



# Swordfish SNIA Standard Notice

## Version: 1.2.8

### ABSTRACT:

This document summarizes the latest release of the Swordfish Management API

This document has been released and approved by SNIA. The SNIA believes that the ideas, methodologies, and technologies described in this document accurately represent SNIA goals and are appropriate for widespread distribution. Suggestion for revision should be directed to <http://www.snia.org/feedback>.

## SNIA Approved Publication

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# USAGE

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## Current Revision

SNIA is actively engaged in expanding and refining the Swordfish documentation. The most current revision can be found on the SNIA web site at [https://www.snia.org/tech\\_activities/standards/curr\\_standards/swordfish](https://www.snia.org/tech_activities/standards/curr_standards/swordfish).

## Contact SNIA

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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 SNIA, 5201 Great America Parkway, Suite 320, Santa Clara, CA 95054, USA.

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

## VERSIONING POLICY

This document is versioned material. 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 document are subject to specific constraints on the scope of change that is permissible from one revision 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 material that have the same version number ‘v’. There is no assurance of interoperability or backward compatibility between revisions of a versioned material with different version numbers.

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## About SNIA

SNIA is a not-for-profit global organization made up of corporations, universities, startups, and individuals. The members collaborate to develop and promote vendor-neutral architectures, standards, and education for management, movement, and security for technologies related to handling and optimizing data. SNIA focuses on the transport, storage, acceleration, format, protection, and optimization of infrastructure for data. Learn more at [www.snia.org](http://www.snia.org).

## Acknowledgements

The SNIA Scalable Storage Management Technical Work Group, which developed and reviewed this work in progress, would like to recognize the significant contributions made by the members listed in Table 1.

Table 1: Contributors

Member	Representatives
Broadcom Inc	Richelle Ahlvers*
Celestica	Krishnakumar Gowravaram

Member	Representatives
Cisco Systems, Inc.	Krishnakumar Gowravaram*
Code Construct	Jeremy Kerr
Dell Inc	David Black
	Patrick Boyd
	George Ericson
	Sean McGinnis
	Jim Pendergraft
	Michael Raineri
	Rich Roscoe
Futurewei Inc	Sean McGinnis*
Hitachi Data Systems	Eric Hibbard
Hewlett Packard Enterprise	Curtis Ballard
	Jeff Hilland
	Chris Lionetti
	John Mendonca
	Doug Voigt
Inova Development Inc	Karl Schopmeyer
Intel Corporation	Richelle Ahlvers
	Rajalaxmi Angadi
	Phil Cayton
	Elham Hojati
	Klaudia Jablonska
	Mariusz Krzywienski
	Mateusz Mania
	Slawek Putyrski
	Paul von Behren
Kioxia	James Borden
	Mark Carlson
Lenovo	Keith Campbell
Microsemi Corporation	Anand Nagarjan
Microsoft Corporation	Hector Linares
	Jim Pinkerton

Member	Representatives
	Michael Pizzo
	Scott Seligman
NetApp, Inc	Don Deel
	Fred Knight
	Nilesh Maheshwari
ScienceLogic	Patrick Strick
VMware, Inc	Murali Rajagopal

# 1 Release Contents

The Following files are included in this SNIA Standard Release (Swordfish\_1.2.8.zip):

- Swordfish\_1.2.8\_SNIASStandard.pdf (this file)
- Swordfish\_1.2.8\_Schema.zip
- Swordfish\_1.2.8\_Profiles.zip
- Swordfish\_1.2.8\_Templates.zip
- Swordfish\_1.2.8\_Specification.pdf
- Swordfish\_1.2.8\_UserGuide.pdf
- Swordfish\_1.2.8\_ErrorGuide.pdf
- Swordfish\_1.2.8\_NVMeMappingGuide.pdf
- Swordfish\_1.2.8\_PropertyGuide.pdf
- Swordfish\_1.2.8\_MetricsWhitePaper.pdf



## 2 Revision History

### 2.1 Release 0.5

Table 2 summarizes the changes made for release 0.5.

Table 2: Revision History for release 0.5

Revision	Date	Changes
v0.5	3/1 6/16	Initial work in progress release

### 2.2 Release 0.6

Table 3 summarizes the changes made for release 0.6.

Table 3: Revision History for release 0.6

Revision	Date	Changes
v0.6	5/2 4/16	Updated to include content including replication for block services

### 2.3 Release 0.9

Table 4 summarizes the changes made for release 0.9.

Table 4: Revision History for release 0.9

Revision	Date	Changes
v0.9	8/3 0/16	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: - 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

## 2.4 Release 1.0

Table 5 summarizes the changes made for release 1.0.

Table 5: Revision History for release 1.0

Revision	Date	Changes
v1.0	9/1 9/16	First release of <i>Swordfish Scalable Storage Management API User's Guide</i> . First release of <i>Swordfish Scalable Storage Management API Specification</i> . Changes to schema: <ul style="list-style-type: none"><li>• Simplified StorageService</li><li>• Updated descriptions and long descriptions</li><li>• Changed GeographicScope to FailureDomainScope</li></ul>

## 2.5 Release 1.0.1

Table 6 summarizes the changes made for release 1.0.1.

Table 6: Revision History for release 1.0.1

Revision	Date	Changes
v1.0.1	10/1 2/16	Errata release v1.0.1 Mockup Overview document updated for clarity. Mockups updated to reflect changes in schema. Spec and schema updates: <ul style="list-style-type: none"><li>• General clean up and formatting consistency</li><li>• Clarify use of StorageGroup</li><li>• Detail interactions between DefaultValue and Nullable in schema attributes</li><li>• Set default values for Boolean attributes</li><li>• Clarify appropriate EntitySet referencing</li><li>• Improve descriptions for many schema attributes</li><li>• Replace IsDefault with reference to ClassOfService in StoragePool and StorageService</li><li>• Align Location with Redfish model</li><li>• Change time values to conform to ISO 8601</li><li>• Collapse TargetEndpointGroup and InitiatorEndpointGroup into EndpointGroup</li><li>• Property and enumeration deleted from</li></ul>

Revision	Date	Changes
		StorageReplicaInfo to remove redundancy with ReplicaSyncType
		<ul style="list-style-type: none"> <li>• Add DefaultClassOfService link to StoragePool and StorageVolume in lieu of ClassOfService.IsDefault</li> <li>• Remove invalid measurement annotation from DataProtectionLoSCapabilities</li> <li>• Moved schedule to Redfish User's Guide:</li> <li>• General clean up and formatting consistency</li> <li>• A discussion of unused CoS and LoS entries in ServiceCatalog</li> <li>• Improve purpose for many use cases</li> </ul>

## 2.6 Release 1.0.2

+@Table\_7 summarizes the changes made for release 1.0.2.

Table 7: Revision History for release 1.0.2

Revision	Date	Changes
v1.0.2	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. Spec and schema updates:</p> <ul style="list-style-type: none"> <li>• Change multiple collections' types from collections (arrays) to ResourceCollections to conform to Redfish usage guidelines: <ul style="list-style-type: none"> <li>◦ Capacity.CapacitySource ProvidingVolumes, ProvidingPools and ProvidingDrives</li> <li>◦ StorageService.StorageService StorageGroups, ClientEndpointGroups and ServerEndpointGroups</li> </ul> </li> <li>• Change multiple collections' types from collections</li> </ul>

Revision	Date	Changes
		<p>(arrays) to ResourceCollections to conform to Redfish usage guidelines and move NavigationProperties from Links section:</p> <ul style="list-style-type: none"> <li>◦ EndpointGroup Endpoints</li> <li>◦ FileShare EthernetInterfaces</li> <li>◦ StoragePool ClassesOfService</li> <li>◦ StorageService ClassesOfService</li> </ul>

## 2.7 Release 1.0.2a

Table 8 summarizes the changes made for release 1.0.2a.

Table 8: Revision History for release 1.0.2a

Revision	Date	Changes
1.0.2 a	11/8/16	Schema changes to 5 files to fix include directories to specify <a href="http://redfish.dmtf.org/schemas/swordfish/v1">http://redfish.dmtf.org/schemas/swordfish/v1</a> instead of <a href="http://redfish.dmtf.org/schemas/v1">http://redfish.dmtf.org/schemas/v1</a> Updated schedule_v1 schema to 8601 format compliance.

## 2.8 Release 1.0.3

Table 9 summarizes the changes made for release 1.0.3.

Table 9: Revision History for release 1.0.3

Revision	Date	Changes
1.0.3	1/24/17	<p>Schema changes:</p> <ul style="list-style-type: none"> <li>• Move complex types and enum to versioned namespace</li> <li>• Schedule schema: add property</li> <li>• json schema fix (Swordfish to swordfish) Specification enhancements, multiple areas User's guide: multiple new use cases and new document section</li> </ul>

## 2.9 Release 1.0.4

Table\_10 summarizes the changes made for release 1.0.4.

Table 10: Revision History for release 1.0.4

Revision	Date	Changes
1.0.4	4/2 5/17	<p>Errata release with minor updates to schema:</p> <ul style="list-style-type: none"> <li>• Move FileShare collection</li> <li>• Integrate DMTF and SNIA versions of Volume</li> <li>• Fix incorrect property references and update descriptions. Update mockups. User's guide: Update cross-references.</li> </ul>

## 2.10 Release 1.0.5

Table 11 summarizes the changes made for release 1.0.5.

Table 11: Revision History for release 1.0.5

Revision	Date	Changes
1.0.5	10/ 3/17	<p>Errata release with updates to schema:</p> <ul style="list-style-type: none"> <li>• Simplifications to StorageGroups and EndpointGroups based on implementation feedback.</li> <li>• Addition of Swordfish Message Registry</li> <li>• Addition of performance metrics, added to block</li> <li>• Add DMTF Volume changes: Dedicated Spare collection Fix inconsistencies in mockups. User's Guide:</li> <li>• Add introductory material to actors and management domain</li> <li>• Minor fixes and updates to use cases</li> </ul>

## 2.11 Release 1.0.6

Table\_12 summarizes the changes made for release 1.0.6.

Table 12: Revision History for release 1.0.6

Revision	Date	Changes
1.0.6	2/1 3/18	<p>Specification:</p> <ul style="list-style-type: none"> <li>• Updated Storage Systems model – added notion of Integrated Service Configuration in addition to (and named) Hosted Service Configuration.</li> <li>• Added ComplexType common definition section.</li> <li>• Added/updated common Redfish property definitions.</li> <li>• Updates to conform to new SNIA templates. Errata release with updates to schema:</li> <li>• Deprecated use of Swordfish Location schema in favor of Redfish Resource.Location</li> <li>• Added support for PersistentMemory capacity source types</li> <li>• New event message entries</li> <li>• 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 Removed mockups from release bundle. Refer to <a href="http://snia.org/swordfish">snia.org/swordfish</a> and <a href="http://swordfishmockups.com">swordfishmockups.com</a> for mockup availability. User's Guide:</li> <li>• Add on-demand replication use cases</li> </ul>

## 2.12 Release 1.0.7

Table 13 summarizes the changes made for release 1.0.7.

Table 13: Revision History for release 1.0.7

Revision	Date	Changes
1.0.7	10/1 2/18	<p>Specification:</p>

Revision	Date	Changes
		<ul style="list-style-type: none"> <li>• Updated Enhanced Spare Capacity Management Model</li> <li>• Deprecated Remaining Capacity</li> <li>• Added OpenAPI support: schema references and OpenAPI YAML files</li> <li>• Added iSCSI properties for CHAP</li> <li>• Event usage enhancements and guidance</li> <li>• Volume schema updates – RAID Type enum (deprecating VolumeType usage), add ReplicaTargets Schema updates:</li> <li>• Annotations enhancements: Capabilities designations, owning entities, Redfish.Required usage</li> <li>• Clarified and updated ClassOfService IsDefault property usage</li> <li>• Updated Capabilities location in hierarchy</li> <li>• Fix cardinality issue of StorageReplicaInfo usage in StorageGroups and Volume</li> <li>• Consolidate Client and Server Endpoint Groups into single Endpoint Group entity (deprecate usage of separate Client Endpoint Group and Server Endpoint Group)</li> <li>• Add MappedVolume construct to StorageGroup – adds LUN info and other properties User's Guide:</li> <li>• Editorial cleanup of JSON</li> </ul>

## 2.13 Release 1.0.7a

Table 14 summarizes the changes made for release 1.0.7a.

Table 14: Revision History for release 1.0.7a

Revision	Date	Changes
1.0.7 a	11/8/18	<p>Specification:</p> <ul style="list-style-type: none"> <li>• Restored RAIDType property that was missing from 1.0.7</li> <li>• Minor correction to schema versioning Deprecated Remaining Capacity</li> </ul>

## 2.14 Release 1.1.0

Table 15 summarizes the changes made for release 1.1.0.

Table 15: Revision History for release 1.1.0

Revision	Date	Changes
1.1.0	8/22/19	<p>Added Features and Profiles Definitions</p> <ul style="list-style-type: none"> <li>• 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</li> <li>• Add SupportedFeatures Registry definition</li> <li>• Add SwordfishSupportedFeatures standard registry</li> </ul> <p>Clarified support for use with and without class of service:</p> <ul style="list-style-type: none"> <li>• Added support for seamless extension of Redfish Storage model to Swordfish, using Swordfish schema attached to the Storage schema</li> </ul> <p>Volume updates:</p> <ul style="list-style-type: none"> <li>• Added Collection of related Endpoints, StorageGroups and ConsistencyGroups</li> <li>• Added new properties: ProvisioningPolicy, OwningStorageService, StripSizeBytes, ReadAheadPolicy, VolumeUsage, WritePolicy, CacheState, LogicalUnitNumber, MediaSpanCount, Deduplicated, Compressed, WriteHoleProtectionPolicy, and DisplayName.</li> <li>• Added Actions for replication: AssignReplicaTarget,</li> </ul>



Revision	Date	Changes
		<p>CreateReplicaTarget, RemoveReplicaRelationship, ResumeReplication, ReverseReplicationRelationship, SplitReplication, and SuspendReplication</p> <p>StoragePool:</p> <ul style="list-style-type: none"> <li>Added properties: SupportedRAIDTypes, SupportedProvisioningPolicies, Compressed, Deduplicated, Encrypted.</li> </ul> <p>Class of Service / Line of Service model changes:</p> <ul style="list-style-type: none"> <li>Changed to make abstract LineOfService be base class for both types</li> <li>Added SupportedProvisioningPolicies to StoragePool and Volume</li> <li>Clarified DataProtectionLineOfService usage in StorageReplicaInfo</li> </ul>
		<p>Replication usage:</p> <ul style="list-style-type: none"> <li>Changed use model to ReplicaTargets array in source, ReplicaInfo in target</li> <li>Clarified terminology / properties in StorageReplicaInfo structures 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),</li> <li>Replication capability added to Consistency Groups</li> </ul> <p>Other Schema Fixes:</p> <ul style="list-style-type: none"> <li>CSDL corrections throughout</li> <li>ReadWrite changes to multiple properties: ExportedShares and ImportedShares in FileSystem, CapacitySources made consistently ReadWrite in Volume/StoragePool/FileSystems</li> <li>Capabilities Annotations updated and added throughout</li> <li>Removed FileSystemPersistenceType enum (not used)</li> <li>Add Redfish.Uri annotations</li> </ul>

Revision	Date	Changes
		<p>User's Guide:</p> <ul style="list-style-type: none"> <li>Restructured to add features and feature cross references, and many new use cases added: <ul style="list-style-type: none"> <li>Create Volume for multiple scenarios (including Redfish Storage)</li> <li>Create Storage Pool for multiple scenarios</li> <li>Replication use cases using single Volume</li> <li>Replication use cases using Consistency Groups</li> </ul> </li> <li>Restructured to add features and profiles <ul style="list-style-type: none"> <li>Add description of SupportedFeatures usage and requirements</li> <li>Add requirements for subsets of features</li> </ul> </li> <li>Add language to clarify support for use with and without the class of service (now an optional feature) <ul style="list-style-type: none"> <li>Added descriptions of support for seamless extension of Redfish Storage model to Swordfish</li> <li>Add updated model diagrams to reflect new model permutations</li> </ul> </li> <li>Added descriptions of new constructs (e.g., Consistency Groups)</li> <li>Cleaned up references to Redfish Specification based on latest version</li> <li>Add Status Codes clarification and constraints section</li> </ul>
1.1.0 (TP)	11/1 2/19	Released as Technical Position

## 2.15 Release 1.1.0a

Table 16 summarizes the changes made for release 1.1.0a.

Table 16: Revision History for release 1.1.0a

Revision	Date	Changes
1.1.0 a	11/1 2/19	<p>Released as Technical Position, Corrected User's Guide:</p> <ul style="list-style-type: none"> <li>Formatting fixes – word wrap in pdf doc format to fix</li> </ul>

Revision	Date	Changes
		<p>truncated lines</p> <ul style="list-style-type: none"> <li>• Added cross referencing of Features to use cases</li> <li>• Editorial changes and cleanup Specification:</li> <li>• Formatting fixes – word wrap in pdf doc format to fix truncated lines</li> <li>• Consistent object labeling in images (replace drive with disk)</li> <li>• Editorial and grammar changes and cleanup to status code guidance section Schema:</li> <li>• Add missing LinesOfService schema in StorageService</li> <li>• Add missing Revision/Kind annotations to Actions added in 1.1.0</li> <li>• Fix issues in Redfish.Uri</li> <li>• Add RDE Dictionary binaries and map types to published schema types</li> <li>• Add additional enum to WriteCachePolicyTypes</li> </ul>

## 2.16 Release 1.1.0b

Table 17 summarizes the changes made for release 1.1.0b.

Table 17: Revision History for release 1.1.0b

Revision	Date	Changes
1.1.0 b	3/2 4/20	<p>Released as Technical Position, Corrected Specification:</p> <ul style="list-style-type: none"> <li>• TLS requirements now based on both ISO and SNIA standards</li> <li>• Redfish references now based on both ISO and SNIA standards Bibliography added</li> </ul>

## 2.17 Release 1.2.0

Table 18 summarizes the changes made for release 1.2.0.

Table 18: Revision History for release 1.2.0

Revision	Date	Changes
1.2.0	5/2 9/20	<p>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. Note: This release is done in conjunction with the DMTF's Redfish Forum Work-in-Progress June 2020 release of DSP-ISO014 (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. Functionality availability in Swordfish includes:</p> <ul style="list-style-type: none"><li>• Enhancements to Volume, StoragePools</li><li>• New schema: NVMeDomain Other supporting documentation released in conjunction with this specification and schema bundle:</li><li>• Multiple mockups reflecting multiple implementation permutation options (available on swordfishmockups.com)</li><li>• Model overview documentation (NVMe to RF/SF Model Mapping Working Draft, dated May 2020) Additional Enhancements in the Specification and schema:</li><li>• 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.</li><li>• Added support to Volume for new Actions: ChangeRAIDLayout, ForceEnable.</li><li>• Added InitializeMethod, IOPerfModeEnabled, and OwningStorageResource and link to JournalingMedia to</li></ul>

Revision	Date	Changes
		<p>Volume.</p> <ul style="list-style-type: none"> <li>Enhanced CHAP definitions and usage in StorageGroup.</li> <li>Fix multiple URI issues across various schema.</li> <li>Add additional enum members: <ul style="list-style-type: none"> <li>None to RAIDType</li> <li>Off to WriteCachePolicy</li> </ul> </li> </ul>
		<ul style="list-style-type: none"> <li>Enhanced support for RDE Dictionaries</li> <li>Add LinesOfService to StorageService Additional Documentation:</li> <li>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. New mockups:</li> <li>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).</li> </ul>

## 2.18 Release 1.2.1

Table 19 summarizes the changes made for release 1.2.1.

Table 19: Revision History for release 1.2.1

Revision	Date	Changes
1.2.1	8/1 8/20	Note: This release is done in conjunction with the DMTF's Redfish

Revision	Date	Changes
		<p>Forum 2020.3 Release of the Redfish Specification, schema bundle and other supporting materials.</p> <p>This release adds to the Swordfish bundle:</p> <ul style="list-style-type: none"> <li>• Swordfish profiles (previous releases have been distributed separately) New Documentation:</li> <li>• Initial Release of the Swordfish NVMe Model Overview and Mapping Guide. The Swordfish NVMe Model Overview and Mapping Guide defines the model to manage NVMe and NVMe-oF storage systems with Redfish and Swordfish. It provides the detailed mapping information between the NVMe, NVMe-oF specifications and the Redfish and Swordfish specifications. Functionality availability in Swordfish includes:</li> <li>• NVMe Mapping Support, Enhancements to Volume, StoragePools Additional Enhancements in the Specification and schema:</li> <li>• Added InitializeMethod property to Volume.</li> <li>• Made DedicateSpareDrives ReadWrite-able</li> <li>• Added enhanced Volume Access Capabilities and usage in StorageGroup.</li> <li>• Fix multiple URI issues across various schema.</li> </ul> <p>Profiles:</p> <ul style="list-style-type: none"> <li>• Enhance profiles to include support / requirements for /Storage (move support to v1.1.0 level)</li> </ul> <p>User's Guide:</p> <ul style="list-style-type: none"> <li>• Add use cases for NVMe specific cases: <ul style="list-style-type: none"> <li>◦ Provision / deprovision namespace</li> <li>◦ Attach / Detach a namespace</li> <li>◦ Report capacity for a namespace</li> <li>◦ Report remaining life for a namespace</li> </ul> </li> </ul>

Revision	Date	Changes
		<p>All documents:</p> <ul style="list-style-type: none"> <li>Updated formatting of tables to support automatic table numbering and ISO compatible table representation.</li> </ul>

## 2.19 Release 1.2.1a

Table 20 summarizes the changes made for release 1.2.1a.

Table 20: Revision History for release 1.2.1a

Revision	Date	Changes
1.2.1 a	9/2 9/20	<p>Updated JSON and YAML schema copyrights, and YAML OpenSchema reference changed to v4 instead of v4.0.3. Specification:</p> <ul style="list-style-type: none"> <li>Added bibliography</li> <li>Updated TLS references</li> </ul>

## 2.20 Release 1.2.1c

Table 21 summarizes the changes made for release 1.2.1c.

Table 21: Revision History for release 1.2.1c

Revision	Date	Changes
1.2.1 c	10/2 0/20	<p>Schema fixes:</p> <ul style="list-style-type: none"> <li>Updated JSON and YAML schema to fix OdataSchema include issues.</li> <li>Fix \$ref issues throughout openapi.yaml.</li> <li>Fix issues with updateable Annotations.</li> <li>Update with additional Redfish.URI annotations. Specification:</li> <li>Updated with additional Redfish.URI annotations.</li> </ul>

## 2.21 Release 1.2.1c SS

Table 22 summarizes the changes made for release 1.2.1c SS.

Table 22: Revision History for release 1.2.1c SS

Revision	Date	Changes
1.2.1 c SS	10/3 1/20	Released as SNIA Standard.

## 2.22 Release 1.2.2

Table 23 summarizes the changes made for release 1.2.2.

Table 23: Revision History for release 1.2.2

Revision	Date	Changes
1.2.2	3/2/ 21	<p>Schema changes:</p> <ul style="list-style-type: none"><li>• Add actions to Add and Remove drives directly from StoragePool.</li><li>• Split NVMeFirmwareImage and NVMeDomains schemas.</li><li>• Deprecate use of NetworkPort; replace with Port.</li><li>• Update Redfish.URI references.</li><li>• Corrected \$ref references in JSON schema files.</li><li>• Fix incorrect references in deprecated JSON files.</li></ul> <p>Profiles:</p> <ul style="list-style-type: none"><li>• Added NVMe drive, Advanced Features and Ethernet Attach profiles</li><li>• Enhanced Swordfish event profile</li></ul> <p>Mapping Document:</p> <ul style="list-style-type: none"><li>• Added detailed mapping information to match information in NVMe drive profiles for many new referenced properties, and included guidance for mandatory/recommended implementation as reflected in the profiles.</li><li>• Added sections for firmware update, with details for NVMe Drive implementation requirements.</li></ul>



Revision	Date	Changes
		<ul style="list-style-type: none"> <li>Added cross-references to User's Guide NVMe-specific use cases.</li> </ul>
		<p>Errata fixes</p> <p>– correct diagram, correct table headers.</p> <p>User's Guide:</p> <ul style="list-style-type: none"> <li>Added cross-references to NVMe mapping document</li> <li>Added new use cases for StoragePool actions.</li> <li>Errata fixes.</li> </ul> <p>New Property Guide document: intended primarily as a reference for Schema authors to locate existing property definitions within the Swordfish Schema.</p> <p>Specification:</p> <ul style="list-style-type: none"> <li>Added sections to document use of complex types.</li> <li>Updated common properties sections.</li> </ul>

## 2.23 Release 1.2.2a

Table 24 summarizes the changes made for release 1.2.2a.

Table 24: Revision History for release 1.2.2a

Revision	Date	Changes
1.2.2 a	6/1 4/21	<p>Schema:</p> <ul style="list-style-type: none"> <li>Updated RDE dictionary files to correct build issues.</li> <li>Updated schema dependencies to Redfish version 2021.1</li> <li>Copyrights updated to 2021. Property Guide:</li> <li>Entry updates corrected from documentation generation tool. All documents :</li> <li>Released as SNIA Standard or White paper instead of Working Draft (modified front matter).</li> </ul>

## 2.24 Release 1.2.3

Table 25 summarizes the changes made for release 1.2.3.

Table 25: Revision History for release 1.2.3

Revision	Date	Changes
1.2.3	8/3 0/21	Schema: <ul style="list-style-type: none"><li>• Updates / corrections to Redfish.URI annotations</li><li>• Add IsBootCapable to Volume; Add SupportedPoolTypes to StoragePool Profiles:</li><li>• Correct formatting in SwordfishDiscovery</li><li>• Add new profile for Swordfish NVMe Front End (used by complex devices such as arrays) Documentation:</li><li>• Update Mapping Guide with new information, corresponding to the Swordfish NVMe Front End profile</li><li>• User's Guide: Added new use cases, correct and update examples</li><li>• Error Handling: Add new message use case</li></ul>

## 2.25 Release 1.2.3 SNIA Standard

Table 26 summarizes the changes made for release 1.2.3.

Table 26: Revision History for release 1.2.3 SNIA Standard

Revision	Date	Changes
1.2.3	12/ 5/21	Release as SNIA Standard

## 2.26 Release 1.2.4

Table 27 summarizes the changes made for release 1.2.4.

Table 27: Revision History for release 1.2.4

Revision	Date	Changes
1.2.4	4/1 2/22	Schema:

Revision	Date	Changes
		<ul style="list-style-type: none"> <li>• Update copyrights to 2022.</li> <li>• IOStatistics: clarify intent regarding reset / wrap.</li> <li>• StoragePool: errata fixes for Actions.</li> <li>• Volume: errata fixes for Actions. Add: LBAFormatsSupported property to NVMeNamespaceProperties. Profiles:</li> <li>• Add new profiles for Access Rights management, Connectivity Rights management, Management Controllers, NVMe EBOF, PCIe JBOF, and NVMe-oF.</li> <li>• Move Swordfish profiles to SwordfishInteroperabilityProfile as base extends Redfish Interoperability Profile, adding support for “conditionals” and comparison for Required Profiles.</li> <li>• Update FeaturesRegistry to v1.3.0 to correspond to latest versions of all profiles.</li> <li>• Updates in multiple profiles to correct conformance to interoperability schema. Modifications to support change for new RequiredProfiles conditionals support.</li> <li>• Add new requirements to NVMeDrive to conform to schema updates for SecureErase.</li> </ul>
		<p>Metrics Templates:</p> <ul style="list-style-type: none"> <li>• In conjunction with release of Swordfish white paper: “Metrics and Telemetry in Swordfish”, add templates for standardized metric and telemetry reporting for capacity metrics.</li> </ul> <p>Documentation:</p> <p>New white paper available: “Metrics and Telemetry in Swordfish”</p> <p>NVMe Mapping Guide:</p> <ul style="list-style-type: none"> <li>• Errata fixes throughout.</li> <li>• Added section for EBOF configuration, and additions to appendix A to correspond to EBOF, JBOF, and NVMe-oF configurations.</li> </ul> <p>User’s Guide:</p> <ul style="list-style-type: none"> <li>• Add multiple new use cases for access management and</li> </ul>

Revision	Date	Changes
		<p>volume creation through capabilities.</p> <ul style="list-style-type: none"> <li>• Enhance language and examples responses throughout.</li> <li>• Add use of content-type headers.</li> </ul>
		<p>Property Guide and Specification:</p> <ul style="list-style-type: none"> <li>• Updated to include new schema and property definitions.</li> </ul>

## 2.27 Release 1.2.4a

Table 28} summarizes the changes made for release 1.2.4a.

Table 28: Revision History for release 1.2.4a

Revision	Date	Changes
1.2.4 a	7/1 2/22	Release as SNIA Standard

## 2.28 Release 1.2.5

Table 29 summarizes the changes made for release 1.2.5.

Table 29: Revision History for release 1.2.5

Revision	Date	Changes
1.2.5	3/1 6/22	<p>Profile Changes:</p> <ul style="list-style-type: none"> <li>• Add new Swordfish profile document to describe profiles.</li> <li>• Descope / Simplify requirements for PCIe JBOF profile</li> <li>• Errata fixes for SubordinateToResource syntax in multiple profiles</li> <li>• Enhancements to add InstanceRequirements to discovery and replication profiles</li> <li>• Add requirements to NVMe profiles:</li> </ul>

Revision	Date	Changes
		<ul style="list-style-type: none"> <li>◦ Links.Controllers required in namespace for NVMeDrive and NVMeFrontEnd</li> <li>◦ Add DNI for DiscoveryControllers in NVMeDrive, NVMeEthernetAttach and NVMeFrontEnd</li> <li>◦ Add HDD support to NVMeDrive</li> <li>◦ Change FailurePredicted to Recommended for Admin and IOControllers in NVMeDrive</li> </ul>
		<ul style="list-style-type: none"> <li>• Enhance ReadRequirement property to define “DoNotImplement” throughout profile set, replacing commented usage.</li> <li>• Errata fix to clarify usage for Manufacturer in NVMe admin controllers for NVMeDrive, NVMeFrontEnd, and NVMeoF profiles.</li> <li>• Update Mapping and Masking profile to reflect usage for Connections, deprecating use of StorageGroups.</li> <li>• Update replication profiles to support ReplicationEnabled as InstanceRequirement.</li> <li>• Update profile versioning to align with new Redfish guidance, adding explicit versioning to filenames.</li> </ul>
		<p>Schema:</p> <ul style="list-style-type: none"> <li>• Simplify all Redfish.Release versions</li> <li>• Add Replication.Enabled to Volume, StoragePool, FileSystem, FileShare</li> <li>• Update DeduplicationEnabled, CompressionEnabled, and EncryptionEnabled in StoragePool to ReadWrite.</li> <li>• Errata fixes:</li> </ul>
		<ul style="list-style-type: none"> <li>• Incorrect AutoExpandReferences removed in ConsistencyGroup and Volume.</li> <li>• Change StorageCollection in StorageService to an array.</li> <li>• Volume: <ul style="list-style-type: none"> <li>◦ For NVMe: add LBAFormats (for collection</li> </ul> </li> </ul>

Revision	Date	Changes
		<p>capabilities annotation usage) and LBAFormat for instance usage.</p> <ul style="list-style-type: none"> <li>◦ Add Controllers to Links</li> <li>◦ Add NamespaceType to NVMeNamespaceProperties</li> <li>◦ Add VolumeMetrics schema</li> </ul>
		<p>NVMe Mapping Guide:</p> <ul style="list-style-type: none"> <li>• Updated all references from NVMe 1.4 Specification to the NVM Express Base Specification 2.0c throughout. Update references to figures in NVMe 2.0 Base Specification as well as the NVM Express NVM Command Set Specification 1.0c, NVMe over PCIe Transport Specification 1.0c, and NVMe-MI 1.2c Specification.</li> <li>• Document usage of SecuritySend and SecurityReceive Actions on StorageController</li> <li>• Define usage for Links.Controllers in Namespace (volume)</li> </ul>
		<ul style="list-style-type: none"> <li>• Errata Fixes: <ul style="list-style-type: none"> <li>◦ Clarify references to CapacitySource collection vs instance</li> <li>◦ Standardize nomenclature for Mandatory instances throughout</li> </ul> </li> </ul>
		<p>User's Guide</p> <ul style="list-style-type: none"> <li>• Add Create Consistency Group use case</li> <li>• Add new section for security related use cases.</li> <li>• New use cases include: <ul style="list-style-type: none"> <li>◦ Query Supported Security Protocols</li> <li>◦ SecuritySend Usage (NVMe example)</li> <li>◦ SecurityReceive Usage (NVMe example)</li> <li>◦ Add Etag headers to use case responses</li> </ul> </li> </ul>

Revision	Date	Changes
		<ul style="list-style-type: none"> <li>Errata Fixes: <ul style="list-style-type: none"> <li>Correct return value in Create New Connection use case</li> </ul> </li> </ul> <p>Specification:</p> <ul style="list-style-type: none"> <li>Align EntitySets usage with Redfish.</li> </ul>
		<p>Mockups:</p> <ul style="list-style-type: none"> <li>Created new mockups to show NVMe SMART Metrics, NVM/TCP Array, NVMe Discovery Controller</li> <li>Extend mockups to show new: <ul style="list-style-type: none"> <li>Drive, Volume and StorageController Metrics</li> <li>SecuritySend and SecurityReceive</li> </ul> </li> <li>Updated mockups to show new functionality defined in Redfish and Swordfish schema enhancements</li> <li>Ensure mockups conform to Swordfish profiles, as verified by Swordfish Conformance Test Program Test Suite</li> </ul>

## 2.29 Release 1.2.5a

Table 30} summarizes the changes made for release 1.2.5a.

Table 30: Revision History for release 1.2.5a

Revision	Date	Changes
1.2.5a	6/20/23	<p>Release as SNIA Standard</p> <p>Documentation:</p> <ul style="list-style-type: none"> <li>Corrected missing section import.</li> <li>Fix typos in schema.</li> </ul> <p>User's Guide</p>

Revision	Date	Changes
		<ul style="list-style-type: none"> <li>Remove erroneous use case entry.</li> </ul> <p>Profiles</p> <ul style="list-style-type: none"> <li>Updated minimum protocol requirements to sync with Redfish release version 2023.1.</li> <li>Corrected management controller profile for CompareProperties.</li> <li>Aligned NVMeoF profile and management controller profile versions.</li> <li>Corrected alignment of profile version numbers and Features registry.</li> <li>Aligned profiles and Features Registry with emerging Swordfish CTP requirements.</li> </ul>

## 2.30 Release 1.2.6

+@Table\_31 summarizes the changes made for release 1.2.6.

Table 31: Revision History for release 1.2.6

Revision	Date	Changes
1.2.6	4/9/24	<p>Global Changes:</p> <ul style="list-style-type: none"> <li>Release as a SNIA Standard</li> </ul>
1.2.6	1/22/24	<p>Global Changes:</p> <ul style="list-style-type: none"> <li>Release as a Working Draft</li> <li>Copyrights updated to 2024.</li> <li>Updates SNIA Front Matter.</li> </ul>
		<p>Profile Changes:</p> <ul style="list-style-type: none"> <li>Add support for Features Registry v1.6.0</li> <li>v1.3.0 Swordfish NVMe Drive: Removes LBAFormatSize requirement</li> <li>v1.2.0 Swordfish IOPerformance: Move IOStatistics</li> </ul>



Revision	Date	Changes
		<p>requirement to metrics</p> <ul style="list-style-type: none"> <li>• v1.2.0 SwordfishCoSDiscovery: remove FileProvisioning feature dependency, Errata fixes to LoSCapabilities checks.</li> <li>• Errata fixes to fix cross dependencies: BlockCapacityManagment: 1.2.0, BlockCoSLocalReplication 1.3.0, BlockCoSRemoteReplication 1.3.0, CoSDiscovery 1.2.0, NVMeoF 1.2.0</li> <li>• v1.30 SwordfishBlockMappingMasking - works with Connections instead of StorageGroups</li> <li>• v1.2.0 NVMeDriveAdvancedFeatures corrects multiple errors in profile</li> </ul>
		<p>NVMe Mapping Guide:</p> <ul style="list-style-type: none"> <li>• Updated cross-references.</li> <li>• Updated Contributing members.</li> <li>• Added NVMeDomains Object, and updated corresponding mockups.</li> <li>• Added missing reference to Drives and EBOFs in HTML version of document.</li> <li>• Updated NVMeNamespaceProperties to new guidance for LBAFormats representation (in both mockups and mapping properties). Removed/deprecated NVMeNamespaceProperties.NumberLBAFormats.</li> <li>• Added new section Namespace Capabilities.</li> <li>• Errata Fixes: <ul style="list-style-type: none"> <li>◦ corrected references to PredictedMediaLifetLeftPercent and NVMeoFDiscoverySubsystems properties.</li> </ul> </li> </ul>
		User's Guide

Revision	Date	Changes
		<ul style="list-style-type: none"> <li>• Simplified and updated Management Domains, Actors.</li> <li>• Add new use cases (access management): <ul style="list-style-type: none"> <li>◦ Create Endpoint</li> <li>◦ Delete Endpoint</li> <li>◦ Create Endpoint Group</li> </ul> </li> <li>• Add new use cases (block provisioning): <ul style="list-style-type: none"> <li>◦ Delete Volume from Storage Pool</li> </ul> </li> <li>• Add new use cases (capacity management): <ul style="list-style-type: none"> <li>◦ Review Metric Trends</li> </ul> </li> <li>• Add new use cases (NVMe): <ul style="list-style-type: none"> <li>◦ Namespace Creation Permission</li> </ul> </li> <li>• Updated use cases (IOPerformance): <ul style="list-style-type: none"> <li>◦ Retrieve Volume Metrics</li> </ul> </li> <li>• Updated use cases (Security Management): <ul style="list-style-type: none"> <li>◦ Security Send</li> <li>◦ Security Receive</li> </ul> </li> <li>• Errata corrections to use cases: <ul style="list-style-type: none"> <li>◦ Create New Connection, Create Consistency Group, Create Volume from Storage Pool.</li> </ul> </li> </ul>
		<p>Specification:</p> <ul style="list-style-type: none"> <li>• Adds new Metrics for FileSystem, StoragePool, StorageService, and enhancements to VolumeMetrics. IOStatistics property moved to Metrics, and deprecated in FileSystem, StoragePool, StoragePool, StorageService (and Volume).</li> <li>• Fully adds new mapping and masking models using Connections in RF Fabrics, deprecates StorageGroups URIs.</li> <li>• Adds support for new volume properties: ProvidingStoragePool, ChangeStripSize, ALUA to manage reservations.</li> <li>• NVMe: <ul style="list-style-type: none"> <li>◦ Adds NVMe Domain Management, including ALUA support with Domain Contents and Firmware Images.</li> <li>◦ Updates and simplifies LBAFormat representation, and adds multiple namespace management.</li> <li>◦ Deprecates NVMeFirmwareImage schema.</li> </ul> </li> </ul>

## 2.31 Release 1.2.7

Table 32 summarizes the changes made for release 1.2.7.

Table 32: Revision History for release 1.2.7

Revision	Date	Changes
1.2.7	5/2 1/24	Global Changes: <ul style="list-style-type: none"><li>• Release as a Working Draft</li></ul>
		Profile and Feature Changes: <ul style="list-style-type: none"><li>• Enhanced Feature Registry to support resource-level features capability.</li></ul>
		Interop Guide: <ul style="list-style-type: none"><li>• Initial release</li></ul>
		NVMe Mapping Guide: <ul style="list-style-type: none"><li>• Added <code>ConfigurationLock</code>, <code>TargetConfigurationLockLevel</code>, and <code>ConfigurationLockState</code> definitions, mappings, and guidance.</li><li>• Added Domain and Implicit Domain examples and guidance.</li><li>• Added NVMeDomains Object, and updated corresponding mockups.</li><li>• Added guidance for StoragePools in Subsystem</li><li>• Added new NVMeSubsystemProperties for Namespace Management: <code>MaxNamespacesSupported</code> and <code>SharedNamespaceControllerAttachmentSupported</code></li><li>• Add updated mapping guidance for <code>DisplayName</code> to use Namespace Admin Label</li><li>• Errata Fixes:<ul style="list-style-type: none"><li>◦ corrected references to <code>PredictedMediaLifetLeftPercent</code> and</li></ul></li></ul>

Revision	Date	Changes
		NVMeoFDiscoverySubsystems properties.
		User's Guide  Add Apply Firmware Image for NVMe controller use case Add body elements to POST responses Cleanup of overview sections Reincorporated actor and management domains sections.
		NVMe-oF White Paper  Updated diagrams for clarity.
		Specification: <ul style="list-style-type: none"> <li>• Move <code>IOStatistics</code> to unversioned namespace. This is used in: <code>FileSystemMetrics</code> <code>FileSystem</code> <code>StoragePoolMetrics</code> <code>StoragePool</code> <code>StorageServiceMetrics</code> <code>VolumeMetrics</code> <code>Volume</code></li> <li>• Add guidance for Operations usage</li> <li>• Add guidance for volume state and status during long-running operations</li> <li>• Expansion of \$metadata description</li> </ul>

## 2.32 Release 1.2.7

Table 33 summarizes the changes made for release 1.2.7.a.

Table 33: Revision History for release 1.2.7

Revision	Date	Changes
1.2.7	8/1 3/24	Global Changes: <ul style="list-style-type: none"> <li>• Release as SNIA Standard</li> </ul>
		Profile and Feature Changes:

Revision	Date	Changes
		<ul style="list-style-type: none"> <li>Errata change in FeaturesRegistry: set Resources to type Resource.Resource</li> </ul>
		NVMe Mapping Guide: <ul style="list-style-type: none"> <li>Updated ConfigurationLock, TargetConfigurationLockLevel, and ConfigurationLockState definitions, mappings, and guidance.</li> </ul>
		Specification: <ul style="list-style-type: none"> <li>Errata change in FeaturesRegistry: set Resources to type Resource.Resource</li> <li>Incorporates inherited RF schema from 2042.2</li> </ul>
		OpenAPI Schema: <ul style="list-style-type: none"> <li>Built with updated tooling</li> </ul>

## 2.33 Release 1.2.8

Table 34 summarizes the changes made for release 1.2.8.

Table 34: Revision History for release 1.2.8

Revision	Date	Changes
1.2.8	01/28/25	Global Changes: <ul style="list-style-type: none"> <li>Release as SNIA Working Draft</li> </ul>
		NVMe Mapping Guide: <ul style="list-style-type: none"> <li>Added mapping for MaxAttachedNamespaces to controllers.</li> <li>Add Transport Service IDs to StorageController for</li> </ul>

Revision	Date	Changes
		NVMe / NVMe-oF
		<p>Schema Changes (in Specification):</p> <ul style="list-style-type: none"> <li>• Add CompressionSavingsBytes, DeduplicationSavingsBytes, and ThinProvisioningSavingsBytes to FileSystemMetrics, StoragePoolMetrics, StorageServiceMetrics and VolumeMetrics.</li> <li>• Add</li> <li>• Features Registry: Fix type of Resources collection</li> <li>• Update MaxAttachedNamespaces to work consistently with RF 2024.3</li> <li>• Add Actions to Connection: Add / Remove volume info</li> <li>• Move Capacity to unversioned namespace</li> </ul>
		<p>User's Guide:</p> <ul style="list-style-type: none"> <li>• Add Create FileShare / FileSystem Use Cases</li> <li>• Updated CreateConsistencyGroup Use Case to use ConsistencyGroup and move to MappingMasking section</li> <li>• Expand normative references</li> </ul>
		<p>Interoperability Guide and Profiles:</p> <ul style="list-style-type: none"> <li>• Update Event profile to remove references to licensing</li> <li>• Updated CreateConsistencyGroup Use Case to use ConsistencyGroup and move to MappingMasking section</li> <li>• Update NVMeNamespaceManagement profile</li> <li>• Features Registry: Fix type of Resources collection</li> </ul>
		<p>Mockups:</p> <ul style="list-style-type: none"> <li>• Converged mockups to use PhysicalAddress instead of PostalAddress (per Redfish Forum guidance)</li> <li>• Updated CreateConsistencyGroup Use Case to use</li> </ul>

Revision	Date	Changes
		<p>ConsistencyGroup and move to MappingMasking section</p> <ul style="list-style-type: none"> <li>• Add non-COS filesystem mockups</li> </ul>
		<p>NVMe-oF White Paper:</p> <ul style="list-style-type: none"> <li>• Added more details for exporting resourcea dna managing exported resources.</li> <li>• Correct formatting errors in document.</li> </ul>
1.2.8	05/22/25	Release as SNIA Standard