementation, and is targeted as a guide for implementers. <p>New mockups:</p> <ul style="list-style-type: none"> • In conjunction with the 1.2.0 release, the swordfishmockups.com site has been updated with 10 new mockups. These include NVMe configuration mockups, as well as several new configurations showing examples of the Swordfish Standalone Configuration in the /Storage collection at the ServiceRoot, the Swordfish Integrated Configuration in use attached to a server (Computer system).

Suggestion for changes or modifications to this document should be sent to the SNIA Scalable Storage Management (SSM) Technical Working Group at <http://www.snia.org/feedback/>.

CONTACTING SNIA

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.

INTENDED AUDIENCE

This document is intended for use by individuals and companies engaged in storage management.

CHANGES TO THE SPECIFICATION

Each publication of this specification is uniquely identified by a one- to three-level identifier, comprised of a version number, a release number and an optional update number. 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. There are four levels of change to the specification:

- Versioned material shall have a three-level revision identifier, comprised of a version number “v”, a release number “r” and an errata number “e”. Future publications of this specification are subject to specific constraints on the scope of change that is permissible from one specification to the next and the degree of interoperability and backward compatibility that should be assumed between products designed to this standard. This versioning policy applies to all SNIA Swordfish versioned materials.
- Version Number: Versioned material having version number “v” shall be backwards compatible with all of revisions of that specifications that have the same version number “r”. There is no assurance of interoperability or backward compatibility between revisions with different version numbers.
- Release Number: Versioned material having version number “v” and release number “r” shall be backwards compatible with previous minor versions. A minor revision represents a technical change to existing content or an adjustment to the scope of the versioned material.
- Errata Number: Versioned material having version number “v” and release number “r” and errata number “e” should be backwards compatible with previous errata versions. An errata revision of versioned material is limited to minor corrections or clarifications of existing versioned material. An errata revision may be backwards incompatible if necessary for correct operation of implementations of the versioned material.

Acknowledgements

The SNIA Scalable Storage Management Technical Work Group, which developed and reviewed work in progress, would like to recognize the significant contributions made by the following members:

Broadcom Inc.....	Richelle Ahlvers
Cisco Systems, Inc.	Krishnakumar Gowravaram
Dell Inc.	Patrick Boyd
.....	George Ericson
.....	Sean McGinnis
.....	Michael Raineri
.....	Rich Roscoe
Futurewei Inc.	Sean McGinnis*
Hitachi Data Systems	Eric Hibbard
Hewlett Packard Enterprise	Jeff Hilland
.....	Chris Lionetti
.....	John Mendonca
.....	Doug Voigt
Inova Development Inc.	Karl Schopmeyer
Intel Corporation	Klaudia Jablonska
.....	Mariusz Krzywienski
.....	Mateusz Mania
.....	Slawek Putyrski
.....	Paul von Behren
Microsemi Corporation.....	Anand Nagarjan
Microsoft Corporation	Hector Linares
.....	Jim Pinkerton
.....	Michael Pizzo
.....	Scott Seligman
NetApp, Inc.	Don Deel
.....	Nilesh Maheshwari
ScienceLogic.....	Patrick Strick
VMware, Inc.	Murali Rajagopal

* — Prior Employer