



Swordfish Scalable Storage Management API Specification

Version 1.0.7a

ABSTRACT: The Swordfish Scalable Storage Management API defines a RESTful interface and a standardized data model to provide a scalable, customer-centric interface for managing storage and related data services.

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>.

Working Draft

Last Updated 8 November 2018

USAGE

Copyright © 2018 SNIA. All rights reserved. All other trademarks or registered trademarks are the property of their respective owners.

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, or any portion thereof, 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 © 2018, 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.

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

Copyright © 2016-2018 Storage Networking Industry Association.

Revision History

Date	Revision	Notes
19 September 2016	1.0.0	Initial Release
12 October 2016	1.0.1	Errata release for general clean up and formatting consistency
1 November 2016	1.0.2	Errata release to change multiple collections' types from collections (arrays) to ResourceCollections to conform to Redfish usage guidelines Change multiple collections' types from collections (arrays) to ResourceCollections to conform to Redfish usage guidelines and move NavigationProperties from Links section.
24 January 2017	1.0.3	Errata release to move complex types and enum to versioned namespace Schedule schema: add property json schema fix (Swordfish to swordfish) Specification enhancements, multiple areas User's guide: multiple new use cases and new document section

Date	Revision	Notes
25 April 2017	1.0.4	Errata release with minor updates to schema: move FileShare collection, integrate DMTF and SNIA versions of Volume, fix incorrect property references and update descriptions. Update mockups. User's guide: Update cross-references.
3 October 2017	1.0.5	Errata release to include schema simplifications and other lessons from initial implementations, as well as general cleanup of specification.
13 February 2018	1.0.6	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.
12 October 2018	1.0.7	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 Schema updates: 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
8 November 2018	1.0.7a	Restored RAIDType property that was missing from 1.0.7 Minor correction to schema versioning

Current Revision

SNIA is actively engaged in expanding and refining the Swordfish specification. The most current revision can be found on the SNIA web site at https://www.snia.org/tech_activities/standards/curr_standards/swordfish.

Contact SNIA

SNIA Web Site

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

FEEDBACK AND INTERPRETATIONS

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.

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.

Release Number: Versioned material with a version number 'v' and release number 'r' shall be backwards compatible with previous revisions of the material with the same version number, and a lower release number. A minor revision represents a technical change to existing content or an adjustment to the scope of the versioned material. Each minor revision causes the release number to be increased by one.

Errata Number: Versioned material having version number 'v', a release number 'r', and an errata number 'e' should be backwards compatible with previous revisions of the material with the same version number and release number ("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 the incompatibility is necessary for correct operation of implementations of the versioned material.

About SNIA

The Storage Networking Industry Association (SNIA) is a non-profit organization made up of member companies spanning information technology. A globally recognized and trusted authority, SNIA's mission is to lead the storage industry in developing and promoting vendor-neutral architectures, standards and educational services that facilitate the efficient management, movement and security of information.

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 following members:

Table 2: Contributors

Member	Representatives
Broadcom Limited	Richelle Ahlvers
Dell Inc.	Patrick Boyd George Ericson Michael Raineri Rich Roscoe
Hitachi Data Systems	Eric Hibbard
Hewlett Packard Enterprise	Jeff Hilland Chris Lionetti John Mendonca Doug Voigt
Inova Development Inc.	Karl Schopmeyer
Intel Corporation	Slawek Putyrski Paul von Behren
Microsemi	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

Table of Contents

USAGE	2
DISCLAIMER	3
Revision History	3
Current Revision	4
Contact SNIA	5
FEEDBACK AND INTERPRETATIONS	5
INTENDED AUDIENCE	5
VERSIONING POLICY	5
About SNIA	6
Acknowledgements	6
Table of Contents	8
1 Abstract	10
2 Scope	10
3 Normative References	11
3.1 Overview	11
3.2 Approved references	11
3.3 References under development	12
3.4 Other references	12
4 Terms and Definitions	12
4.1 Overview	12
4.2 Swordfish-specific Terms	13
4.3 Reference to Redfish terms	13
4.4 Keywords (normative language terms)	14
5 Swordfish Overview	15
5.1 Introduction	15
5.2 Relation to Redfish	15
5.3 Storage Services	19
5.4 The ClassOfService resource	20
5.5 The Endpoint resource	20
5.6 The Endpoint Collection resource	21
5.7 The EndpointGroup resource	21
5.8 The EndpointGroupCollection resource	21
5.9 The StorageGroup resource	21
5.10 The StoragePool resource	21
5.11 The Volume resource	22
5.12 The FileSystem resource	22
6 Data model	22
6.1 Swordfish extensions to Redfish	22
6.2 Entity Sets	23
6.3 Addressing entities within a collection	23
6.4 Addressing members of a ResourceCollection	23
6.5 Schema repository	24
6.6 Referencing other schemas	24
7 Schema Considerations	24
7.1 Schema Introduction and Overview	24
7.2 Common schema attributes	24
7.3 Default values and NULLABLE attributes	25
7.4 Common schema annotations	26
7.5 Property implementation requirements	26
7.6 Schema repository	27
7.7 Referencing other schemas	27
8 Implementation requirements	27
8.1 Security	28
8.2 General constraints	28
8.3 Discovering Swordfish resources	29

8.4 ClassOfService requirements	29
8.5 StorageSystems requirements	29
8.6 Entity Sets	30
8.7 Addressing entities within a collection	30
8.8 Addressing members of a ResourceCollection	30
9 Swordfish type definitions	31
9.1 Overview	31
9.2 Common properties	31
9.3 Complex Types	38
9.4 CapacitySource 1.1.1	38
9.5 ClassOfService 1.1.1	43
9.6 ClassOfServiceCollection	45
9.7 DataProtectionLineOfService 1.1.1	46
9.8 DataProtectionLoSCapabilities 1.1.2	49
9.9 DataSecurityLineOfService 1.0.1	52
9.10 DataSecurityLoSCapabilities 1.1.2	56
9.11 DataStorageLineOfService 1.2.0	61
9.12 DataStorageLoSCapabilities 1.2.0	64
9.13 DriveCollection	66
9.14 EndpointGroup 1.1.2	67
9.15 EndpointGroupCollection	70
9.16 FileShare 1.1.2	71
9.17 FileShareCollection	75
9.18 FileSystem 1.2.1	76
9.19 FileSystemCollection	82
9.20 HostedStorageServices	82
9.21 IOConnectivityLineOfService 1.1.1	83
9.22 IOConnectivityLoSCapabilities 1.1.2	86
9.23 IOPerformanceLineOfService 1.0.2	89
9.24 IOPerformanceLoSCapabilities 1.1.2	90
9.25 SpareResourceSet 1.0.0	94
9.26 StorageGroup 1.2.0	96
9.27 StorageGroupCollection	101
9.28 StoragePool 1.2.0	102
9.29 StoragePoolCollection	106
9.30 StorageReplicaInfo 1.1.1	107
9.31 StorageService 1.2.0	108
9.32 StorageServiceCollection	115
9.33 StorageSystemCollection	116
9.34 Volume 1.3.1	117
9.35 VolumeCollection	126

1 Abstract

The Swordfish Scalable Storage Management API ("Swordfish") defines a RESTful interface and a standardized data model to provide a scalable, customer-centric interface for managing storage and related data services. It extends the Redfish Scalable Platforms Management API Specification (DSPo266) from the DMTF.

2 Scope

Swordfish extends the Redfish Scalable Platforms Management API Specification to define a comprehensive, RESTful API for storage management that addresses block storage, file systems, object storage, and storage network infrastructure. It is centered around common operational and business concerns of storage management, including:

- Configuration and provisioning
- Monitoring
- Event and log management
- Performance assessment
- Diagnostics
- Fault detection and remediation
- Security
- Accounting and resource consumption

Swordfish's storage model is built around well-defined classes of service, which provide a means to map high-level business goals and objectives to specific, storage-based actions and requirements, in a clear and consistent way that can be applied uniformly across a broad spectrum of storage configurations and storage types (e.g., block storage, file systems, object stores). Common storage management functionality covered by class of service includes snapshots, replication, mapping and masking, and provisioning.

The Redfish specification provides the protocols and a core set of data models and behaviors for the management of systems. It defines the elements and behaviors that are mandatory for all Redfish implementations. Additionally it defines additional elements and behaviors that can be chosen by system vendors or manufacturers. The specifications also defines points at which OEM (system vendor) extensions can be provided by a given implementation. The specifications specifies normative requirements for Redfish Services and associated materials, such as Redfish Schema files. The Redfish specifications does not set requirements for Redfish clients, but will indicate what a Redfish client should do in order to access and utilize a Redfish Service successfully and effectively.

The Swordfish specification defines additional data models and behaviors for the management of storage systems and storage infrastructure. A Swordfish implementation shall conform to all requirements specified in the Redfish specifications.

Swordfish is suitable for a wide range of storage, from small-scale object drives, integrated RAID cards or RBODs providing storage services, to external disk arrays or file servers, to infrastructure providing storage services for converged, hyperscale and large scale cloud environments.

This document defines the Swordfish Scalable Storage Management API.

3 Normative References

3.1 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.

3.2 Approved references

Table 1: Approved normative references

Tag	Title (Version)	Author	URL
ISO-8601	Data elements and interchange formats -- Information interchange -- Representation of dates and times -- Part 1: Basic rules	ISO/IEC	http://www.iso.org/iso/home/store/catalogue_ics/catalogue_detail_ics.htm?csnumber=70907
ISO-Direct	ISO/IEC Directives, Part 2 Principles and rules for the structure and drafting of ISO and IEC documents (Seventh Edition, 2016)	ISO/IEC	http://isotc.iso.org/livelink/livelink/fetch/2000/2122/4230450/4230456/ISO_IEC_Directives_Part_2_Principles_and_rules_for_the_structure_and_drafting_of_ISO_and_IEC_documents_-_2016%287th_edition%29_-_PDF.pdf?nodeid=17667902&vernum=-2
Redfish	Redfish Scalable Platforms Management API Specification (v1.4.0)	DMTF	http://www.dmtf.org/sites/default/files/standards/documents/DSP0266_1.4.0.pdf
OData	Open Data Protocol (v. 4.0)	OASIS	https://www.oasis-open.org/standards#odatav4.0
RFC3986	Uniform Resource Identifier (URI): Generic Syntax (2005)	The Internet Society	http://www.rfc-base.org/txt/rfc-3986.txt
CSDL	Common Schema Definition Language (4.0)	OASIS	http://docs.oasis-open.org/odata/odata/v4.0/odata-v4.0-part3-csdl.html
ITIL	ITIL Glossary (2011)	ITIL	https://www.axelos.com/Corporate/media/Files/Glossaries/ITIL_2011_Glossary_GB-v1-o.pdf

Tag	Title (Version)	Author	URL
Units	The Unified Code for Units of Measure (v2.0.1)	Regenstrief Institute, Inc. and the UCUM Organization	http://unitsofmeasure.org/trac
TLS	Transport Layer Security (TLS) Protocol Version 1.2	IETF	https://www.ietf.org/rfc/rfc5246.txt
SPC-4	SCSI Primary Commands - 4 (SPC-4) INCITS 513-2015	T10	http://www.techstreet.com/cgi-bin/joint.cgi/incits

3.3 References under development

Documents referenced in this section are under active development, and subject to revision or replacement at any time. In the event that the provided URL is no longer valid, refer to the related parent page to locate a replacement.

Table 2: References under development

Tag	Title (Version)	Author	URL	Parent Page
RedfishResource	Redfish Resource and Schema Guide	DMTF	http://www.dmtf.org/sites/default/files/standards/documents/DSP2046_2017.0a.pdf	http://www.dmtf.org/redfish

3.4 Other references

None defined in this document.

4 Terms and Definitions

4.1 Overview

In this document, some terms have a specific meaning beyond the normal English meaning. Those terms are defined in this clause. New terms, frequently used Redfish terms.

4.2 Swordfish-specific Terms

4.2.1 Definitions

The following terms are used in this document.

Table 3: Swordfish terms

Term	Definition
Entity	An element in a model that represents resources. The element may be either a type declaration or a model instance representing an instance of the resource.
Entity Instance	A model element that represents the information and behaviors of a particular instance of an entity.
Entity Type	A model element that specifies the structure, information and behaviors of an entity.
Instance	See Entity Instance.
OData service	A REST-based service that allows resources, identified using Uniform Resource Locators (URLs) and defined in a model, to be published and edited by Web clients using simple HTTP messages.
Metamodel	A model that defines the semantics for the construction of a model.
Model	A set of entities and the relationships between them that define the semantics, behavior and state of that set.
Resource	A named item of interest. The item may be a collection of other items. A resource may be assigned a URI that allows it to receive and process messages. A particular instance of a resource is represented in the model by an entity instance. The type of a resource is represented in the model by an entity type.
Schema	A formal language representation of a model that conforms to a metamodel.
Service Document	The term Service Document is used to refer to a particular resource that is directly accessed via the OData service entry point. This resource serves as a starting point for locating and accessing the other resources and associated metadata that together make up an instance of a Swordfish Service. See also OData Service Document
Swordfish service	A service that is a Redfish service and that implements Swordfish extensions to the Redfish model that conform to the requirements of this document.

4.2.2 Symbols and abbreviated terms

None in this document.

4.3 Reference to Redfish terms

Many terms in this document were originally defined in the [Redfish Specification](#). Some of the more common terms and definitions are reproduced here, as an aid to the reader.

Table 4: Redfish terms

Term	Definition (as of 24 January 2017)
OData	The Open Data Protocol, as defined in OData-Protocol .
OData Service Document	The name for a resource that provides information about the Service Root. The Service Document provides a standard format for enumerating the resources exposed by the service that enables generic hypermedia-driven OData clients to navigate to the resources of the Redfish Service. See also Service Document
Redfish Schema	The CSDL definition of Redfish resources.
Redfish service	An OData service that conforms to requirements of the Redfish specification .
Redfish Service Entry Point	Also referred to as "Service Entry Point". An URI through which a particular instance of a Redfish Service is accessed. A Redfish Service may have more than one Service Entry Point
Request	A message from a Client to a Server. It consists of a request line (which includes the Operation), request headers, an empty line and an optional message body.
Service Root	The term Service Root is used to refer to a particular resource that is directly accessed via the Redfish service entry point. This resource serves as a starting point for locating and accessing the other resources and associated metadata that together make up an instance of a Redfish Service.

4.4 Keywords (normative language terms)

This document conforms to [ISO/IEC Directives, Part 2](#) for keyword usage. The most common terms and their intended meanings are summarized below.

Table 5: Normative language terms

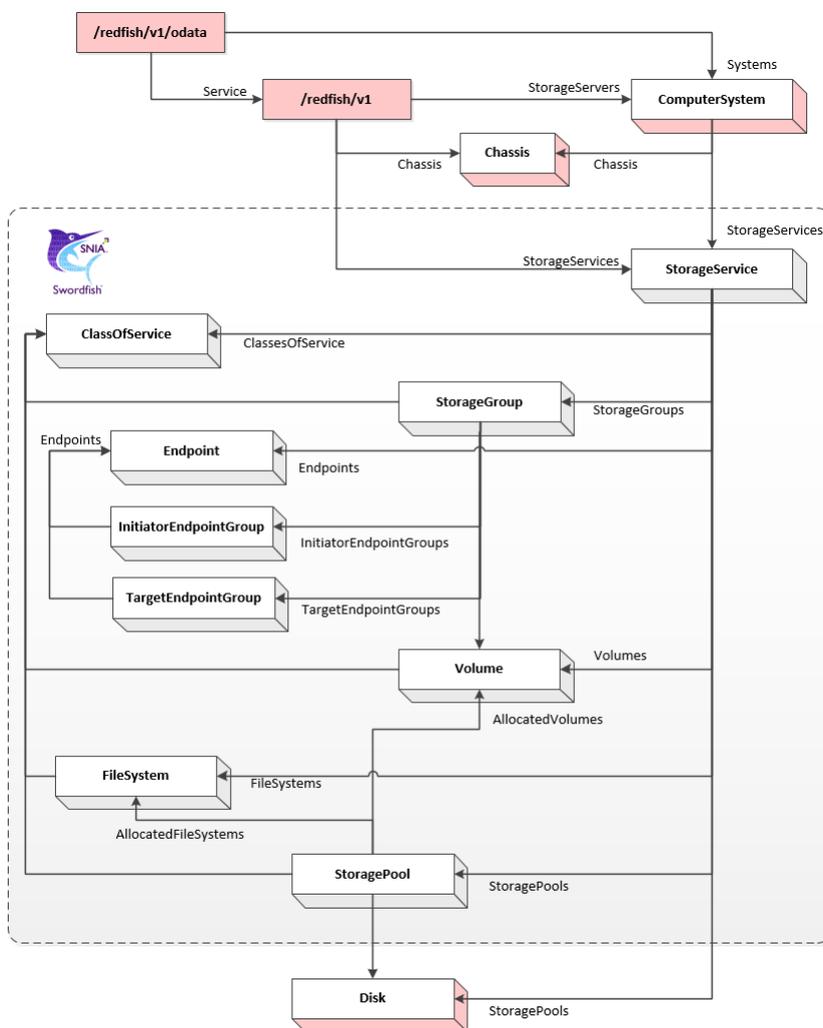
Term(s)	Meaning
shall / shall not	Used to identify objectively verifiable criteria to be fulfilled and from which no deviation is permitted if compliance with the document is to be claimed
should / should not	Used to identify a suggested possible choice or course of action deemed to be particularly suitable without necessarily mentioning or excluding others
may / need not	Used to convey consent or liberty (or opportunity) to do something
can / cannot	Expected or conceivable material, physical or causal outcome
must	Identifies a constraint or obligation on the user of the document, typically due to one or more legal requirements or laws of nature, that is not stated as a provision of the standard <i>NB:</i> "must" is not an alternative for "shall", and should only be used for constraints that arise from outside this standard

5 Swordfish Overview

5.1 Introduction

The Swordfish Scalable Storage Management API ("Swordfish") defines a RESTful interface and a standardized data model to provide a scalable, customer-centric interface for managing storage and related data services. It extends the Redfish Scalable Platforms Management API Specification (DSP0266) from the DMTF.

5.2 Relation to Redfish



The Swordfish service interface extends the Redfish service interface. As such, a Swordfish service is a Redfish service and includes all required elements of the Redfish model.

Storage systems managed by the Swordfish storage service are located in the `ServiceRoot` (and `ServiceContainer`) via the `StorageSystems` resource collection. They are modeled using Redfish `ComputerSystems`. The physical infrastructure is modeled using Redfish `Chassis`.

Each Swordfish `StorageService` is located in the `ServiceRoot` (and `ServiceContainer`) via the `StorageServices` resource collection. All Swordfish defined instances are located through `StorageService` instances. A Swordfish management client may focus entirely on entities defined by the Swordfish schema.

The combined Redfish and Swordfish models defines information requirements and constraints on the values that are used as input or output of the operations supported by the Swordfish interface. The Swordfish interface relies on the operations specified by the OData REST protocol ([#normative-references](#)). Additional operations (known as Actions) are also defined by the model. The information content is defined by a schema specified using the Common Schema Definition Language (CSDL) ([#normative-references](#)) defined by the OData organization within OASIS (<https://www.oasis-open.org/>).

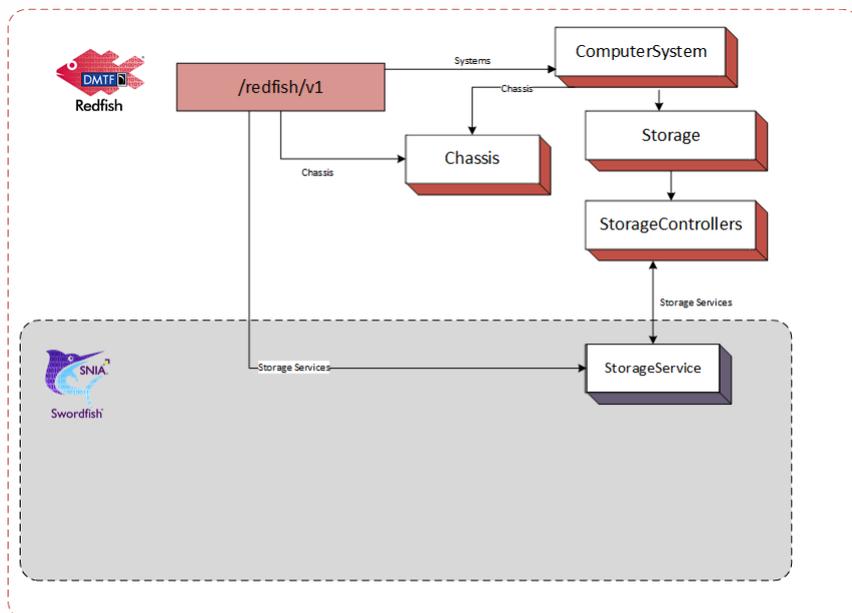
Each Swordfish service is accessed via well known URLs on the system supporting the Swordfish Service. Since Swordfish is an extension of Redfish, these URLs are the same as for accessing the Redfish defined aspects of the service.

5.2.1 Storage System Models

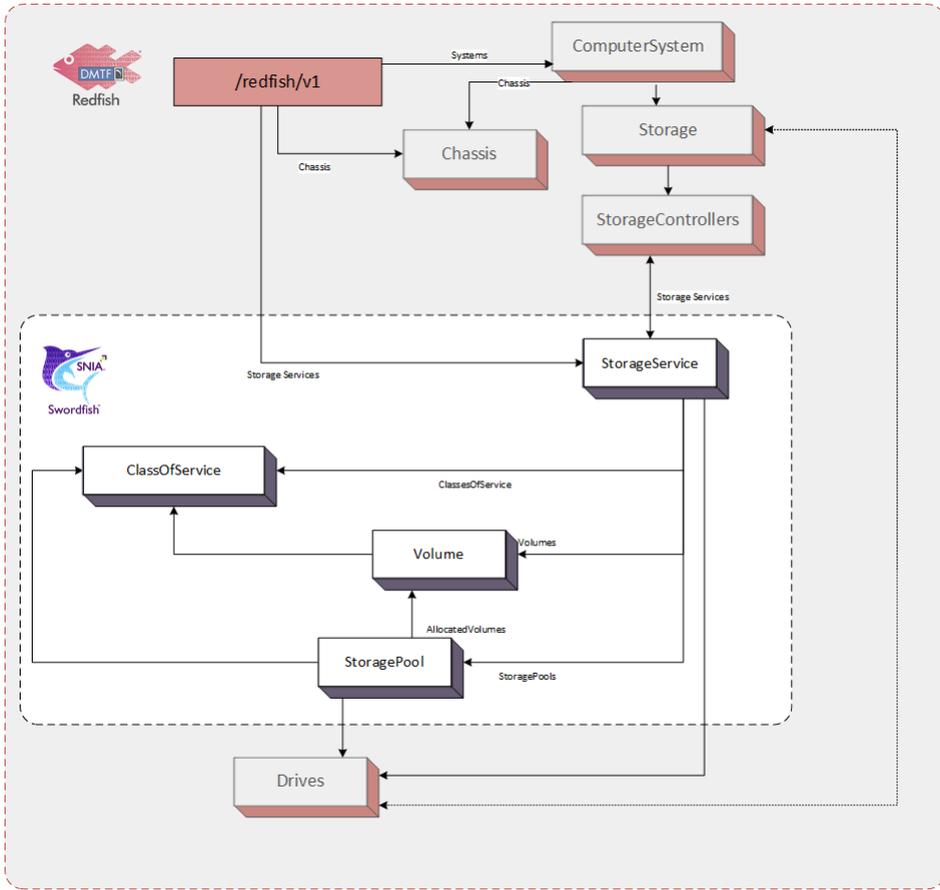
Swordfish has been designed to support a broad range of configurations, requirements, size and complexity, as well as logical and physical architectures. As a result, there are two primary methods of modelling the storage system for a Swordfish implementation. Either model choice results in the same storage service, regardless of the storage system model.

1. Integrated Service Configuration

The storage systems managed by the Swordfish storage service are modeled using the Redfish `Storage` resource and `StorageController` resource collections. The `Storage` resource is located in the Redfish hierarchy contained by `ComputerSystems`, typically running as `ApplicationServers`. The physical infrastructure is modeled using Redfish `Chassis`.

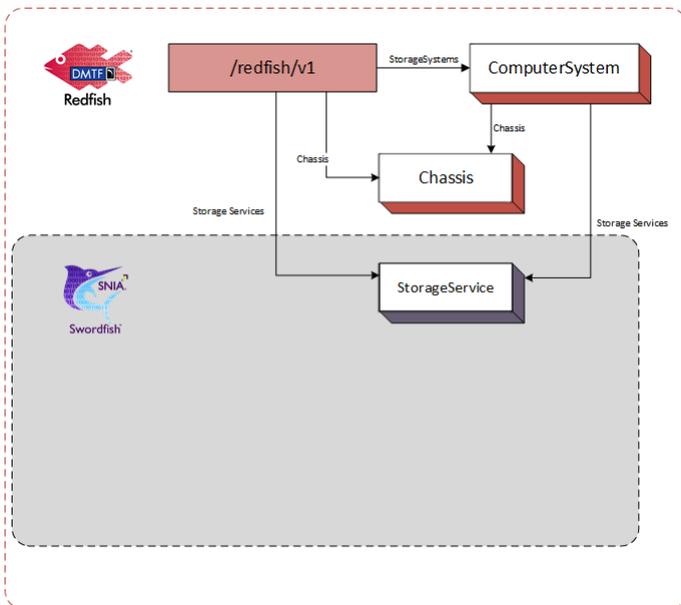


This configuration works well when the storage service is hosted by a storage resource within a computer system. An example of a Storage Service for an integrated service configuration is shown below.

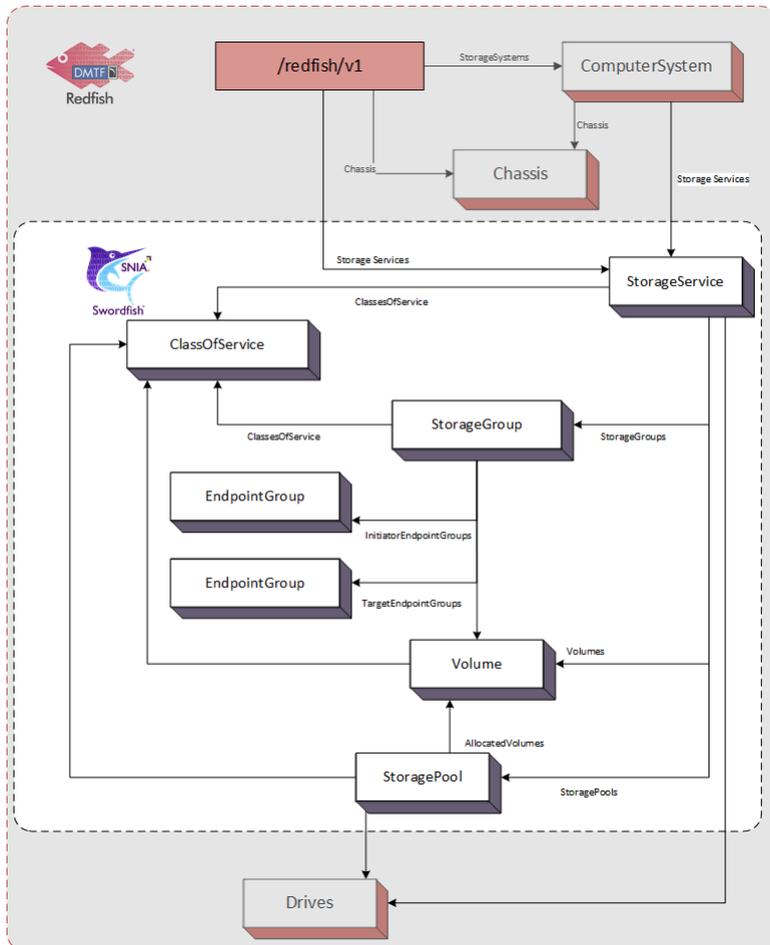


2. Hosted Service Configuration

The storage systems managed by the Swordfish storage service are located in the `ServiceRoot` (and `ServiceContainer`) via the `StorageSystems` resource collection. They are modeled using Redfish `ComputerSystems`. The physical infrastructure is modeled using Redfish `Chassis`.



This configuration works well when the storage system hosts the storage service directly. An example of a Storage Service for a hosted service configuration is shown below.



5.2.2 The ServiceRoot and ServiceContainer entities

5.2.2.1 Overview

A **GET** of `/redfish/v1` will return the `ServiceRoot` entity. A **GET** of `/redfish/v1/odata` will return the `ServiceContainer` instances that represents the OData service document. Each of these instances provides links to the remainder of the system.

The following are the elements utilized for Swordfish management.

- `Systems`: A reference to a `Systems` resource collection;
- `Chassis`: A reference to a `Chassis` resource collection;
- `StorageSystems`: A reference to a `StorageSystems` resource collection;
- `StorageServices`: A reference to a `StorageServices` resource collection.

5.2.2.2 The Systems resource collection

A resource collection that references a set of `ComputerSystem` resources that each represents a general purpose application server. Each `ComputerSystem` resource will have an entry with the value of "ApplicationServer" in its `HostingRoles` property. A particular `ComputerSystem` resource can be in both the `StorageSystems` collection and the `Systems` collection.

5.2.2.3 The Chassis resource collection

A resource collection that references a set of `Chassis` resources. Each `Chassis` resource represents physical containers, (i.e. sheet-metal confined spaces and logical zones like racks, enclosures, chassis and all other containers). Subsystems (like sensors), which operate outside of a system's data plane (meaning the resources are not accessible to software running on the system) are linked either directly or indirectly through this resource.

5.2.2.4 The `StorageSystems` resource collection

A reference to a `ComputerSystemCollection` with members of type `ComputerSystem` that support storage services. These `ComputerSystem` resources represent systems that support Swordfish storage management services. They will have an entry with the value of "StorageServer" in their `HostingRoles` property. A resource collection that references a set of `ComputerSystem` resources that each represents a storage server. Each `ComputerSystem` resource will have an entry with the value of "StorageServer" in its `HostingRoles` property. A particular `ComputerSystem` resource can be a member of both the `StorageSystems` resource collection and the `Systems` resource collection.

5.2.2.5 The `StorageServices` resource collection

A reference to a `StorageServiceCollection` with members that are of type `StorageService`. A resource collection that references a set of `StorageService` resources. Each `StorageService` resource represents the resources and behaviors supported by that storage service.

5.3 Storage Services

5.3.1 The `StorageService` resource

The storage service is hosted on a storage system and exposes logical storage, associated resources and related functionality. Storage service resources can be found in the service root or service container via the `StorageServices` resource collection.

The following are the principal properties of `StorageService` that point to resources managed or defined by the storage service:

- `ClassesOfService`: A reference to a resource collection that specifies the supported `ClassOfService` resources.
- `ClientEndpointGroups`: A reference to a resource collection that collects `ClientEndpointGroup` resources.
- `Drives`: A reference to a resource collection that collects `Drive` resources used for storage.
- `Enclosures`: A reference to a resource collection that collects `Chassis` resources that contain storage related resources.
- `Endpoints`: A reference to a resource collection that collects `Endpoint` resources used to access storage.
- `FileSystems`: A reference to a resource collection that collects `FileSystem` resources.
- `ServerEndpointGroups`: A reference to a resource collection that collects `ServerEndpointGroup` resources.
- `StorageGroups`: A reference to a resource collection that collects `StorageGroup` resources.
- `StoragePools`: A reference to a resource collection that collects `StorageGroup` resources.
- `Volumes`: A reference to a resource collection that collects `Volume` resources.
- `HostingSystem`: A reference to the `ComputerSystem` instance that hosts this `StorageService`.

The following properties each include a set of attributes that each describe a range of capabilities that the storage service can support for a particular kind of service.

- `DataProtectionLoSCapabilities`: Replicas that protects data from loss.

- `DataSecurityLoSCapabilities`: Data security service level requirements. The data security characteristics enable the storage system to be used in an environment where compliance with an externally-specified security standard or standards is required. Examples of such standards include FIPS-140, HIPAA and PCI.
- `DataStorageLoSCapabilities`: Provisioning and access characteristics for storage of the data.
- `IOConnectivityLoSCapabilities`: IO connectivity requirements for access to the data.
- `IOPerformanceLoSCapabilities`: IO performance requirements for access to the data.

In each of the above, not all combinations of attribute values are likely to be supported by the storage service.

Known supported combinations of attribute values are used to construct entries in the `LinesOfService` array property. Not all attributes of a line of service entry need be specified (i.e. some may be Null). If an attribute has no value, the storage service may choose any supported values when provisioning for that entry. Otherwise, the line of service attribute values specifies the kind or level of service to be provided.

5.4 The `ClassOfService` resource

A class of service represents a choice of utility or warranty offered to customers by a service. (ITIL uses the term `service option`. See the [Normative References](#).)

Each `ClassOfService` resource is a uniquely named description of the characteristics of one choice of utility or warranty for a service. Each `ClassOfService` is a description of the kind and quality of service to provide and is not intended to describe how the service provides that service.

Each `ClassOfService` is defined by an aggregation of lines of service. Supported lines of service are listed in the corresponding capabilities attributes of the storage service, (see above).

Currently defined lines of service are:

- **Data Protection**: Describes the characteristics of a replica that protects data from loss.
- **Data Security**: Describe data security service level requirements. The data security characteristics enable the storage system to be used in an environment where compliance with an externally-specified security standard or standards is required. Examples of such standards include FIPS-140, HIPAA and PCI.
- **Data Storage**: Describes provisioning and access characteristics for storage of the data.
- **IO Connectivity**: Describes IO connectivity requirements for access to the data.
- **IO Performance**: Describes the IO performance requirements for access to the data under a particular workload.

Some advertised `ClassOfService` resources are created by the service implementation. These are generally not changeable and are intrinsic to the implementation.

A service may support creation or modification of `ClassOfService` resources. All must be consistent with the capabilities of the service.

5.5 The Endpoint resource

Endpoints represent one end of a protocol specific connection that supports sending or receiving messages according to a particular protocol.

5.6 The Endpoint Collection resource

The `Endpoint Group` is resource collection that references a set of `Endpoint` resources.

5.7 The EndpointGroup resource

The `EndpointGroup` is a resource that represents a set of `Endpoint` resources that have the same management characteristics and which will all have the same access state.

5.8 The EndpointGroupCollection resource

The `EndpointGroupCollection` is resource collection that references a set of `EndpointGroup` resources.

5.9 The StorageGroup resource

`StorageGroups` represent a set of volumes that are managed as a group with the same consistency requirements. The volumes of a storage group are collectively exposed or hidden to a set of clients.

The set of volumes is specified by the `Volumes` attribute, which is a resource collection that references volumes.

The set of client endpoints to which the volumes can be exposed is specified by the `ClientEndpointGroups` attribute. The `ClientEndpointGroup` resource specifies a collection of `EndpointGroup` resources.

The set of server endpoints to which the volumes can be exposed is specified by the `ServerEndpointGroups` attribute. The `ServerEndpointGroup` resource specifies a collection of `EndpointGroup` resources.

5.10 The StoragePool resource

The `StoragePool` resource represents unassigned storage capacity that can be used to produce storage volumes or other storage pools, which conform to one or more classes of service.

The following are the principal properties of `StoragePool` that are used to identify resources provisioned or supported by the storage pool:

- `ClassesOfService`: A reference to a resource collection that specifies the set `ClassOfService` resources that can be specified when provisioning resources from the storage pool.
- `AllocatedVolumes`: A reference to a resource collection that collects `Volume` resources that have been provisioned from the storage pool.
- `AllocatedPools`: A reference to a resource collection that collects `StoragePool` resources that have been provisioned from the storage pool.
- `DefaultClassOfService`: A reference to the default `ClassOfService` resources used for provisioning from the storage

pool.

5.11 The Volume resource

Volume resource represents a block-addressable container of storage, sometimes referred to as a "Logical Unit", "LU", "LUN", or "StorageVolume" in the storage industry. Volumes optionally adhere to a `ClassOfService`, which defines added functionality.

Examples include:

- Access capabilities
- Capacity and capacity sources
- Consumption tracking (e.g., `LowSpaceWarningThresholdPercents`)
- Replication details
- `StorageGroup` Information

5.12 The FileSystem resource

This `FileSystem` resource represents a file system. File systems represent file-addressable capacity that are conformant to a `ClassOfService`. Each `FileSystem` may contain a collection of `FileShares` that can be presented to hosts.

6 Data model

6.1 Swordfish extensions to Redfish

6.1.1 Overview

Redfish has added two properties to the `ServiceRoot` that provide access to Swordfish resources.

The first is `StorageSystems`. This property references a collection of `ComputerSystem` resources that each support Swordfish functionality. Each such `ComputerSystem` shall have:

- an entry in its `HostingRoles` property with the value of `StorageServer`
- at least one entry in its `StorageServices.Members` property.

The second is `StorageServices`. This property references a collection of `StorageService` resources. It provides the client an efficient means to search across all `StorageService` resources, regardless of which `ComputerSystem` is supporting the service.

6.1.2 Swordfish and Redfish specific OEM or vendor extensions

The Swordfish and Redfish models are extended by subclassing the `OEM ComplexTypes` that are defined in the Swordfish and

Redfish schemas.

6.1.3 OData specific OEM or vendor extensions

In addition to extending the Redfish model as described above. An OEM may extend the Redfish `ServiceContainer` by defining a new `EntityContainer` that extends the `ServiceContainer` found in the Redfish `ServiceRoot_v1.xml` file, (see [OData EntityContainer](#)).

Note: This has the same semantics as subclassing in a typical object oriented environment.

An OEM extended implementation of the Swordfish service would access OEM extensions to `EntityContainer` via the service entry-point `/redfish/v1/odata`.

6.2 Entity Sets

The Swordfish model does not currently expose any explicitly defined entity sets. OData specifies that an entity set is defined for each `NavigationProperty` that is defined as a collection and that has the `ContainsTarget` attribute set to true. In all other cases, Swordfish assumes that an entity set is defined globally within the implementation for each entity type. This is effectively the same as if the entity sets were explicitly defined in the `ServiceRoot` entity container.

6.3 Addressing entities within a collection

An instance (entity) of an `EntityType` is uniquely identified within its entity set by its key. The URI for the reference may specify the key using one of two general strategies

1. OData recommends specifying the key value within parenthesis following the path segment that identifies the referencing entity set. (See clause "Canonical URL" in [OData](#))
2. Redfish common practice is to use an alternative form that adds a path segment having the value of the key following the path segment that identifies the referencing collection. (See clause "Alternate Key-as-Segment Syntax" in [OData](#).)

A Swordfish implementation shall support both strategies.

6.4 Addressing members of a ResourceCollection

Redfish specifies that subclasses of `ResourceCollection` shall include a `Members` collection property (See clause "Collection resource response" in [DSP0266](#))

Redfish allows a POST request to a `ResourceCollection` to be equivalent to the same POST request to the `Members` property of that `ResourceCollection`.

For a particular `ResourceCollection`, if a Swordfish implementation supports either form, it shall support both.

It is common practice in Redfish to also eliminate the `Members` property from any request URI that navigates through a type hierarchy that includes a `Member` within a `ResourceCollection`. Care should be taken when defining and using a

ResourceCollection subclass to not introduce ambiguities when an explicit reference to a Members property is dropped from a request URI.

6.5 Schema repository

The primary online source for the Swordfish schema shall be co-located on the DMTF schema site with the Redfish schema: <http://redfish.dmtf.org/schemas/swordfish> Developers may also download the schema as part of the Swordfish bundle from snia.org (refer to snia.org/swordfish for pointers to the bundle locations).

Implementations should refer either to the versions available on the dmtof.org site or to locally provided instances of the schema.

6.6 Referencing other schemas

Swordfish directly reference the following Redfish schemas. - Chassis - ChassisCollection - ComputerSystem - ComputerSystemCollection - Drive - Endpoint - EthernetInterface - EventService - Location - RedfishExtensions - Redundancy - ResourceTask - Schedule - ServiceContainer - ServiceRoot

Other Redfish schema may be added by inference or directly to implementations. Examples are available in the Swordfish mockups.

7 Schema Considerations

7.1 Schema Introduction and Overview

A Swordfish implementation is a Redfish implementation, as such it minimally includes support for some Redfish-defined schema, including ServiceRoot and ComputerSystem. Swordfish implementations include support for Swordfish-defined schema and shall include support for StorageService. A Swordfish implementation is not required to support all of the various hardware oriented schema typically found in a Redfish implementation.

Swordfish schema is conformant with the rules used to define Redfish schema. Redfish schema is conformant with the Common Schema Definition Language, see [CSDL](#). This section provides additional definition and context for the CSDL elements used to define Swordfish schema.

7.2 Common schema attributes

The following table lists common schema attributes used in the definition of Swordfish, for details see [CSDL](#)

Table 6: Schema attributes

Name	Applies to	Description
Abstract	ComplexType, EntityType	If true, the entity may not be instantiated
BaseType	ComplexType, EntityType	Names an inherited element.
DefaultValue	Property	The value of a property if not explicitly set
Name	All	The name of the schema element
Nullable	NavigationProperty, Property	If false, the qualified property shall have a value. The default value is true. A navigation property whose Type attribute specifies a collection shall not specify Nullable=false, as the collection always exists, but may just be empty. <i>Note: Null is not itself a value, but is an indication of no value.</i>
Type	Property	The type of the element

7.3 Default values and NULLABLE attributes

The interaction of `Nullable` and `DefaultValue` needs to be clearly understood by both implementers and client developers. The possible combinations of are summarized in [Table 6](#). The table contains:

- **Nullable:** True, if a given property may be NULL
- **DefaultValue:** True, if a default value is provided for a given property
- **Client:** True, if a client value is supplied for a given property in a query or response
- **Result:** The resultant value of the given property. One of:
 - *C*: The client-provided value
 - *D*: The default value
 - *Null*: Null
 - *I*: Implementation defined
 - *Error*: Error state

Table 7: Default and Nullable Interaction

Nullable	DefaultValue	Client	Value
T	T	T	C
T	T	F	D
T	F	T	C
T	F	F	I or Null
F	T	T	C
F	T	F	D
F	F	T	C
F	F	F	I or Error

7.4 Common schema annotations

The following table lists common annotation used in the definition of Swordfish, for details see [OData Capabilities Vocabulary](#), [OData Core Vocabulary](#), [OData Measures Vocabulary](#), and [Redfish Extensions](#),

Table 8: Schema annotations

Name	Applies to	Description
AllowableValues	Parameter	The set of allowable values for a parameter
AutoExpand	NavigationProperty	If true, return expand the target element
AutoExpandReferences	NavigationProperty	If true, return references to the target element
ConformanceLevel	EntityContainer	Specifies OData conformance level
Deprecated	All	Specifies that the element may be removed in future major revisions, but shall continue to be supported as specified in the current revision.
Description	All	A brief description of a model element
LongDescription	All	A normative description of a model element
Maximum	Parameter, Property	Maximum value that an integer property or parameter may have
Minimum	Parameter, Property	Minimum value that an integer property or parameter may have
Pattern	Parameter, Property	Specifies a pattern that the value shall match
Permissions	NavigationProperty, Property	Access permission for the property.
Required	NavigationProperty, Property	If true, property is required to be supported by the service. The default is optional. See Required Properties
RequiredOnCreate	NavigationProperty, Property	If true, property is required on creation. See Required Properties
Unit	Property	The unit of measure for the value.

7.5 Property implementation requirements

The client and the implementer should understand that, regardless of the schema declaration, an implementer may choose to not implement a property. If not implemented, a representation of the property will not be present in a reply. This should not be confused with a response that indicates that a property has been implemented, but has no value (i.e. *propertyName = null*).

There are several factors that could affect the implementation choice. Implementation requirements can be defined in many documents. At a minimum, a developer should review: - this document, - the Redfish specification, and - associated profile specifications.

If a property is implemented, and its schema definition includes the *Redfish.Required* annotation, the property and its current value shall be returned in response to a GET operation against any associated services. If the value of the property is not available, then an implementation shall return *NULL* in place of the value.

If a property is implemented, and its schema definitions includes the *Redfish.RequiredOnCreate* annotation, the property and an appropriate value shall be included in any creation (i.e., POST or PATCH) operation against associated services.

7.6 Schema repository

The primary online source for the Swordfish schema shall be co-located on the DMTF schema site with the Redfish schema: <http://redfish.dmtf.org/schemas/swordfish> Developers may also download the schema as part of the Swordfish bundle from snia.org (refer to snia.org/swordfish for pointers to the bundle locations).

Implementations should refer either to the versions available on the dmtof.org site or to locally provided instances of the schema.

7.7 Referencing other schemas

Swordfish directly references the following Redfish schemas:

Table 9: Referenced Redfish Schema

Redfish Schema
Chassis
ChassisCollection
ComputerSystem
ComputerSystemCollection
Drive
Endpoint
EthernetInterface
EventService
Location
RedfishExtensions
Redundancy
ResourceTask
Schedule
ServiceContainer
ServiceRoot

Other Redfish schema may be added by inference or directly to implementations. Examples are available in the Swordfish mockups.

8 Implementation requirements

8.1 Security

This document generally adheres to the security requirements defined in the [Redfish Specification](#). It extends the Redfish security model in one important way:

- Swordfish implementations shall implement [TLS version 1.2](#) or greater.

8.2 General constraints

8.2.1 Redfish elements

The Swordfish service interface extends the Redfish service interface. As such, a Swordfish service is a Redfish service and all required elements of the Redfish model shall be present in a Swordfish model.

Swordfish functionality shall not conflict with any previously defined Redfish functionality but it may add to or extend it, and it may add additional constraints on Redfish functionality.

Additionally, any functionality desired in a Swordfish implementation that is specified in Redfish shall follow the requirements as specified in the Redfish specification.

8.2.2 Storage Events

8.2.2.1 Overview:

A Swordfish implementation should implement an event service. Redfish defines the Event Service framework, client subscription model, event delivery mechanism, as well as standard message registries. Swordfish extends the standard message registries to provide additional message registries that correspond to Swordfish-specific services and properties.

The Redfish event service publishes a list of event types supported, and maintains a list of clients that have subscribed. Each subscription maps clients, subscribed events, and the resources that generate them.

8.2.2.2 Message Registry Selection and Management

Swordfish constrains the existing event model to provide a more consistent handling of event notifications and the related messages, in order to assure that client systems can easily and consistently parse and respond to system-level events.

8.2.2.3 Required Usage

- The Resource Event Message Registry defines the underlying messaging model, and shall be used to map messages to resources for storage implementations.
- The Redfish Base Message Registry shall be used to support HTTP connection/error/protocol issues, and general errors.
- The Swordfish Message Registry shall be used as a supplement for the resource event message registry.
- If the Swordfish service implements Redfish tasks (i.e., long-running operations), the implementation shall use the messages defined in the Task Event Message Registry to report status.

8.2.2.4 Recommended Usage

- Standard Messages should be used, wherever possible.
- OEM messages should be avoided. Suggestions for clarification or expansion of the existing registries are encouraged. (submissions should be sent to the [SNIA Feedback Portal](#))

8.3 Discovering Swordfish resources

Each Swordfish implementation supports the following well-known URLs, as defined in [Redfish](#). Specifically:

- `/Redfish`, which contains one or more version properties for the integrated Swordfish and Redfish implementation, starting with `v1`.
- `/Redfish/v1`, which addresses a `ServiceRoot` instance, which defines the Redfish default principal starting information for version 1 implementation of an integrated Redfish and Swordfish service. A GET operation to it shall retrieve the value of an instance of a `ServiceRoot` `EntityType` as defined in the [ServiceRoot_v1.xml](#) file.
- `/Redfish/v1/odata`, which addresses a `ServiceContainer` instance, which defines OData conformant principal starting information for the same version 1 implementation of an integrated Redfish and Swordfish service. A GET operation shall retrieve the value of an instance of a `ServiceContainer` `EntityContainer` as defined in the [ServiceRoot_v1.xml](#) file.

Note: Since the `ServiceContainer` is required to return an `@odata.context` value of `/redfish/v1`, all other elements accessed via it will be the same elements found via the `ServiceRoot`.

Note: A Swordfish service is a Redfish service with extensions to support storage management. No additional service entry-points are necessary.

Both the `ServiceRoot` and `ServiceContainer` contain a resource collection named `Systems` that lists `ComputerSystem` instances. A `ComputerSystem` instance that supports Swordfish defined services will have a value of "StorageServer" in an entry of its `HostingRoles` property.

The `ServiceContainer` additionally has a `Service` attribute that references the `ServiceRoot` resource.

Regardless of starting point, the property values of the `ServiceRoot` instance enable navigation to all other resources exposed by the Swordfish service.

8.4 ClassOfService requirements

Each `ClassOfService` shall include at least one line of service. The providing server shall assure that the line of service values of a `ClassOfService` collectively represent a supported choice of service.

8.5 StorageSystems requirements

For Hosted Service Configurations, this property of the `ServiceRoot` references a collection of `ComputerSystem` resources that each support Swordfish functionality. Each `ComputerSystem` included in the `StorageSystems` entry in the `ServiceRoot` shall have:

- an entry in its `HostingRoles` property with the value of `StorageServer`
- at least one entry in its `StorageServices.Members` property.

For Integrated Service Configurations, the `StorageSystems` concept is realized through the `StorageController` resource. Each `StorageController` instantiated as a Swordfish `StorageSystem` shall have:

- at least one entry in its `StorageController.Links` property `StorageServices` collection identifying related `StorageServices`

8.6 Entity Sets

The Swordfish model does not currently expose any explicitly defined entity sets. OData specifies that an entity set is defined for each `NavigationProperty` that is defined as a collection and that has the `ContainsTarget` attribute set to true. In all other cases, Swordfish assumes that an entity set is defined globally within the implementation for each entity type. This is effectively the same as if the entity sets were explicitly defined in the `ServiceRoot` entity container.

8.7 Addressing entities within a collection

An instance (entity) of an `EntityType` is uniquely identified within its entity set by its key. The URI for the reference may specify the key using one of two general strategies

1. OData recommends specifying the key value within parenthesis following the path segment that identifies the referencing entity set. (See clause "Canonical URL" in in [OData](#))
2. Redfish common practice is to use an alternative form that adds a path segment having the value of the key following the path segment that identifies the referencing collection. (See clause "Alternate Key-as-Segment Syntax" in [OData](#).)

A Swordfish implementation shall support both strategies.

8.8 Addressing members of a ResourceCollection

Redfish specifies that subclasses of `ResourceCollection` shall include a `Members` collection property (See clause "Collection resource response" in [DSP0266](#))

Redfish allows a POST request to a `ResourceCollection` to be equivalent to the same POST request to the `Members` property of that `ResourceCollection`. For a particular `ResourceCollection`, if a Swordfish implementation supports either form, it shall support both.

It is common practice in Redfish to also eliminate the `Members` property from any request URI that navigates through a type hierarchy that includes a Member within a `ResourceCollection`. Care should be taken when defining and using a `ResourceCollection` subclass to not introduce ambiguities when an explicit reference to a `Members` property is dropped from a request URI.

9 Swordfish type definitions

9.1 Overview

The following sections define the schema and type definitions that make up a Swordfish implementation. Each data type or entity within the schema includes a description that defines its implementation requirements and their interaction

9.2 Common properties

This section describes the properties (data fields) that share a common definition across many or all Redfish schema

9.2.1 Properties defined for all Redfish schemas

The following properties are included in every Redfish schema, and therefore may be encountered in any Response payload. They are documented here to avoid repetition in the Resource Guide tables for each schema.

Table 9: Common Properties

Property	Datatype	Attributes	Notes
@odata.context	string	read-only	The @odata.context property is a URL to a metadata document with a fragment describing the data (typically rooted at the top-level singleton or collection). Technically the metadata document only has to define, or reference, any of the types that it directly uses, and different payloads could reference different metadata documents. However, since the @odata.context provides a root URL for resolving relative references (such as @odata.id's), we return the canonical metadata document.
@odata.id	string	read-only	The @odata.id property is a string that indicates the unique identifier of a resource.
@odata.type	string	read-only	The @odata.type property is a URL fragment that indicates the type of the resource.
Description	string	read-write	The Description property is used to convey a human-readable description of the resource.
Id	string	read-write	The Id property of a resource uniquely identifies the resource within the Resource Collection that contains it. The value of Id is unique within a Resource Collection.
Name	string	read-write	The Name property is used to convey a human-readable moniker for a resource. The type of the Name property is a string. The value of Name is NOT necessarily unique across resource instances within a Resource Collection.

Property	Datatype	Attributes	Notes
Oem { }	object	read-write	This is the manufacturer/provider specific extension moniker used to divide the Oem object into sections. See the Resource schema for details on this property.

9.2.2 Links

The Links property represents the links associated with the resource, as defined by that resource's schema definition. All associated reference properties defined for a resource are nested under the Links property. All directly referenced (subordinate) properties defined for a resource can be found from the root of the resource.

9.2.3 Actions

The Actions property contains the actions supported by a resource.

9.2.4 OEM

The OEM property is used for OEM extensions.

9.2.5 RelatedItem

The RelatedItem property is represented as a set of links. The links point to a resource, or part of a resource, as defined by that resource's schema definition.

This representation is not intended to be a strong linking methodology like other references. Instead it is used to show a relationship between elements or sub-elements in disparate parts of the service. For example, Fans may be in one area of the system and Processors in another area of the system. It could be that the relationship between the two is not obvious. The RelatedItem property can be used to show that one is related to the other. In this example, it might indicate that a specific fan is cooling a specific processor.

9.2.6 Status

The Status property is common to many Redfish schema.

Health	string (enum)	read-only	This represents the health state of this resource in the absence of its dependent resources. See Health in Property Details, below, for the possible values of this property.
HealthRollup	string (enum)	read-only	This represents the overall health state from the view of this resource. See HealthRollup in Property Details, below, for the possible values of this property.
Oem { }	object	read-write	Oem extension object.

State	string (enum)	read-only	This indicates the known state of the resource, such as if it is enabled. See State in Property Details, below, for the possible values of this property.
--------------	------------------	-----------	---

9.2.6.1 Property details

Health:

This represents the health state of this resource in the absence of its dependent resources.

string	Description
Critical	A critical condition exists that requires immediate attention.
OK	Normal.
Warning	A condition exists that requires attention.

HealthRollup:

This represents the overall health state from the view of this resource.

string	Description
Critical	A critical condition exists that requires immediate attention.
OK	Normal.
Warning	A condition exists that requires attention.

State:

This indicates the known state of the resource, such as if it is enabled.

string	Description
Absent	This function or resource is not present or not detected.
Disabled	This function or resource has been disabled.
Enabled	This function or resource has been enabled.
InTest	This function or resource is undergoing testing.
Quiesced	The element is enabled but only processes a restricted set of commands.
StandbyOffline	This function or resource is enabled, but awaiting an external action to activate it.
StandbySpare	This function or resource is part of a redundancy set and is awaiting a failover or other external action to activate it.
Starting	This function or resource is starting.
UnavailableOffline	This function or resource is present but cannot be used.
Updating	The element is updating and may be unavailable or degraded.

9.2.7 Location

AltitudeMeters	number (m)	read-only (null)	The altitude of the resource in meters.
Info	string	read-only (null)	This indicates the location of the resource.
InfoFormat	string	read-only (null)	This represents the format of the Info property.
Latitude	number (deg)	read-only (null)	The latitude resource.
Longitude	number (deg)	read-only (null)	The longitude resource in degrees.
Oem { }	object	read-write	Oem extension object. See the Resource schema for details on this property.
PartLocation {	object	read-write	Postal address of the addressed resource.
LocationOrdinalValue	number	read-only (null)	The number that represents the location of the part. If LocationType is slot and this unit is in slot 2 then the LocationOrdinalValue will be 2.
LocationType	string (enum)	read-only	The type of location of the part, such as slot, bay, socket and slot. See LocationType in Property Details, below, for the possible values of this property.
Orientation	string (enum)	read-only	The orientation for the ordering of the slot enumeration used by the LocationOrdinalValue property. See Orientation in Property Details, below, for the possible values of this property.
Reference	string (enum)	read-only	The reference point for the part location. This is used to give guidance as to the general location of the part. See Reference in Property Details, below, for the possible values of this property.
ServiceLabel }	string	read-only (null)	This is the label of the part location, such as a silk screened name or a printed label.
Placement {	object	read-write	A place within the addressed location.
Rack	string	read-write (null)	Name of a rack location within a row.
RackOffset	number	read-write (null)	Vertical location of the item in terms of RackOffsetUnits.

RackOffsetUnits	string (enum)	read- write	The type of Rack Units in use. See RackOffsetUnits in Property Details, below, for the possible values of this property.
Row }	string	read- write (null)	Name of row.
PostalAddress {	object	read- write	Postal address of the addressed resource.
AdditionalCode	string	read- write (null)	Additional code.
Building	string	read- write (null)	Name of the building.
City	string	read- write (null)	City, township, or shi (JP).
Community	string	read- write (null)	Postal community name.
Country	string	read- write (null)	Country.
District	string	read- write (null)	A county, parish, gun (JP), or district (IN).
Division	string	read- write (null)	City division, borough, dity district, ward, chou (JP).
Floor	string	read- write (null)	Floor.
GPSCoords	string	read- write (null)	The GPS coordinates of the part.
HouseNumber	number	read- write (null)	Numeric portion of house number.
HouseNumberSuffix	string	read- write (null)	House number suffix.
Landmark	string	read- write (null)	Landmark.

LeadingStreetDirection	string	read-write (null)	A leading street direction.
Location	string	read-write (null)	Room designation or other additional info.
Name	string	read-write (null)	Name.
Neighborhood	string	read-write (null)	Neighborhood or block.
POBox	string	read-write (null)	Post office box (P.O. box).
PlaceType	string	read-write (null)	A description of the type of place that is addressed.
PostalCode	string	read-write (null)	Postal code (or zip code).
Road	string	read-write (null)	A primary road or street.
RoadBranch	string	read-write (null)	Road branch.
RoadPostModifier	string	read-write (null)	Road post-modifier.
RoadPreModifier	string	read-write (null)	Road pre-modifier.
RoadSection	string	read-write (null)	Road Section.
RoadSubBranch	string	read-write (null)	Road sub branch.
Room	string	read-write (null)	Name or number of the room.
Seat	string	read-write (null)	Seat (desk, cubicle, workstation).

Street	string	read-write (null)	Street name.
StreetSuffix	string	read-write (null)	Avenue, Platz, Street, Circle.
Territory	string	read-write (null)	A top-level subdivision within a country.
TrailingStreetSuffix	string	read-write (null)	A trailing street suffix.
Unit }	string	read-write (null)	Name or number of the unit (apartment, suite).

9.2.7.1 Property details

LocationType:

The type of location of the part, such as slot, bay, socket and slot.

string	Description
Bay	Defines a bay as the type of location.
Connector	Defines a connector as the type of location.
Slot	Defines a slot as the type of location.
Socket	Defines a socket as the type of location.

Orientation:

The orientation for the ordering of the slot enumeration used by the LocationOrdinalValue property.

string	Description
BackToFront	Defines the ordering for the LocationOrdinalValue is back to front.
BottomToTop	Defines the ordering for the LocationOrdinalValue is bottom to top.
FrontToBack	Defines the ordering for the LocationOrdinalValue is front to back.
LeftToRight	Defines the ordering for the LocationOrdinalValue is left to right.
RightToLeft	Defines the ordering for the LocationOrdinalValue is right to left.
TopToBottom	Defines the ordering for the LocationOrdinalValue is top to bottom.

RackOffsetUnits:

The type of Rack Units in use.

string	Description
EIA_310	Defines a rack unit as being equal to 1.75 in (44.45 mm).
OpenU	Defines a rack unit as being equal to 48 mm (1.89 in).

Reference:

The reference point for the part location. This is used to give guidance as to the general location of the part.

string	Description
Bottom	Defines the part as being in the bottom of the unit.
Front	Defines the part as being in the front of the unit.
Left	Defines the part as being in the left of the unit.
Middle	Defines the part as being in the middle of the unit.
Rear	Defines the part as being in the rear of the unit.
Right	Defines the part as being in the right of the unit.
Top	Defines the part as being in the top of the unit.

9.3 Complex Types

The following table defines a number of complex types that are used frequently in Swordfish schema. Multiple references to each complex type may be seen in later sections. For detailed definitions and properties contained in each complex type, refer to the schema definitions as referenced in the table.

Capacity {}	This composition may be used to represent storage capacity. The sum of the values in Data, Metadata, and Snapshot shall be equal to the total capacity for the datastore. See the Capacity.v1_1_0 schema for details.
CapacityInfo {}	This composition may be used to represent the utilization of storage capacity. See the Capacity.v1_1_0 schema for details.
IOStatistics {}	See the IOStatistics.v1_0_1 schema for details on this property.
IOWorkload {}	This structure may be used to describe an IO Workload. See the IOPerformanceLoSCapabilities.v1_0_0 schema for details.
IOWorkloadComponent {}	This structure may be used to describe a component of an IO workload. See the IOPerformanceLoSCapabilities.v1_1_1 schema for details.
ReplicaInfo {}	The value shall define the characteristics of a replica. See the StorageReplicaInfo.v1_1_0 schema for details.
ReplicaRequest {}	See the DataProtectionLineOfService.v1_1_0 schema for details.
Schedule {}	Schedule a series of occurrences. See the Schedule.v1_1_0 schema for details.

9.4 CapacitySource 1.1.1

This composition may be used to represent the source and type of storage capacity. At most one of the ProvidingDrives,

ProvidingVolumes, ProvidingMemoryChunks, ProvidingMemory or ProvidingPools properties may have a value. If any of ProvidingDrives, ProvidingVolumes, ProvidingMemory or ProvidingPools reference more than one resource, allocation of capacity across those resources is implementation dependent.

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Description	string <i>read-only</i> <i>(null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Id	string <i>read-only</i> <i>required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Name	string <i>read-only</i> <i>required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the <i>redfish.dmtf.org/schemas/v1/Resource.json</i> schema for details on this property.
ProvidedCapacity { }	object <i>(null)</i>	The value shall be the amount of space that has been provided from the ProvidingDrives, ProvidingVolumes, ProvidingMemory or ProvidingPools.
Data { }	object <i>(null)</i>	The value shall be capacity information relating to provisioned user data.
AllocatedBytes	integer (By) <i>read-write</i> <i>(null)</i>	The value shall be the number of bytes currently allocated by the storage system in this data store for this data type.
ConsumedBytes	integer (By) <i>read-write</i> <i>(null)</i>	The value shall be the number of logical bytes currently consumed in this data store for this data type.

GuaranteedBytes	integer (By) <i>read- write</i> <i>(null)</i>	The value shall be the number of bytes the storage system guarantees can be allocated in this data store for this data type.
ProvisionedBytes	integer (By) <i>read- write</i> <i>(null)</i>	The value shall be the maximum number of bytes that can be allocated in this data store for this data type.
}		
IsThinProvisioned	boolean <i>read- write</i> <i>(null)</i>	If the value is false, the capacity shall be fully allocated. The default value shall be false.
Metadata {	object <i>(null)</i>	The value shall be capacity information relating to provisioned system (non-user accessible) data.
AllocatedBytes	integer (By) <i>read- write</i> <i>(null)</i>	The value shall be the number of bytes currently allocated by the storage system in this data store for this data type.
ConsumedBytes	integer (By) <i>read- write</i> <i>(null)</i>	The value shall be the number of logical bytes currently consumed in this data store for this data type.
GuaranteedBytes	integer (By) <i>read- write</i> <i>(null)</i>	The value shall be the number of bytes the storage system guarantees can be allocated in this data store for this data type.

ProvisionedBytes	integer (By) <i>read- write</i> (<i>null</i>)	The value shall be the maximum number of bytes that can be allocated in this data store for this data type.
}		
Snapshot {	object (<i>null</i>)	The value shall be capacity information relating to provisioned snapshot or backup data.
AllocatedBytes	integer (By) <i>read- write</i> (<i>null</i>)	The value shall be the number of bytes currently allocated by the storage system in this data store for this data type.
ConsumedBytes	integer (By) <i>read- write</i> (<i>null</i>)	The value shall be the number of logical bytes currently consumed in this data store for this data type.
GuaranteedBytes	integer (By) <i>read- write</i> (<i>null</i>)	The value shall be the number of bytes the storage system guarantees can be allocated in this data store for this data type.
ProvisionedBytes	integer (By) <i>read- write</i> (<i>null</i>)	The value shall be the maximum number of bytes that can be allocated in this data store for this data type.
}		
}		
ProvidedClassOfService {	object (<i>null</i>)	The value shall reference the provided ClassOfService from the ProvidingDrives, ProvidingVolumes, ProvidingMemoryChunks, ProvidingMemory or ProvidingPools. See the <i>ClassOfService</i> schema for details on this property.
@odata.id	string <i>read- only</i>	Link to a ClassOfService resource. See the Links section and the <i>ClassOfService</i> schema for details.

}		
ProvidingDrives {	object (null)	If present, the value shall be a reference to a contributing drive or drives. Contains a link to a resource.
@odata.id	string read-only	Link to Collection of <i>redfish.dmtf.org/schemas/v1/Drive.json</i> . See the <i>redfish.dmtf.org/schemas/v1/Drive.json</i> schema for details.
}		
ProvidingMemory {	object (null)	If present, the value shall be a reference to the contributing memory.
@odata.id	string read-only	The value of this property shall be the unique identifier for the resource and it shall be of the form defined in the Redfish specification.
}		
ProvidingMemoryChunks {	object (null)	If present, the value shall be a reference to the contributing memory chunks.
@odata.id	string read-only	The value of this property shall be the unique identifier for the resource and it shall be of the form defined in the Redfish specification.
}		
ProvidingPools {	object (null)	If present, the value shall be a reference to a contributing storage pool or storage pools. Contains a link to a resource.
@odata.id	string read-only	Link to Collection of <i>StoragePool</i> . See the <i>StoragePool</i> schema for details.
}		
ProvidingVolumes {	object (null)	If present, the value shall be a reference to a contributing volume or volumes. Contains a link to a resource.

@odata.id	string <i>read-only</i>	Link to Collection of <i>Volume</i> . See the Volume schema for details.
}		

9.5 ClassOfService 1.1.1

This resource shall define a service option composed of one or more line of service entities. ITIL defines a service option as a choice of utility or warranty for a service.

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Actions (<i>v1.1+</i>) {}	object	The Actions property shall contain the available actions for this resource.
ClassOfServiceVersion	string <i>read-write</i> <i>(null)</i>	The version describing the creation or last modification of this service option specification. The string representing the version shall be in the form: M + '.' + N + '.' + U Where: M - The major version (in numeric form). N - The minor version (in numeric form). U - The update (e.g. errata or patch in numeric form).
DataProtectionLinesOfService [{	array <i>read-write</i>	The value shall be a set of data protection service options. Within a class of service, one data protection service option shall be present for each replication session.
@odata.id	string <i>read-only</i>	Link to a DataProtectionLineOfService resource. See the Links section and the <i>DataProtectionLineOfService</i> schema for details.
}]		
DataSecurityLinesOfService [{	array <i>read-write</i>	The value shall be a set of data security service options.
@odata.id	string <i>read-only</i>	Link to a DataSecurityLineOfService resource. See the Links section and the <i>DataSecurityLineOfService</i> schema for details.
}]		

DataStorageLinesOfService [{	array <i>read-write</i>	The value shall be a set of data protection service options.
@odata.id	string <i>read-only</i>	Link to a DataStorageLineOfService resource. See the Links section and the <i>DataStorageLineOfService</i> schema for details.
}]		
Description	string <i>read-only (null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Id	string <i>read-only required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Identifier { }	object <i>(null)</i>	The value shall be unique within the managed ecosystem. See the <i>redfish.dmtf.org/schemas/v1/Resource.v1_7_0.json</i> schema for details on this property.
IOConnectivityLinesOfService [{	array <i>read-write</i>	The value shall be a set of IO connectivity service options. Within a class of service, at most one IO connectivity service option may be present for a value of AccessProtocol.
@odata.id	string <i>read-only</i>	Link to a IOConnectivityLineOfService resource. See the Links section and the <i>IOConnectivityLineOfService</i> schema for details.
}]		
IOPerformanceLinesOfService [{	array <i>read-write</i>	The value shall be a set of IO performance service options.
@odata.id	string <i>read-only</i>	Link to a IOPerformanceLineOfService resource. See the Links section and the <i>IOPerformanceLineOfService</i> schema for details.
}]		

Name	string <i>read-only</i> <i>required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem {}	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.

9.6 ClassOfServiceCollection

URIs:

Redfish/v1/StorageServices/{StorageServiceId}/ClassesOfService

Redfish/v1/StorageServices/{StorageServiceId}/ClassesOfService/Members

Redfish/v1/StorageServices/{StorageServiceId}/StoragePools/{StoragePoolId}/ClassesOfService

Redfish/v1/StorageServices/{StorageServiceId}/StoragePools/{StoragePoolId}/ClassesOfService/Members

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Description	string <i>read-only</i> <i>(null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Members [{	array <i>read-only</i>	The value of each member entry shall reference a ClassOfService resource.
@odata.id	string <i>read-only</i>	Link to a ClassOfService resource. See the Links section and the <i>ClassOfService</i> schema for details.
}]		
Members@odata.nextLink	string <i>read-only</i>	The value of this property shall be a URI to a resource, with the same @odata.type, containing the next set of partial members.

Name	string <i>read-only</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem ⚡	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.

9.7 DataProtectionLineOfService 1.1.1

This service option describes a replica that protects data from loss. The requirements must be met collectively by the communication path and the replica.

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Description	string <i>read-only</i> <i>(null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Id	string <i>read-only</i> <i>required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
IsIsolated	boolean <i>read-write</i> <i>(null)</i>	True shall indicate that the replica is in a separate fault domain from its source. The default value of this property is false.
MinLifetime	string <i>read-write</i> <i>(null)</i>	The value shall be an ISO 8601 duration that specifies the minimum required lifetime of the replica. Note: The maximum number of replicas can be determined using this value together with the replicaSchedule.
Name	string <i>read-only</i> <i>required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .

Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the <i>redfish.dmtf.org/schemas/v1/Resource.json</i> schema for details on this property.
RecoveryGeographicObjective	string (enum) read-write (null)	The value specifies the geographic scope of the failure domain. See <i>RecoveryGeographicObjective</i> in <i>Property Details</i> , below, for the possible values of this property.
RecoveryPointObjectiveTime	string read-write (null)	The value shall be an ISO 8601 duration that specifies the maximum time over which source data may be lost on failure. In the case that <i>IsIsolated</i> = false, failure of the domain is not a consideration.
RecoveryTimeObjective	string (enum) read-write (null)	The value shall be an enumeration that indicates the maximum time required to access an alternate replica. In the case that <i>IsIsolated</i> = false, failure of the domain is not a consideration. See <i>RecoveryTimeObjective</i> in <i>Property Details</i> , below, for the possible values of this property.
ReplicaAccessLocation { }	object (null)	This value shall be used if the data access location of the replica is required to be at a specific location. Note 1: The location value may be granular. Note 2: A value may be required for some regulatory compliance. See the <i>v1_0_0.v1_0_0</i> schema for details on this property.
ReplicaClassOfService {	object (null)	The value shall reference the class of service that defines the required service levels of the replica. See the <i>ClassOfService</i> schema for details on this property.
@odata.id	string read-only	Link to a <i>ClassOfService</i> resource. See the Links section and the <i>ClassOfService</i> schema for details.
}		
ReplicaType	string (enum) read-write (null)	The type of replica shall conform to this value. See <i>ReplicaType</i> in <i>Property Details</i> , below, for the possible values of this property.
Schedule { }	object (null)	If a replica is made periodically, the value shall define the schedule. See the <i>v1_1_1.v1_1_1</i> schema for details on this property.

9.7.1 Property Details

9.7.1.1 RecoveryGeographicObjective:

The value specifies the geographic scope of the failure domain.

string	Description
Datacenter	A facility that provides communication, power, or cooling infrastructure to a co-located set of servers, networking and storage.
Rack	A container within a datacenter that provides communication, power, or cooling to a set of components.
RackGroup	A set of racks that may share common communication, power, or cooling.
Region	A set of resources that are required to be either geographically or politically isolated from resources not in the resources.
Row	A set of adjacent racks or rackgroups that may share common communication, power, or cooling.
Server	Components of a CPU/memory complex that share the same infrastructure.

9.7.1.2 RecoveryTimeObjective:

The value shall be an enumeration that indicates the maximum time required to access an alternate replica. In the case that IsIsolated = false, failure of the domain is not a consideration.

string	Description
Nearline	Access to a replica shall be consistent with switching access to a different path through a different front-end interconnection infrastructure. Some inconsistency may occur. A restore step may be required before recovery can commence.
Offline	Access to a replica may take a significant amount of time. No direct connection to the replica is assumed. Some inconsistency loss may occur. A restore step is likely to be required.
OnlineActive	Access to synchronous replicas shall be instantaneous.
OnlinePassive	Access to a synchronous replica shall be consistent with switching access to a different path the same front-end interconnect. A restore step shall not be required.

9.7.1.3 ReplicaType:

The type of replica shall conform to this value.

string	Description
Clone	This enumeration literal shall indicate that replication shall create a point in time, full copy the source.
Mirror	This enumeration literal shall indicate that replication shall create and maintain a copy of the source.
Snapshot	This enumeration literal shall indicate that replication shall create a point in time, virtual copy of the source.

string	Description
TokenizedClone	This enumeration literal shall indicate that replication shall create a token based clone.

9.8 DataProtectionLoSCapabilities 1.1.2

The capabilities to protect data from loss by the use of a replica. The requirements shall be met collectively by the communication path and the replica. There should be one instance associated to a class of service for each replica. Each replica independently should have a class of service that describes its characteristics.

URIs:

/redfish/v1/StorageServices/{StorageServiceId}/DataProtectionLoSCapabilities

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Actions (v1.1+) {}	object	The Actions property shall contain the available actions for this resource.
Description	string <i>read-only</i> (null)	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Id	string <i>read-only</i> <i>required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Identifier {}	object (null)	The value shall be unique within the managed ecosystem. See the redfish.dmtf.org/schemas/v1/Resource.v1_7_0.json schema for details on this property.
Links {	object	The value of this property shall contains links to other resources that are not contained in this resource.
Oem {}	object	This object represents the Oem property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.

SupportedReplicaOptions [{	array <i>read-write</i>	The collection shall contain known and supported replica Classes of Service.
@odata.id	string <i>read-only</i>	Link to a ClassOfService resource. See the Links section and the <i>ClassOfService</i> schema for details.
}]		
SupportedReplicaOptions@odata.count	integer <i>read-only</i>	The value of this property shall be an integer representing the number of items in a collection.
}		
Name	string <i>read-only required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
SupportedLinesOfService [{	array <i>read-write</i>	The collection shall contain known and supported DataProtectionLinesOfService.
@odata.id	string <i>read-only</i>	Link to a DataProtectionLineOfService resource. See the Links section and the <i>DataProtectionLineOfService</i> schema for details.
}]		
SupportedMinLifetimes []	array (string, null) <i>read-write</i>	The value of each entry shall be an ISO 8601 duration that specifies the minimum lifetime required for the replica.

SupportedRecoveryGeographicObjectives []	array (string (enum)) <i>read- write (null)</i>	The value of each entry shall specify a supported failure domain. The enumeration literals of this enumeration shall represent a geographic scope in which all components within that scope have similar vulnerabilities. <i>See SupportedRecoveryGeographicObjectives in Property Details, below, for the possible values of this property.</i>
SupportedRecoveryPointObjectiveTimes []	array (string, null) <i>read- write</i>	The value of each entry shall specify a supported ISO 8601 time interval defining the maximum source information that may be lost on failure. In the case that IsIsolated = false, failure of the domain is not a consideration.
SupportedRecoveryTimeObjectives []	array (string (enum)) <i>read- write (null)</i>	The value of each entry shall specify an enumerated value that indicates a supported expectation for the time required to access an alternate replica. In the case that IsIsolated = false, failure of the domain is not a consideration. The enumeration literals shall represent the relative time required to make a replica available as a source. <i>See SupportedRecoveryTimeObjectives in Property Details, below, for the possible values of this property.</i>
SupportedReplicaTypes []	array (string (enum)) <i>read- write (null)</i>	The value of each entry shall specify a supported replica type. The enumeration literals may be used to specify the intended outcome of the replication. <i>See SupportedReplicaTypes in Property Details, below, for the possible values of this property.</i>
SupportsIsolated	boolean <i>read- write (null)</i>	A value of true shall indicate that allocating a replica in a separate fault domain is supported. The default value for this property is false.

9.8.1 Property Details

9.8.1.1 SupportedRecoveryGeographicObjectives:

The value of each entry shall specify a supported failure domain. The enumeration literals of this enumeration shall represent a geographic scope in which all components within that scope have similar vulnerabilities.

string	Description

string	Description
Datacenter	A facility that provides communication, power, or cooling infrastructure to a co-located set of servers, networking and storage.
Rack	A container within a datacenter that provides communication, power, or cooling to a set of components.
RackGroup	A set of racks that may share common communication, power, or cooling.
Region	A set of resources that are required to be either geographically or politically isolated from resources not in the resources.
Row	A set of adjacent racks or rackgroups that may share common communication, power, or cooling.
Server	Components of a CPU/memory complex that share the same infrastructure.

9.8.1.2 SupportedRecoveryTimeObjectives:

The value of each entry shall specify an enumerated value that indicates a supported expectation for the time required to access an alternate replica. In the case that `IsIsolated = false`, failure of the domain is not a consideration. The enumeration literals shall represent the relative time required to make a replica available as a source.

string	Description
Nearline	Access to a replica shall be consistent with switching access to a different path through a different front-end interconnection infrastructure. Some inconsistency may occur. A restore step may be required before recovery can commence.
Offline	Access to a replica may take a significant amount of time. No direct connection to the replica is assumed. Some inconsistency loss may occur. A restore step is likely to be required.
OnlineActive	Access to synchronous replicas shall be instantaneous.
OnlinePassive	Access to a synchronous replica shall be consistent with switching access to a different path the same front-end interconnect. A restore step shall not be required.

9.8.1.3 SupportedReplicaTypes:

The value of each entry shall specify a supported replica type. The enumeration literals may be used to specify the intended outcome of the replication.

string	Description
Clone	This enumeration literal shall indicate that replication shall create a point in time, full copy the source.
Mirror	This enumeration literal shall indicate that replication shall create and maintain a copy of the source.
Snapshot	This enumeration literal shall indicate that replication shall create a point in time, virtual copy of the source.
TokenizedClone	This enumeration literal shall indicate that replication shall create a token based clone.

9.9 DataSecurityLineOfService 1.0.1

This structure shall be used to describe data security service level requirements.

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
AntivirusEngineProvider	string <i>read-write (null)</i>	The value shall specify an AntiVirus provider.
AntivirusScanPolicies []	array (string (enum)) <i>read-write (null)</i>	The enumeration literal shall specify the policy for triggering an AntiVirus scan. The enumeration literals shall specify types of antivirus scan triggers. <i>See AntivirusScanPolicies in Property Details, below, for the possible values of this property.</i>
ChannelEncryptionStrength	string (enum) <i>read-write (null)</i>	The enumeration literal shall specify a key size in a symmetric encryption algorithm for transport channel encryption. <i>See ChannelEncryptionStrength in Property Details, below, for the possible values of this property.</i>
DataSanitizationPolicy	string (enum) <i>read-write (null)</i>	The enumeration literal shall specify the data sanitization policy. <i>See DataSanitizationPolicy in Property Details, below, for the possible values of this property.</i>
Description	string <i>read-only (null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
HostAuthenticationType	string (enum) <i>read-write (null)</i>	The enumeration literal shall specify the authentication type for hosts (servers) or initiator endpoints. <i>See HostAuthenticationType in Property Details, below, for the possible values of this property.</i>

Id	string <i>read-only</i> <i>required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
MediaEncryptionStrength	string (enum) <i>read-write</i> <i>(null)</i>	The enumeration literal shall specify a key size in a symmetric encryption algorithm for media encryption. <i>See MediaEncryptionStrength in Property Details, below, for the possible values of this property.</i>
Name	string <i>read-only</i> <i>required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem ⚡	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
SecureChannelProtocol	string (enum) <i>read-write</i> <i>(null)</i>	The enumeration literal shall specify the protocol that provide encrypted communication. <i>See SecureChannelProtocol in Property Details, below, for the possible values of this property.</i>
UserAuthenticationType	string (enum) <i>read-write</i> <i>(null)</i>	The enumeration literal shall specify the authentication type for users (or programs). <i>See UserAuthenticationType in Property Details, below, for the possible values of this property.</i>

9.9.1 Property Details

9.9.1.1 AntivirusScanPolicies:

The enumeration literal shall specify the policy for triggering an AntiVirus scan. The enumeration literals shall specify types of antivirus scan triggers.

string	Description
None	This enumeration literal specifies No trigger.
OnFirstRead	This enumeration literal specifies to trigger on first read.
OnPatternUpdate	This enumeration literal specifies to trigger on antivirus pattern file update.
OnRename	This enumeration literal specifies to trigger on object rename.

string	Description
OnUpdate	This enumeration literal specifies to trigger on object update.

9.9.1.2 ChannelEncryptionStrength:

The enumeration literal shall specify a key size in a symmetric encryption algorithm for transport channel encryption.

string	Description
Bits_0	This enumeration literal specifies that there is no key.
Bits_112	This enumeration literal specifies a 3DES 112 bit key.
Bits_128	This enumeration literal specifies an AES 128 bit key.
Bits_192	This enumeration literal specifies an AES 192 bit key.
Bits_256	This enumeration literal specifies an AES 256 bit key.

9.9.1.3 DataSanitizationPolicy:

The enumeration literal shall specify the data sanitization policy.

string	Description
Clear	This enumeration literal specifies to sanitize data in all user-addressable storage locations for protection against simple non-invasive data recovery techniques.
CryptographicErase	This enumeration literal specifies to leverages the encryption of target data by enabling sanitization of the target data's encryption key. This leaves only the ciphertext remaining on the media, effectively sanitizing the data by preventing read-access. For more information, see NIST800-88 and ISO/IEC 27040.
None	This enumeration literal specifies no sanitization.

9.9.1.4 HostAuthenticationType:

The enumeration literal shall specify the authentication type for hosts (servers) or initiator endpoints.

string	Description
None	This enumeration literal specifies No authentication.
Password	This enumeration literal specifies Password/shared-secret: Absent an distributed authentication infrastructure, this is what is typically done.
PKI	This enumeration literal specifies a Public Key Infrastructure. Customers with the highest assurance requirements roll PKI out to hosts and users (it is more common for hosts than users. User PKI-based authentication has significant operational complications and administrative overheads, e.g., smart cards may be involved.
Ticket	This enumeration literal specifies Ticket-based (e.g., Kerberos): This is the most common class of authentication infrastructure used in enterprises. Kerberos is the best known example, and Windows usage of that via Active Directory is so widely deployed as to be a de facto standard. In other areas (e.g., academia) there are comparable ticket-based systems.

9.9.1.5 MediaEncryptionStrength:

The enumeration literal shall specify a key size in a symmetric encryption algorithm for media encryption.

string	Description
Bits_0	This enumeration literal specifies that there is no key.
Bits_112	This enumeration literal specifies a 3DES 112 bit key.
Bits_128	This enumeration literal specifies an AES 128 bit key.
Bits_192	This enumeration literal specifies an AES 192 bit key.
Bits_256	This enumeration literal specifies an AES 256 bit key.

9.9.1.6 SecureChannelProtocol:

The enumeration literal shall specify the protocol that provide encrypted communication.

string	Description
IPsec	This enumeration literal specifies Internet Protocol Security (IPsec), as defined by IETF RFC 2401.
None	This enumeration literal specifies no encryption.
RPCSEC_GSS	This enumeration literal specifies RPC access to the Generic Security Services Application Programming Interface (GSS-API), as defined by IETF RPC 2203.
TLS	This enumeration literal specifies Transport Layer Security (TLS), as defined by IETF RFC 5246.

9.9.1.7 UserAuthenticationType:

The enumeration literal shall specify the authentication type for users (or programs).

string	Description
None	This enumeration literal specifies No authentication.
Password	This enumeration literal specifies Password/shared-secret: Absent an distributed authentication infrastructure, this is what is typically done.
PKI	This enumeration literal specifies a Public Key Infrastructure. Customers with the highest assurance requirements roll PKI out to hosts and users (it is more common for hosts than users. User PKI-based authentication has significant operational complications and administrative overheads, e.g., smart cards may be involved.
Ticket	This enumeration literal specifies Ticket-based (e.g., Kerberos): This is the most common class of authentication infrastructure used in enterprises. Kerberos is the best known example, and Windows usage of that via Active Directory is so widely deployed as to be a de facto standard. In other areas (e.g., academia) there are comparable ticket-based systems.

9.10 DataSecurityLoSCapabilities 1.1.2

This resource may be used to describe data security capabilities.

URIs:

/redfish/v1/StorageServices/{StorageServiceId}/DataSecurityLoSCapabilities

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Actions (v1.1+) {}	object	The Actions property shall contain the available actions for this resource.
Description	string <i>read-only (null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Id	string <i>read-only required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Identifier {}	object <i>(null)</i>	The value identifies this resource. The value shall be unique within the managed ecosystem. See the redfish.dmtf.org/schemas/v1/Resource.v1_7_0.json schema for details on this property.
Name	string <i>read-only required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem {}	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
SupportedAntivirusEngineProviders []	array (string, null) <i>read-write</i>	The entry values shall specify supported AntiVirus providers.

SupportedAntivirusScanPolicies []	array (string (enum)) read- write (null)	The enumeration literal shall specify supported policies that trigger an AntiVirus scan. The enumeration literals shall specify types of antivirus scan triggers. <i>See SupportedAntivirusScanPolicies in Property Details, below, for the possible values of this property.</i>
SupportedChannelEncryptionStrengths []	array (string (enum)) read- write (null)	The enumeration literal shall specify supported key sizes in a symmetric encryption algorithm (AES) for transport channel encryption. The enumeration literals shall specify Key sizes in a symmetric encryption algorithm, (see NIST SP 800-57 part 1 (http://csrc.nist.gov/publications/nistpubs/800-57/sp800-57_part1_rev3_general.pdf) <i>See SupportedChannelEncryptionStrengths in Property Details, below, for the possible values of this property.</i>
SupportedDataSanitizationPolicies []	array (string (enum)) read- write (null)	The enumeration literal shall specify supported data sanitization policies. The enumeration literals shall specify types of data sanitization policies. <i>See SupportedDataSanitizationPolicies in Property Details, below, for the possible values of this property.</i>
SupportedHostAuthenticationTypes []	array (string (enum)) read- write (null)	The enumeration literal shall specify supported authentication types for hosts (servers) or initiator endpoints. The enumeration literals shall specify authentication algorithms. <i>See SupportedHostAuthenticationTypes in Property Details, below, for the possible values of this property.</i>
SupportedLinesOfService [{	array read- write	The collection shall contain supported DataSecurity service options.
@odata.id	string read- only	Link to a DataSecurityLineOfService resource. See the Links section and the <i>DataSecurityLineOfService</i> schema for details.
}]		

SupportedMediaEncryptionStrengths []	array (string (enum)) <i>read- write (null)</i>	The enumeration literal shall specify supported key sizes in a symmetric encryption algorithm (AES) for media encryption. The enumeration literals shall specify Key sizes in a symmetric encryption algorithm, (see NIST SP 800-57 part 1 (http://csrc.nist.gov/publications/nistpubs/800-57/sp800-57_part1_rev3_general.pdf) See <i>SupportedMediaEncryptionStrengths</i> in <i>Property Details</i> , below, for the possible values of this property.
SupportedSecureChannelProtocols []	array (string (enum)) <i>read- write (null)</i>	The enumeration literal shall specify supported protocols that provide encrypted communication. The enumeration literals shall specify types of Secure channel protocols. See <i>SupportedSecureChannelProtocols</i> in <i>Property Details</i> , below, for the possible values of this property.
SupportedUserAuthenticationTypes []	array (string (enum)) <i>read- write (null)</i>	The enumeration literal shall specify supported authentication types for users (or programs). The enumeration literals shall specify authentication algorithms. See <i>SupportedUserAuthenticationTypes</i> in <i>Property Details</i> , below, for the possible values of this property.

9.10.1 Property Details

9.10.1.1 SupportedAntivirusScanPolicies:

The enumeration literal shall specify supported policies that trigger an AntiVirus scan. The enumeration literals shall specify types of antivirus scan triggers.

string	Description
None	This enumeration literal specifies No trigger.
OnFirstRead	This enumeration literal specifies to trigger on first read.
OnPatternUpdate	This enumeration literal specifies to trigger on antivirus pattern file update.
OnRename	This enumeration literal specifies to trigger on object rename.
OnUpdate	This enumeration literal specifies to trigger on object update.

9.10.1.2 SupportedChannelEncryptionStrengths:

The enumeration literal shall specify supported key sizes in a symmetric encryption algorithm (AES) for transport channel encryption. The enumeration literals shall specify Key sizes in a symmetric encryption algorithm, (see NIST SP 800-57 part 1 (http://csrc.nist.gov/publications/nistpubs/800-57/sp800-57_part1_rev3_general.pdf))

string	Description
Bits_0	This enumeration literal specifies that there is no key.
Bits_112	This enumeration literal specifies a 3DES 112 bit key.
Bits_128	This enumeration literal specifies an AES 128 bit key.
Bits_192	This enumeration literal specifies an AES 192 bit key.
Bits_256	This enumeration literal specifies an AES 256 bit key.

9.10.1.3 SupportedDataSanitizationPolicies:

The enumeration literal shall specify supported data sanitization policies. The enumeration literals shall specify types of data sanitization policies.

string	Description
Clear	This enumeration literal specifies to sanitize data in all user-addressable storage locations for protection against simple non-invasive data recovery techniques.
CryptographicErase	This enumeration literal specifies to leverages the encryption of target data by enabling sanitization of the target data's encryption key. This leaves only the ciphertext remaining on the media, effectively sanitizing the data by preventing read-access. For more information, see NIST800-88 and ISO/IEC 27040.
None	This enumeration literal specifies no sanitization.

9.10.1.4 SupportedHostAuthenticationTypes:

The enumeration literal shall specify supported authentication types for hosts (servers) or initiator endpoints. The enumeration literals shall specify authentication algorithms.

string	Description
None	This enumeration literal specifies No authentication.
Password	This enumeration literal specifies Password/shared-secret: Absent an distributed authentication infrastructure, this is what is typically done.
PKI	This enumeration literal specifies a Public Key Infrastructure. Customers with the highest assurance requirements roll PKI out to hosts and users (it is more common for hosts than users. User PKI-based authentication has significant operational complications and administrative overheads, e.g., smart cards may be involved.
Ticket	This enumeration literal specifies Ticket-based (e.g., Kerberos): This is the most common class of authentication infrastructure used in enterprises. Kerberos is the best known example, and Windows usage of that via Active Directory is so widely deployed as to be a de facto standard. In other areas (e.g., academia) there are comparable ticket-based systems.

9.10.1.5 SupportedMediaEncryptionStrengths:

The enumeration literal shall specify supported key sizes in a symmetric encryption algorithm (AES) for media encryption. The enumeration literals shall specify Key sizes in a symmetric encryption algorithm, (see NIST SP 800-57 part 1 (http://csrc.nist.gov/publications/nistpubs/800-57/sp800-57_part1_rev3_general.pdf))

string	Description
Bits_0	This enumeration literal specifies that there is no key.
Bits_112	This enumeration literal specifies a 3DES 112 bit key.
Bits_128	This enumeration literal specifies an AES 128 bit key.
Bits_192	This enumeration literal specifies an AES 192 bit key.
Bits_256	This enumeration literal specifies an AES 256 bit key.

9.10.1.6 SupportedSecureChannelProtocols:

The enumeration literal shall specify supported protocols that provide encrypted communication. The enumeration literals shall specify types of Secure channel protocols.

string	Description
IPsec	This enumeration literal specifies Internet Protocol Security (IPsec), as defined by IETF RFC 2401.
None	This enumeration literal specifies no encryption.
RPCSEC_GSS	This enumeration literal specifies RPC access to the Generic Security Services Application Programming Interface (GSS-API), as defined by IETF RPC 2203.
TLS	This enumeration literal specifies Transport Layer Security (TLS), as defined by IETF RFC 5246.

9.10.1.7 SupportedUserAuthenticationTypes:

The enumeration literal shall specify supported authentication types for users (or programs). The enumeration literals shall specify authentication algorithms.

string	Description
None	This enumeration literal specifies No authentication.
Password	This enumeration literal specifies Password/shared-secret: Absent an distributed authentication infrastructure, this is what is typically done.
PKI	This enumeration literal specifies a Public Key Infrastructure. Customers with the highest assurance requirements roll PKI out to hosts and users (it is more common for hosts than users). User PKI-based authentication has significant operational complications and administrative overheads, e.g., smart cards may be involved.
Ticket	This enumeration literal specifies Ticket-based (e.g., Kerberos): This is the most common class of authentication infrastructure used in enterprises. Kerberos is the best known example, and Windows usage of that via Active Directory is so widely deployed as to be a de facto standard. In other areas (e.g., academia) there are comparable ticket-based systems.

9.11 DataStorageLineOfService 1.2.0

This structure may be used to describe a service option covering storage provisioning and availability.

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
AccessCapabilities []	array (string (enum)) <i>read-write (null)</i>	Each entry specifies a required storage access capability. StorageAccessCapability enumeration literals may be used to describe abilities to read or write storage. <i>See AccessCapabilities in Property Details, below, for the possible values of this property.</i>
Description	string <i>read-only (null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Id	string <i>read-only required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
IsSpaceEfficient	boolean <i>read-write (null)</i>	A value of true shall indicate that the storage is compressed or deduplicated. The default value for this property is false.
Name	string <i>read-only required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
ProvisioningPolicy	string (enum) <i>read-write (null)</i>	The enumeration literal shall define the provisioning policy for storage. <i>See ProvisioningPolicy in Property Details, below, for the possible values of this property.</i>

RecoverableCapacitySourceCount (v1.2+)	integer read- write (null)	The value is minimum required number of available capacity source resources that shall be available in the event that an equivalent capacity source resource fails. It is assumed that drives and memory components can be replaced, repaired or otherwise added to increase an associated resource's RecoverableCapacitySourceCount.
RecoveryTimeObjectives	string (enum) read- write (null)	The enumeration literal specifies the time after a disaster that the client shall regain conformant service level access to the primary store, typical values are 'immediate' or 'offline'. The expectation is that the services required to implement this capability are part of the advertising system. <i>See RecoveryTimeObjectives in Property Details, below, for the possible values of this property.</i>

9.11.1 Property Details

9.11.1.1 AccessCapabilities:

Each entry specifies a required storage access capability. StorageAccessCapability enumeration literals may be used to describe abilities to read or write storage.

string	Description
Append	This enumeration literal shall indicate that the storage may be written only to append.
Execute	This value shall indicate that Execute access is allowed by the file share.
Read	This enumeration literal shall indicate that the storage may be read.
Streaming	This enumeration literal shall indicate that the storage may be read sequentially.
Write	This enumeration literal shall indicate that the storage may be written multiple times.
WriteOnce	This enumeration literal shall indicate that the storage may be written only once.

9.11.1.2 ProvisioningPolicy:

The enumeration literal shall define the provisioning policy for storage.

string	Description
Fixed	This enumeration literal specifies storage shall be fully allocated.
Thin	This enumeration literal specifies storage may be over allocated.

9.11.1.3 RecoveryTimeObjectives:

The enumeration literal specifies the time after a disaster that the client shall regain conformant service level access to the primary store, typical values are 'immediate' or 'offline'. The expectation is that the services required to implement this capability are part of the advertising system.

string	Description
Nearline	Access to a replica shall be consistent with switching access to a different path through a different front-end interconnection infrastructure. Some inconsistency may occur. A restore step may be required before recovery can commence.
Offline	Access to a replica may take a significant amount of time. No direct connection to the replica is assumed. Some inconsistency loss may occur. A restore step is likely to be required.
OnlineActive	Access to synchronous replicas shall be instantaneous.
OnlinePassive	Access to a synchronous replica shall be consistent with switching access to a different path the same front-end interconnect. A restore step shall not be required.

9.12 DataStorageLoSCapabilities 1.2.0

Each instance of DataStorageLoSCapabilities describes capabilities of the system to support various data storage service options.

URIs:

/redfish/v1/StorageServices/{StorageServiceId}/DataStorageLoSCapabilities

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Actions (v1.1+) {}	object	The Actions property shall contain the available actions for this resource.
Description	string <i>read-only</i> (null)	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Id	string <i>read-only</i> <i>required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Identifier {}	object (null)	The value shall be unique within the managed ecosystem. See the redfish.dmtf.org/schemas/v1/Resource.v1_7_0.json schema for details on this property.
MaximumRecoverableCapacitySourceCount (v1.2+)	integer <i>read-write</i> (null)	The maximum number of capacity source resources that can be supported for the purpose of recovery when in the event that an equivalent capacity source resource fails.

Name	string <i>read-only</i> <i>required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
SupportedAccessCapabilities []	array (string (enum)) <i>read-write</i> (null)	Each entry specifies a storage access capability. StorageAccessCapability enumeration literals may be used to describe abilities to read or write storage. <i>See SupportedAccessCapabilities in Property Details, below, for the possible values of this property.</i>
SupportedLinesOfService [{	array <i>read-write</i>	The collection shall contain known and supported DataStorageLinesOfService.
@odata.id	string <i>read-only</i>	Link to a DataStorageLineOfService resource. See the Links section and the <i>DataStorageLineOfService</i> schema for details.
}]		
SupportedProvisioningPolicies []	array (string (enum)) <i>read-write</i> (null)	This collection specifies supported storage allocation policies. The enumeration literals may be used to specify space provisioning policy. <i>See SupportedProvisioningPolicies in Property Details, below, for the possible values of this property.</i>
SupportedRecoveryTimeObjectives []	array (string (enum)) <i>read-write</i> (null)	This collection specifies supported expectations for time to access the primary store after recovery. The enumeration literals shall represent the relative time required to make a replica available as a source. <i>See SupportedRecoveryTimeObjectives in Property Details, below, for the possible values of this property.</i>
SupportsSpaceEfficiency	boolean <i>read-write</i> (null)	The value specifies whether storage compression or deduplication is supported. The default value for this property is false.

9.12.1 Property Details

9.12.1.1 SupportedAccessCapabilities:

Each entry specifies a storage access capability. StorageAccessCapability enumeration literals may be used to describe abilities to read or write storage.

string	Description
Append	This enumeration literal shall indicate that the storage may be written only to append.
Execute	This value shall indicate that Execute access is allowed by the file share.
Read	This enumeration literal shall indicate that the storage may be read.
Streaming	This enumeration literal shall indicate that the storage may be read sequentially.
Write	This enumeration literal shall indicate that the storage may be written multiple times.
WriteOnce	This enumeration literal shall indicate that the storage may be written only once.

9.12.1.2 SupportedProvisioningPolicies:

This collection specifies supported storage allocation policies. The enumeration literals may be used to specify space provisioning policy.

string	Description
Fixed	This enumeration literal specifies storage shall be fully allocated.
Thin	This enumeration literal specifies storage may be over allocated.

9.12.1.3 SupportedRecoveryTimeObjectives:

This collection specifies supported expectations for time to access the primary store after recovery. The enumeration literals shall represent the relative time required to make a replica available as a source.

string	Description
Nearline	Access to a replica shall be consistent with switching access to a different path through a different front-end interconnection infrastructure. Some inconsistency may occur. A restore step may be required before recovery can commence.
Offline	Access to a replica may take a significant amount of time. No direct connection to the replica is assumed. Some inconsistency loss may occur. A restore step is likely to be required.
OnlineActive	Access to synchronous replicas shall be instantaneous.
OnlinePassive	Access to a synchronous replica shall be consistent with switching access to a different path the same front-end interconnect. A restore step shall not be required.

9.13 DriveCollection

URIs:

/redfish/v1/StorageServices/{StorageServiceId}/FileSystems/{FileSystemId}/CapacitySources/{CapacitySourceId}/ProvidingDrives
 /redfish/v1/StorageServices/{StorageServiceId}/StoragePools/{StoragePoolId}/CapacitySources/{CapacitySourceId}/ProvidingDrives
 /redfish/v1/StorageServices/{StorageServiceId}/Volumes/{VolumeId}/CapacitySources/{CapacitySourceId}/ProvidingDrives

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Description	string <i>read-only (null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Members [{	array <i>read-only</i>	The value of each entry of this property shall reference a Drive resource.
@odata.id	string <i>read-only</i>	The value of this property shall be the unique identifier for the resource and it shall be of the form defined in the Redfish specification.
}]		
Members@odata.nextLink	string <i>read-only</i>	The value of this property shall be a URI to a resource, with the same @odata.type, containing the next set of partial members.
Name	string <i>read-only</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.

9.14 EndpointGroup 1.1.2

An EndpointGroup represents a collection of endpoints that are managed as a unit. By grouping together a collection of Endpoints, the EndpointGroup allows a collection of entities from differing sources or hosts to be manipulated uniformly and efficiently.

For any given EndpointGroup, all of its endpoints act exclusively as either server endpoints or client endpoints, as indicated by the value of the EndpointType property. Similarly, each Endpoint within a group has the same AccessState.

A server or client may define multiple EndpointGroup entities that access the same set of resources or functionality. A group may be designated as preferred, which signifies that access should be directed through its members in preference to the Endpoints listed in other EndpointGroups. If the value of EndpointType is Server, an EndpointGroup entity can be used to represent target

port group as defined by SCSI. In that mode, the value of the TargetEndpointGroupIdentifier should correspond to the target port group number. (See clause "Device Identification VPD page" as defined in the SCSI Primary Commands specification.)

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
AccessState	string (enum) <i>read-write</i> (null)	Access to all associated resources through all aggregated endpoints shall share this access state. <i>See AccessState in Property Details, below, for the possible values of this property.</i>
Actions (v1.1+) {}	object	The Actions property shall contain the available actions for this resource.
Description	string <i>read-only</i> (null)	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Endpoints {	object (null)	The value of each entry shall reference an Endpoint resource.
@odata.id	string <i>read-only</i>	The value of this property shall be the unique identifier for the resource and it shall be of the form defined in the Redfish specification.
}		
GroupType	string (enum) <i>read-write</i> (null)	The group contains only endpoints of a given type Client/Initiator or Server/Target. If this endpoint group represents a SCSI target group, the value of GroupType shall be Server. <i>See GroupType in Property Details, below, for the possible values of this property.</i>
Id	string <i>read-only</i> <i>required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Identifier {}	object (null)	The value shall be unique within the managed ecosystem. See the <i>redfish.dmtf.org/schemas/v1/Resource.v1_7_0.json</i> schema for details on this property.

Links {	object	This structure shall contain references to resources that are not contained within this resource.
Oem {	object	This object represents the Oem property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. See the <i>redfish.dmtf.org/schemas/v1/Resource.json</i> schema for details on this property.
}		
Name	string <i>read-only required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem {	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the <i>redfish.dmtf.org/schemas/v1/Resource.json</i> schema for details on this property.
Preferred	boolean <i>read-write (null)</i>	A value of True in this property shall indicate that access to the associated resource through the endpoints in this endpoint group is preferred over access through other endpoints. The default value for this property is false.
TargetEndpointGroupIdentifier	integer <i>read-write (null)</i>	If this endpoint group represents a SCSI target group, the value of this property shall contain a SCSI defined identifier for this group, which corresponds to the TARGET PORT GROUP field in the REPORT TARGET PORT GROUPS response and the TARGET PORT GROUP field in an INQUIRY VPD page 85 response, type 5h identifier. See the INCITS SAM-5 specification.

9.14.1 Property Details

9.14.1.1 AccessState:

Access to all associated resources through all aggregated endpoints shall share this access state.

string	Description
NonOptimized	In the context of this enumeration literal, each endpoint shall be in an Active/NonOptimized state.
Optimized	In the context of this enumeration literal, each endpoint shall be in an Active/Optimized state.
Standby	In the context of this enumeration literal, each endpoint shall be in a Standby state.
Transitioning	In the context of this enumeration literal, at least one endpoint shall be transitioning to a new AccessState.

string	Description
Unavailable	In the context of this enumeration literal, each endpoint shall be in an unavailable state.

9.14.1.2 GroupType:

The group contains only endpoints of a given type Client/Initiator or Server/Target. If this endpoint group represents a SCSI target group, the value of GroupType shall be Server.

string	Description
Client	The group contains the client (initiator) endpoints.
Server	The group contains the server (target) endpoints.

9.15 EndpointGroupCollection

URIs:

/redfish/v1/StorageServices/{StorageServiceId}/EndpointGroups

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Description	string <i>read-only (null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Members [{	array <i>read-only</i>	The value of each member entry shall reference an endpoint group resource.
@odata.id	string <i>read-only</i>	Link to a EndpointGroup resource. See the Links section and the <i>EndpointGroup</i> schema for details.
}]		
Members@odata.nextLink	string <i>read-only</i>	The value of this property shall be a URI to a resource, with the same @odata.type, containing the next set of partial members.
Name	string <i>read-only</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .

Oem {	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
--------------	--------	--

9.16 FileShare 1.1.2

This resource shall be used to represent a shared set of files with a common directory structure.

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Actions (<i>v1.1+</i>) {	object	The Actions property shall contain the available actions for this resource.
CASupported	boolean <i>read-write</i> <i>(null)</i>	The value of this property shall indicate that Continuous Availability is supported. Client/Server mediated recovery from network and server failure with application transparency. This property shall be NULL unless the FileSharingProtocols property includes SMB. The default value for this property is false.
DefaultAccessCapabilities []	array (string (enum)) <i>read-only</i> <i>(null)</i>	The value of this property shall be an array containing entries for the default access capabilities for the file share. Each entry shall specify a default access privilege. The types of default access can include Read, Write, and/or Execute. StorageAccessCapability enumeration literals may be used to describe abilities to read or write storage. <i>See DefaultAccessCapabilities in Property Details, below, for the possible values of this property.</i>
Description	string <i>read-only</i> <i>(null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
EthernetInterfaces {	object	The value shall be a link to an EthernetInterfaceCollection with members that provide access to the file share.
@odata.id	string <i>read-only</i>	The value of this property shall be the unique identifier for the resource and it shall be of the form defined in the Redfish specification.
}		

ExecuteSupport	boolean <i>read-only</i> <i>(null)</i>	The value of this property shall indicate whether Execute access is supported by the file share. The default value for this property is false.
FileSharePath	string <i>read-only</i> <i>(null)</i>	The value of this property shall be a path (relative to the file system root) to the exported file or directory on the file system where this file share is hosted.
FileShareQuotaType	string (enum) <i>read-write</i> <i>(null)</i>	If FileShareQuotaType is present, a value of Soft shall specify that quotas are not enforced, and a value of Hard shall specify that writes shall fail if the space consumed would exceed the value of the FileShareTotalQuotaBytes property. <i>See FileShareQuotaType in Property Details, below, for the possible values of this property.</i>
FileShareRemainingQuotaBytes	integer (By) <i>read-write</i> <i>(null)</i>	If present, the value of this property shall indicate the remaining number of bytes that may be consumed by this file share.
FileShareTotalQuotaBytes	integer (By) <i>read-write</i> <i>(null)</i>	If present, the value of this property shall indicate the maximum number of bytes that may be consumed by this file share.
FileSharingProtocols []	array (string (enum)) <i>read-only</i> <i>(null)</i>	This property shall be an array containing entries for the file sharing protocols supported by this file share. Each entry shall specify a file sharing protocol supported by the file system. The values shall indicate the file sharing protocols supported by the file system. At least one value shall be present. <i>See FileSharingProtocols in Property Details, below, for the possible values of this property.</i>
Id	string <i>read-only</i> <i>required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Links {	object	This property shall contain links to other resources that are related to this resource.

ClassOfService {	object (null)	This value shall be a link to the ClassOfService for this file share. See the <i>ClassOfService</i> schema for details on this property.
@odata.id	string read-only	Link to a ClassOfService resource. See the Links section and the <i>ClassOfService</i> schema for details.
}		
FileSystem {	object (null)	The value shall be a link to the file system containing the file share. See the <i>FileSystem</i> schema for details on this property.
@odata.id	string read-only	Link to a FileSystem resource. See the Links section and the <i>FileSystem</i> schema for details.
}		
Oem { }	object	This object represents the Oem property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
}		
LowSpaceWarningThresholdPercents []	array (%) (integer, null) read-write	This property shall be an array containing entries for the percentages of file share capacity at which low space warning events are to be issued. A <code>LOW_SPACE_THRESHOLD_WARNING</code> event shall be triggered each time the remaining file share capacity value becomes less than one of the values in the array. The following shall be true: Across all CapacitySources entries, $\text{percent} = \frac{\text{SUM}(\text{AllocatedBytes}) - \text{SUM}(\text{ConsumedBytes})}{\text{SUM}(\text{AllocatedBytes})}$
Name	string read-only required	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.

RemainingCapacityPercent (v1.1+)	integer read-only (null)	If present, this value shall return $\{[(\text{SUM}(\text{AllocatedBytes}) - \text{SUM}(\text{ConsumedBytes}))/\text{SUM}(\text{AllocatedBytes})]*100\}$ represented as an integer value.
RootAccess	boolean read-only (null)	The value of this property shall indicate whether Root access is allowed by the file share. The default value for this property is false.
Status {}	object (null)	This value of this property shall indicate the status of the file share. See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
WritePolicy	string (enum) read-only (null)	The value of this property shall define how writes are replicated to the shared source. <i>See WritePolicy in Property Details, below, for the possible values of this property.</i>

9.16.1 Property Details

9.16.1.1 DefaultAccessCapabilities:

The value of this property shall be an array containing entries for the default access capabilities for the file share. Each entry shall specify a default access privilege. The types of default access can include Read, Write, and/or Execute. StorageAccessCapability enumeration literals may be used to describe abilities to read or write storage.

string	Description
Append	This enumeration literal shall indicate that the storage may be written only to append.
Execute	This value shall indicate that Execute access is allowed by the file share.
Read	This enumeration literal shall indicate that the storage may be read.
Streaming	This enumeration literal shall indicate that the storage may be read sequentially.
Write	This enumeration literal shall indicate that the storage may be written multiple times.
WriteOnce	This enumeration literal shall indicate that the storage may be written only once.

9.16.1.2 FileShareQuotaType:

If FileShareQuotaType is present, a value of Soft shall specify that quotas are not enforced, and a value of Hard shall specify that writes shall fail if the space consumed would exceed the value of the FileShareTotalQuotaBytes property.

string	Description
Hard	This value shall indicate that quotas are enabled and enforced.

string	Description
Soft	This value shall indicate that quotas are enabled but not enforced.

9.16.1.3 FileSharingProtocols:

This property shall be an array containing entries for the file sharing protocols supported by this file share. Each entry shall specify a file sharing protocol supported by the file system. The values shall indicate the file sharing protocols supported by the file system. At least one value shall be present.

string	Description
NFSv3	This value shall indicate that NFSv3, as defined in RFC 1813, is supported by the file system.
NFSv4_0	This value shall indicate that NFSv4, as defined in RFC 7530, is supported by the file system.
NFSv4_1	This value shall indicate that NFSv4.1, as defined in RFC 5661, is supported by the file system.
SMBv2_0	This value shall indicate that Server Message Block version 2.0 is supported by the file system.
SMBv2_1	This value shall indicate that Server Message Block version 2.1 is supported by the file system.
SMBv3_0	This value shall indicate that Server Message Block version 3.0 is supported by the file system.
SMBv3_0_2	This value shall indicate that Server Message Block version 3.0.2 is supported by the file system.
SMBv3_1_1	This value shall indicate that Server Message Block version 3.1.1 is supported by the file system.

9.16.1.4 WritePolicy:

The value of this property shall define how writes are replicated to the shared source.

string	Description
Active	This enumeration literal shall indicate Active-Active (i.e. bidirectional) synchronous updates.
Adaptive	This enumeration literal shall indicate that an implementation may switch between synchronous and asynchronous modes.
Asynchronous	This enumeration literal shall indicate Asynchronous updates.
Synchronous	This enumeration literal shall indicate Synchronous updates.

9.17 FileShareCollection

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Description	string <i>read-only</i> <i>(null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.

Members [{	array <i>read-only</i>	This property shall contain references to the members of this FileSystem collection.
@odata.id	string <i>read-only</i>	Link to a FileShare resource. See the Links section and the <i>FileShare</i> schema for details.
}]		
Members@odata.nextLink	string <i>read-only</i>	The value of this property shall be a URI to a resource, with the same @odata.type, containing the next set of partial members.
Name	string <i>read-only</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the <i>redfish.dmtf.org/schemas/v1/Resource.json</i> schema for details on this property.

9.18 FileSystem 1.2.1

This resource shall be used to represent an instance of a hierarchical namespace of files.

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
AccessCapabilities []	array (string (enum)) <i>read-write</i> (null)	This property shall be an array containing entries for the supported IO access capabilities. Each entry shall specify a current storage access capability. StorageAccessCapability enumeration literals may be used to describe abilities to read or write storage. <i>See AccessCapabilities in Property Details, below, for the possible values of this property.</i>
Actions (v1.1+) { }	object	The Actions property shall contain the available actions for this resource.
BlockSizeBytes	integer (By) <i>read-only</i> (null)	The value of this property shall be the block size of the file system in bytes.

Capacity {	object (null)	The value of this property shall be the capacity allocated to the file system in bytes. See the <i>CapacitySource</i> schema for details on this property.
@odata.id	string read-only	Link to a Capacity resource. See the Links section and the <i>CapacitySource</i> schema for details.
}		
CapacitySources [{	array read-write	This property shall be an array containing entries for all the capacity sources for the file system. Each entry shall provide capacity allocation information from a named resource.
@odata.id	string read-only	Link to a CapacitySource resource. See the Links section and the <i>CapacitySource</i> schema for details.
}]		
CasePreserved	boolean read-write (null)	This property shall indicate that the case of file names is preserved by the file system. A value of True shall indicate that case of file names shall be preserved.
CaseSensitive	boolean read-write (null)	This property shall indicate that case sensitive file names are supported by the file system. A value of True shall indicate that file names are case sensitive.
CharacterCodeSet []	array (string (enum)) read-write (null)	This property shall be an array containing entries for the character sets or encodings supported by the file system. Each entry shall specify a character set encoding supported by the file system. The values shall indicate the character code standards supported by the file system. <i>See CharacterCodeSet in Property Details, below, for the possible values of this property.</i>
ClusterSizeBytes	integer (By) read-write (null)	This value shall specify the minimum file allocation size imposed by the file system. This minimum allocation size shall be the smallest amount of storage allocated to a file by the file system. Under stress conditions, the file system may allocate storage in amounts smaller than this value.

Description	string <i>read-only</i> <i>(null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
ExportedShares {	object <i>(null)</i>	This property shall be an array of exported file shares of this file system. Each entry shall define an exported file share of this file system. Contains a link to a resource.
@odata.id	string <i>read-only</i>	Link to Collection of <i>FileShare</i> . See the FileShare schema for details.
}		
Id	string <i>read-only</i> <i>required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Identifiers [{}]	array (object)	This property shall contain a list of all known durable names for this file system. This type shall contain any additional identifiers of a resource. See the redfish.dmtf.org/schemas/v1/Resource.v1_7_0.json schema for details on this property.
ImportedShares []	array () <i>read-only</i> <i>(null)</i>	The value shall be an array of imported file shares.
IOStatistics {}	object <i>(null)</i>	The value shall represent IO statistics for this FileSystem. See the <i>IOStatistics</i> schema for details on this property.
Links {	object	This property shall contain links to other resources that are related to this resource.
ClassOfService {	object <i>(null)</i>	This value shall be a link to the ClassOfService for this file system. See the <i>ClassOfService</i> schema for details on this property.
@odata.id	string <i>read-only</i>	Link to a ClassOfService resource. See the Links section and the <i>ClassOfService</i> schema for details.
}		

Oem { }	object	This object represents the Oem property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
ReplicaCollection (<i>deprecated v1.1</i>) [{	array <i>read-only</i>	This property shall be an array of links to replicas for this file system. Each entry shall be a link to a replica for this file system. <i>Deprecated v1.1+. Deprecated in favor of ReplicaTargets.</i>
@odata.id	string <i>read-only</i>	Link to another FileSystem resource.
}]		
ReplicaCollection@odata.count	integer <i>read-only</i>	The value of this property shall be an integer representing the number of items in a collection.
SpareResourceSets (<i>v1.2+</i>) [{	array <i>read-write</i>	Each referenced SpareResourceSet shall contain resources that may be utilized to replace the capacity provided by a failed resource having a compatible type.
@odata.id	string <i>read-only</i>	Link to a SpareResourceSet resource. See the Links section and the <i>SpareResourceSet</i> schema for details.
}]		
SpareResourceSets@odata.count (<i>v1.2+</i>)	integer <i>read-only</i>	The value of this property shall be an integer representing the number of items in a collection.
}		
LowSpaceWarningThresholdPercents []	array (%) (integer, null) <i>read-write</i>	This property shall be an array containing entries for the percentages of file system capacity at which low space warning events are to be issued. A <code>LOW_SPACE_THRESHOLD_WARNING</code> event shall be triggered each time the remaining file system capacity value becomes less than one of the values in the array. The following shall be true: Across all CapacitySources entries, percent = $(\text{SUM}(\text{AllocatedBytes}) - \text{SUM}(\text{ConsumedBytes})) / \text{SUM}(\text{AllocatedBytes})$

MaxFileNameLengthBytes	integer (By) <i>read-write</i> (null)	If specified, this value shall specify the maximum length of a file name within the file system.
Name	string <i>read-only</i> <i>required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem {	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
RecoverableCapacitySourceCount (v1.2+)	integer <i>read-write</i> (null)	The value is the number of available capacity source resources currently available in the event that an equivalent capacity source resource fails.
RemainingCapacity {	object (null)	The value of this property shall be the remaining capacity allocated to the file system in bytes. See the <i>CapacitySource</i> schema for details on this property.
@odata.id	string <i>read-only</i>	Link to a Capacity resource. See the Links section and the <i>CapacitySource</i> schema for details.
}		
RemainingCapacityPercent (v1.1+)	integer <i>read-only</i> (null)	If present, this value shall return $\{[(\text{SUM}(\text{AllocatedBytes}) - \text{SUM}(\text{ConsumedBytes}))/\text{SUM}(\text{AllocatedBytes})]*100$ represented as an integer value.
ReplicaInfo {	object (null)	If this file system is a replica, this value shall describe its replication attributes. This value shall not be present if this file system is not a replica. A file system may be both a source and a replica. See the <i>StorageReplicaInfo</i> schema for details on this property.
@odata.id	string <i>read-only</i>	Link to a ReplicaInfo resource. See the Links section and the <i>StorageReplicaInfo</i> schema for details.
}		

ReplicaTargets [{	array <i>read-only</i>	The value shall reference the target replicas that are sourced by this replica.
@odata.id	string <i>read-only</i>	The value of this property shall be the unique identifier for the resource and it shall be of the form defined in the Redfish specification.
}]		

9.18.1 Property Details

9.18.1.1 AccessCapabilities:

This property shall be an array containing entries for the supported IO access capabilities. Each entry shall specify a current storage access capability. StorageAccessCapability enumeration literals may be used to describe abilities to read or write storage.

string	Description
Append	This enumeration literal shall indicate that the storage may be written only to append.
Execute	This value shall indicate that Execute access is allowed by the file share.
Read	This enumeration literal shall indicate that the storage may be read.
Streaming	This enumeration literal shall indicate that the storage may be read sequentially.
Write	This enumeration literal shall indicate that the storage may be written multiple times.
WriteOnce	This enumeration literal shall indicate that the storage may be written only once.

9.18.1.2 CharacterCodeSet:

This property shall be an array containing entries for the character sets or encodings supported by the file system. Each entry shall specify a character set encoding supported by the file system. The values shall indicate the character code standards supported by the file system.

string	Description
ASCII	This value shall indicate that the ASCII character encoding is supported by the file system.
ExtendedUNIXCode	This value shall indicate that Extended Unix Code character encoding is supported by the file system.
ISO2022	This value shall indicate that ISO-2022 character encoding is supported by the file system.
ISO8859_1	This value shall indicate that ISO-8859-1 character encoding is supported by the file system.
UCS_2	This value shall indicate that the UCS-2 character encoding is supported by the file system.

string	Description
Unicode	This value shall indicate that Unicode character encoding is supported by the file system.
UTF_16	This value shall indicate that the UTF-16 character encoding is supported by the file system.
UTF_8	This value shall indicate that the UTF-8 character encoding is supported by the file system.

9.19 FileSystemCollection

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Description	string <i>read-only (null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Members [{	array <i>read-only</i>	This property shall contain references to the members of this FileSystem collection.
@odata.id	string <i>read-only</i>	Link to a FileSystem resource. See the Links section and the <i>FileSystem</i> schema for details.
}]		
Members@odata.nextLink	string <i>read-only</i>	The value of this property shall be a URI to a resource, with the same @odata.type, containing the next set of partial members.
Name	string <i>read-only</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.

9.20 HostedStorageServices

URIs:

/redfish/v1/StorageServices

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Description	string <i>read-only (null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Members [{	array <i>read-write</i>	The value of each member entry shall reference a StorageService resource.
@odata.id	string <i>read-only</i>	Link to a StorageService resource. See the Links section and the <i>StorageService</i> schema for details.
}]		
Members@odata.nextLink	string <i>read-only</i>	The value of this property shall be a URI to a resource, with the same @odata.type, containing the next set of partial members.
Name	string <i>read-only</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.

9.21 IOConnectivityLineOfService 1.1.1

An IO connectivity service option may be used to specify the characteristics of storage connectivity.

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
--------------------	--------------------------------	---

AccessProtocols []	array (string (enum)) <i>read- write</i> <i>(null)</i>	The Enumeration Literal shall specify the Access protocol for this service option. NOTE: If multiple protocols are specified, the corresponding MaxSupportedIOPS governs the max achieved across all protocol uses. This may be less than the sum of the individual max values, which may be specified by individual Line of Service entries. <i>See AccessProtocols in Property Details, below, for the possible values of this property.</i>
Description	string <i>read- only</i> <i>(null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Id	string <i>read- only</i> <i>required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
MaxBytesPerSecond (v1.1+)	integer (By/s) <i>read- write</i> <i>(null)</i>	The value shall be the maximum bytes per second that a connection can support.
MaxIOPS (v1.1+)	integer ([IO]/s) <i>read- write</i> <i>(null)</i>	The value shall be the maximum IOs per second that the connection shall allow for the selected access protocol.
Name	string <i>read- only</i> <i>required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem {}	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.

9.21.1 Property Details

9.21.1.1 AccessProtocols:

The Enumeration Literal shall specify the Access protocol for this service option. NOTE: If multiple protocols are specified, the corresponding MaxSupportedIOPS governs the max achieved across all protocol uses. This may be less than the sum of the individual max values, which may be specified by individual Line of Service entries.

string	Description
AHCI	This value shall mean that this device conforms to the Intel Advanced Host Controller Interface Specification.
FC	This value shall mean that this device conforms to the T11 Fibre Channel Physical and Signaling Interface Specification.
FCoE	This value shall mean that this device conforms to the T11 FC-BB-5 Specification.
FCP	This enumeration literal shall indicate the INCITS 481: Information technology - Fibre Channel Protocol for SCSI. The Fibre Channel SCSI Protocol.
FICON	This enumeration literal shall indicate the (ANSI FC-SB-3 Single-Byte Command Code Sets-3 Mapping Protocol for the Fibre Channel(FC) protocol. FICON (Fibre CONnection) is the IBM proprietary name for this protocol.
FTP	This value shall mean that this device conforms to the File Transfer protocol as defined by RFC 114.
HTTP	This value shall mean that this device conforms to the Hypertext Transfer protocol as defined by RFC 2068 or RFC 2616.
HTTPS	This value shall mean that this device conforms to the Hypertext Transfer protocol as defined by RFC 2068 or RFC 2616 utilizing Transport Layer Security as specified by RFC 5246 or RFC 6176.
I2C	This value shall mean that this device conforms to the NXP Semiconductors I2C-bus Specification.
iSCSI	This value shall mean that this device conforms to the IETF Internet Small Computer Systems Interface (iSCSI) Specification.
iWARP	This value shall mean that this device conforms to the iWARP protocol as defined by RFC 5042 utilizing Transport Layer mechanisms as specified by RFC 5043 or RFC 5044.
NFSv3	This value shall mean that this device conforms to the Network File System protocol as defined by RFC 1813.
NFSv4	This value shall mean that this device conforms to the Network File System protocol as defined by RFC 3010 or RFC 5661.
NVMe	This value shall mean that this device conforms to the Non-Volatile Memory Host Controller Interface Specification Specification.
NVMeOverFabrics	This value shall mean that this device conforms to the NVM Express over Fabrics Specification.
OEM	This value shall mean that this device conforms to an OEM specific architecture and additional information may be included in the OEM section.
PCIe	This value shall mean that this device conforms to the PCI-SIG PCI Express Base Specification.
RoCE	This value shall mean that this device conforms to the RDMA over Converged Ethernet protocol as defined by the Infiniband Architecture Specification.
RoCEv2	This value shall mean that this device conforms to the RDMA over Converged Ethernet version 2 protocol as defined by the Infiniband Architecture Specification.
SAS	This value shall mean that this device conforms to the T10 SAS Protocol Layer Specification.

string	Description
SATA	This value shall mean that this device conforms to the Serial ATA International Organization Serial ATA Specification.
SFTP	This value shall mean that this device conforms to the File Transfer protocol as defined by RFC 114 utilizing Transport Layer Security as specified by RFC 5246 or RFC 6176.
SMB	This value shall mean that this device conforms to the Microsoft Server Message Block Protocol.
UHCI	This value shall mean that this device conforms to the Intel Universal Host Controller Interface Specification, Enhanced Host Controller Interface Specification, or the Extensible Host Controller Interface specification.
USB	This value shall mean that this device conforms to the USB Implementers Forum Universal Serial Bus Specification.

9.22 IOConnectivityLoSCapabilities 1.1.2

Each instance of IOConnectivityLoSCapabilities describes capabilities of the system to support various IO Connectivity service options.

URIs:

/redfish/v1/StorageServices/{StorageServiceId}/IOConnectivityLoSCapabilities

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Actions (v1.1+) {}	object	The Actions property shall contain the available actions for this resource.
Description	string <i>read-only</i> (null)	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Id	string <i>read-only</i> <i>required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Identifier {}	object (null)	The value identifies this resource. The value shall be unique within the managed ecosystem. See the redfish.dmtf.org/schemas/v1/Resource.v1_7_0.json schema for details on this property.

MaxSupportedBytesPerSecond	integer (By/s) <i>read- write</i> (null)	The value shall be the maximum bytes per second that a connection can support.
MaxSupportedIOPS (<i>v1.1+</i>)	integer ([IO]/s) <i>read- write</i> (null)	The value shall be the maximum IOPS that a connection can support.
Name	string <i>read- only</i> <i>required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
SupportedAccessProtocols []	array (string (enum)) <i>read- write</i> (null)	Access protocols supported by this service option. NOTE: SMB+NFS* requires that SMB and at least one of NFSv3 or NFXv4 are also selected, (i.e. {'SMB', 'NFSv4', 'SMB+NFS'}). See SupportedAccessProtocols in Property Details, below, for the possible values of this property.*
SupportedLinesOfService [{	array <i>read- write</i>	The collection shall contain known and supported IOConnectivityLinesOfService.
@odata.id	string <i>read- only</i>	Link to a IOConnectivityLineOfService resource. See the Links section and the <i>IOConnectivityLineOfService</i> schema for details.
}]		

9.22.1 Property Details

9.22.1.1 SupportedAccessProtocols:

Access protocols supported by this service option. NOTE: SMB+NFS* requires that SMB and at least one of NFSv3 or NFXv4 are also selected, (i.e. {'SMB', 'NFSv4', 'SMB+NFS*'}).

string	Description
AHCI	This value shall mean that this device conforms to the Intel Advanced Host Controller Interface Specification.
FC	This value shall mean that this device conforms to the T11 Fibre Channel Physical and Signaling Interface Specification.
FCoE	This value shall mean that this device conforms to the T11 FC-BB-5 Specification.
FCP	This enumeration literal shall indicate the INCITS 481: Information technology - Fibre Channel Protocol for SCSI. The Fibre Channel SCSI Protocol.
FICON	This enumeration literal shall indicate the (ANSI FC-SB-3 Single-Byte Command Code Sets-3 Mapping Protocol for the Fibre Channel(FC) protocol. FICON (Fibre CONnection) is the IBM proprietary name for this protocol.
FTP	This value shall mean that this device conforms to the File Transfer protocol as defined by RFC 114.
HTTP	This value shall mean that this device conforms to the Hypertext Transfer protocol as defined by RFC 2068 or RFC 2616.
HTTPS	This value shall mean that this device conforms to the Hypertext Transfer protocol as defined by RFC 2068 or RFC 2616 utilizing Transport Layer Security as specified by RFC 5246 or RFC 6176.
I2C	This value shall mean that this device conforms to the NXP Semiconductors I2C-bus Specification.
iSCSI	This value shall mean that this device conforms to the IETF Internet Small Computer Systems Interface (iSCSI) Specification.
iWARP	This value shall mean that this device conforms to the iWARP protocol as defined by RFC 5042 utilizing Transport Layer mechanisms as specified by RFC 5043 or RFC 5044.
NFSv3	This value shall mean that this device conforms to the Network File System protocol as defined by RFC 1813.
NFSv4	This value shall mean that this device conforms to the Network File System protocol as defined by RFC 3010 or RFC 5661.
NVMe	This value shall mean that this device conforms to the Non-Volatile Memory Host Controller Interface Specification Specification.
NVMeOverFabrics	This value shall mean that this device conforms to the NVM Express over Fabrics Specification.
OEM	This value shall mean that this device conforms to an OEM specific architecture and additional information may be included in the OEM section.
PCIe	This value shall mean that this device conforms to the PCI-SIG PCI Express Base Specification.
RoCE	This value shall mean that this device conforms to the RDMA over Converged Ethernet protocol as defined by the Infiniband Architecture Specification.
RoCEv2	This value shall mean that this device conforms to the RDMA over Converged Ethernet version 2 protocol as defined by the Infiniband Architecture Specification.
SAS	This value shall mean that this device conforms to the T10 SAS Protocol Layer Specification.

string	Description
SATA	This value shall mean that this device conforms to the Serial ATA International Organization Serial ATA Specification.
SFTP	This value shall mean that this device conforms to the File Transfer protocol as defined by RFC 114 utilizing Transport Layer Security as specified by RFC 5246 or RFC 6176.
SMB	This value shall mean that this device conforms to the Microsoft Server Message Block Protocol.
UHCI	This value shall mean that this device conforms to the Intel Universal Host Controller Interface Specification, Enhanced Host Controller Interface Specification, or the Extensible Host Controller Interface specification.
USB	This value shall mean that this device conforms to the USB Implementers Forum Universal Serial Bus Specification.

9.23 IOPerformanceLineOfService 1.0.2

This structure may be used to define a service option related to IO performance.

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
AverageIOOperationLatencyMicroseconds	integer (us) <i>read-write (null)</i>	The value shall be the expected average IO latency in microseconds calculated over sample periods (see SamplePeriodSeconds).
Description	string <i>read-only (null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Id	string <i>read-only required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
IOOperationsPerSecondIsLimited	boolean <i>read-write (null)</i>	If true, the system should not allow IOPS to exceed MaxIoOperationsPerSecondPerTerabyte * VolumeSize. Otherwise, the system shall not enforce a limit. The default value for this property is false.

IOWorkload {	object (null)	The value shall be a description of the expected workload. The workload provides the context in which the values of <code>MaxIOOperationsPerSecondPerTerabyte</code> and <code>AverageIOOperationLatencyMicroseconds</code> are expected to be achievable. See the <i>IOPerformanceLoSCapabilities</i> schema for details on this property.
@odata.id	string read-only	Link to a <i>IOWorkload</i> resource. See the Links section and the <i>IOPerformanceLoSCapabilities</i> schema for details.
}		
MaxIOOperationsPerSecondPerTerabyte	integer (1/s/TBy) read-write (null)	The value shall be the amount of IOPS a volume of a given committed size in Terabytes can support. This IOPS density value is useful as a metric that is independent of capacity. Cost is a function of this value and the <code>AverageIOOperationLatencyMicroseconds</code> .
Name	string read-only required	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem {}	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the <i>redfish.dmtf.org/schemas/v1/Resource.json</i> schema for details on this property.
SamplePeriod	string read-write (null)	The value shall be an ISO 8601 duration specifying the sampling period over which average values are calculated.

9.24 IOPerformanceLoSCapabilities 1.1.2

Each instance of *IOPerformanceLoSCapabilities* shall describe the capabilities of the system to support various IO performance service options.

URIs:

/redfish/v1/StorageServices/{StorageServiceId}/IOPerformanceLoSCapabilities

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Actions (v1.1+) {}	object	The Actions property shall contain the available actions for this resource.
Description	string <i>read-only</i> <i>(null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Id	string <i>read-only</i> <i>required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Identifier {}	object <i>(null)</i>	The value shall be unique within the managed ecosystem. See the redfish.dmtf.org/schemas/v1/Resource.v1_7_0.json schema for details on this property.
IOLimitingIsSupported	boolean <i>read-write</i> <i>(null)</i>	If true, the system should limit IOPS to $\text{MaxIOOperationsPerSecondPerTerabyte} * (\text{Volume Size in Terabytes})$. Otherwise, the system shall not enforce a limit. The default value for this property is false.
MaxSamplePeriod	string (s) <i>read-write</i> <i>(null)</i>	The value shall be an ISO 8601 duration specifying the maximum sampling period over which average values are calculated.
MinSamplePeriod	string (s) <i>read-write</i> <i>(null)</i>	The value shall be an ISO 8601 duration specifying the minimum sampling period over which average values are calculated.
MinSupportedIoOperationLatencyMicroseconds	integer (us) <i>read-write</i> <i>(null)</i>	The value shall be the minimum supported average IO latency in microseconds calculated over the SamplePeriod

Name	string <i>read-only</i> <i>required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
SupportedIOWorkloads [{ }	array <i>read-write</i>	The value shall be a collection of supported workloads.
Components [{ }	array <i>read-write</i>	The value shall be an array of IO workload component descriptions.
AverageIOBytes	integer (By) <i>read-write</i> <i>(null)</i>	The value shall be the expected average I/O size.
Duration	string (s) <i>read-write</i> <i>(null)</i>	The value of each entry shall be an ISO 8601 duration that shall specify the expected length of time that this component is applied to the workload. This attribute shall be specified if a schedule is specified and otherwise shall not be specified.
IOAccessPattern	string (enum) <i>read-write</i> <i>(null)</i>	The enumeration literal shall be the expected access pattern. See <i>IOAccessPattern</i> in <i>Property Details</i> , below, for the possible values of this property.
PercentOfData	integer (%) <i>read-write</i> <i>(null)</i>	The value shall be the expected percent of the data referenced by the workload that is covered by this component.

PercentOfIOPS	integer (%) <i>read-write</i> (null)	The value shall be the expected percent of the total IOPS for this workload that is covered by this component
Schedule { }	object (null)	The value shall specifies when this workload component is applied to the overall workload. See the <i>v1_1_1.v1_1_1</i> schema for details on this property.
}]		
Name	string <i>read-write</i> (null)	The value shall be a name of the workload. It should be constructed as OrgID:WorkloadID. Examples: ACME:DSS, ACME:DSS-REP, ACME:Exchange, ACME:OLTP, ACME:OLTP-REPA. An organization may define a set of well known workloads.
}]		
SupportedLinesOfService [{	array <i>read-write</i>	The value shall be a collection supported IO performance service options.
@odata.id	string <i>read-only</i>	Link to a <i>IOPerformanceLineOfService</i> resource. See the Links section and the <i>IOPerformanceLineOfService</i> schema for details.
}]		

9.24.1 Property Details

9.24.1.1 IOAccessPattern:

The enumeration literal shall be the expected access pattern.

string	Description
RandomReadAgain	Use of this enumeration literal shall indicate an access pattern of random reads of cached data.
RandomReadNew	Use of this enumeration literal shall indicate an access pattern of random reads of uncached data.
ReadWrite	Use of this enumeration literal shall indicate a Uniform distribution of reads and writes.
SequentialRead	Use of this enumeration literal shall indicate a sequential read pattern of access.
SequentialWrite	Use of this enumeration literal shall indicate a sequential write pattern of access.

9.25 SpareResourceSet 1.0.0

The values define a set of spares of a particular type.

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Description	string <i>read-only (null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Id	string <i>read-only required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Links {	object	This structure shall contain references to resources that are not contained within this resource.
Oem { }	object	This object represents the Oem property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
OnHandSpares [{	array <i>read-write</i>	The type of resources in the set.
@odata.id	string <i>read-only</i>	The value of this property shall be the unique identifier for the resource and it shall be of the form defined in the Redfish specification.
}]		
OnHandSpares@odata.count	integer <i>read-only</i>	The value of this property shall be an integer representing the number of items in a collection.
ReplacementSpareSets [{	array <i>read-write</i>	Other spare sets that can be utilized to replenish this spare set.

@odata.id	string <i>read-only</i>	Link to another SpareResourceSet resource.
}]		
ReplacementSpareSets@odata.count	integer <i>read-only</i>	The value of this property shall be an integer representing the number of items in a collection.
}		
Name	string <i>read-only required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem {}	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
OnHandLocation {}	object <i>(null)</i>	The location where this set of spares is kept. See the redfish.dmtf.org/schemas/v1/Resource.v1_5_0.json schema for details on this property.
OnLine	boolean <i>read-write (null)</i>	This set shall be online.
ResourceType	string <i>read-write (null)</i>	The type of resources in the set.
TimeToProvision	string <i>read-write (null)</i>	Amount of time needed to make an on-hand resource available as a spare. Pattern: <code>-?P(+D)?(T(+H)?(+M)?(+.)?S)??</code>
TimeToReplenish	string <i>read-write (null)</i>	Amount of time to needed replenish consumed on-hand resources. Pattern: <code>-?P(+D)?(T(+H)?(+M)?(+.)?S)??</code>

9.26 StorageGroup 1.2.0

The primary purposes of the collection shall be to govern access to the storage by clients or to add service requirements for the members of the collection. Access to the collected storage by a specified set of hosts shall be made available or unavailable atomically. Requirements specified by the class of service shall be satisfied by each collected element to which they apply. The storage group may contain: block, file, or object storage; local storage system access points through which the collection is made available; and hosts, or host access points to which the collection is made available.

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
AccessState	string (enum) <i>read-write (null)</i>	The value of this property shall describe the access characteristics of this storage group. All associated logical units through all aggregated ports shall share this access state. <i>See AccessState in Property Details, below, for the possible values of this property.</i>
Actions {	object	The Actions property shall contain the available actions for this resource.
#StorageGroup.ExposeVolumes { }	object	Exposes the storage of this group via the target endpoints named in the ServerEndpointGroups to the initiator endpoints named in the ClientEndpointGroups. The property VolumesAreExposed shall be set to true when this action is completed. <i>For more information, see the Action Details section below.</i>
#StorageGroup.HideVolumes { }	object	Hide the storage of this group from the initiator endpoints named in the ClientEndpointGroups. The property VolumesAreExposed shall be set to false when this action is completed. <i>For more information, see the Action Details section below.</i>
}		
AuthenticationMethod (v1.2+)	string (enum) <i>read-write (null)</i>	The value of this property must be what kind of authentication that the endpoints in this StorageGroup understands. <i>See AuthenticationMethod in Property Details, below, for the possible values of this property.</i>

ChapInfo (v1.2+) [{	array <i>read- write</i>	The value of this property must reflect the authentication used by this specific endpoint. For example, if this endpoint represents an initiator, and AuthenticationMethod is CHAP or MutualCHAP, the Credentials fields CHAPUsername and CHAPSecret must be used. If this endpoint represents a target endpoint and AuthenticationMethod is MutualCHAP, then MutualCHAPUsername and MutualCHAPSecret must be used.
InitiatorCHAPPassword	string <i>read- write (null)</i>	The value of this property shall be the shared secret for CHAP authentication.
InitiatorCHAPUser	string <i>read- write (null)</i>	If present, this property is the initiator CHAP username for authentication. For example, with an iSCSI scenario, use the initiator iQN.
TargetCHAPUser	string <i>read- write (null)</i>	The value of this property shall be the CHAP Username for 2-way CHAP authentication. For example, with an iSCSI scenario, use the target iQN. In a FC with DHCHAP, this value will be a FC WWN.
TargetPassword	string <i>read- write (null)</i>	The value of this property shall be the CHAP Secret for 2-way CHAP authentication.
}]		
ClientEndpointGroups [{	array <i>read- write</i>	An array of references to groups of client-side endpoints that may be used to make requests to the storage exposed by this StorageGroup. If null, the implementation may allow access to the storage via any client-side endpoint. If empty, the implementation shall not allow access to the storage via any client-side endpoint.
@odata.id	string <i>read- only</i>	Link to a EndpointGroup resource. See the Links section and the <i>EndpointGroup</i> schema for details.
}]		

Description	string <i>read-only</i> <i>(null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Id	string <i>read-only</i> <i>required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Identifier { }	object <i>(null)</i>	The value shall be unique within the managed ecosystem. See the redfish.dmtf.org/schemas/v1/Resource.v1_7_0.json schema for details on this property.
Links {	object	This structure shall contain references to resources that are not contained within this resource.
ChildStorageGroups [{	array <i>read-write</i>	An array of references to StorageGroups are incorporated into this StorageGroup
@odata.id	string <i>read-only</i>	Link to another StorageGroup resource.
}]		
ChildStorageGroups@odata.count	integer <i>read-only</i>	The value of this property shall be an integer representing the number of items in a collection.
ClassOfService {	object <i>(null)</i>	The ClassOfService that all storage in this StorageGroup conforms to. See the <i>ClassOfService</i> schema for details on this property.
@odata.id	string <i>read-only</i>	Link to a ClassOfService resource. See the Links section and the <i>ClassOfService</i> schema for details.
}		
Oem { }	object	This object represents the Oem property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.

ParentStorageGroups [{	array <i>read-only</i>	An array of references to StorageGroups that incorporate this StorageGroup
@odata.id	string <i>read-only</i>	Link to another StorageGroup resource.
}]		
ParentStorageGroups@odata.count	integer <i>read-only</i>	The value of this property shall be an integer representing the number of items in a collection.
}		
MappedVolumes []	array () <i>read-write (null)</i>	An array of mapped volumes managed by this storage group.
MembersAreConsistent	boolean <i>read-write (null)</i>	The value of this property shall be set to true if all members are in a consistent state. The default value for this property is false.
Name	string <i>read-only required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
ReplicaInfo {	object <i>(null)</i>	This property shall describe the replication relationship between this storage group and a corresponding source storage group. See the <i>StorageReplicaInfo</i> schema for details on this property.
@odata.id	string <i>read-only</i>	Link to a ReplicaInfo resource. See the Links section and the <i>StorageReplicaInfo</i> schema for details.
}		

ReplicaTargets (<i>v1.2+</i>) [{	array <i>read-only</i>	The value shall reference the target replicas that are sourced by this replica.
@odata.id	string <i>read-only</i>	The value of this property shall be the unique identifier for the resource and it shall be of the form defined in the Redfish specification.
}]		
ServerEndpointGroups [{	array <i>read-write</i>	An array of references to groups of server-side endpoints that may be used to make requests to the storage exposed by this storage group. If null, the implementation may allow access to the storage via any server-side endpoint. If empty, the implementation shall not allow access to the storage via any server-side endpoint.
@odata.id	string <i>read-only</i>	Link to a EndpointGroup resource. See the Links section and the <i>EndpointGroup</i> schema for details.
}]		
Status { }	object <i>(null)</i>	This type shall contain any status or health properties of a resource. See the <i>redfish.dmtf.org/schemas/v1/Resource.json</i> schema for details on this property.
Volumes (<i>deprecated v1.1</i>) [{	array <i>read-write</i>	An array of references to volumes managed by this storage group. <i>Deprecated v1.1+. These references are replaced by the MappedVolumes array in StorageGroup.</i>
@odata.id	string <i>read-only</i>	Link to a Volume resource. See the Links section and the <i>Volume</i> schema for details.
}]		
VolumesAreExposed	boolean <i>read-write (null)</i>	The value of this property shall be set to true if storage volumes are exposed to the paths defined by the client and server endpoints. The default value for this property is false.

9.26.1 Action Details

9.26.1.0.0.1 ExposeVolumes

Exposes the storage of this group via the target endpoints named in the ServerEndpointGroups to the initiator endpoints named in

the ClientEndpointGroups. The property VolumesAreExposed shall be set to true when this action is completed.

(This action takes no parameters.)

9.26.1.0.0.2 HideVolumes

Hide the storage of this group from the initiator endpoints named in the ClientEndpointGroups. The property VolumesAreExposed shall be set to false when this action is completed.

(This action takes no parameters.)

9.26.2 Property Details

9.26.2.1 AccessState:

The value of this property shall describe the access characteristics of this storage group. All associated logical units through all aggregated ports shall share this access state.

string	Description
NonOptimized	In the context of this enumeration literal, each endpoint shall be in an Active/NonOptimized state.
Optimized	In the context of this enumeration literal, each endpoint shall be in an Active/Optimized state.
Standby	In the context of this enumeration literal, each endpoint shall be in a Standby state.
Transitioning	In the context of this enumeration literal, at least one endpoint shall be transitioning to a new AccesState.
Unavailable	In the context of this enumeration literal, each endpoint shall be in an unavailable state.

9.26.2.2 AuthenticationMethod:

The value of this property must be what kind of authentication that the endpoints in this StorageGroup understands.

string	Description
CHAP	iSCSI Challenge Handshake Authentication Protocol (CHAP) authentication is used.
DHCHAP	Diffie-Hellman Challenge Handshake Authentication Protocol (DHCHAP) is an authentication protocol used in Fibre Channel. DHCHAP implies that only properties 'TargetCHAPUser' and 'TargetPassword' need to be present.
MutualCHAP	iSCSI Mutual Challenge Handshake Authentication Protocol (CHAP) authentication is used.
None	No authentication is used.

9.27 StorageGroupCollection

URIs:

/redfish/v1/StorageServices/{StorageServiceId}/StorageGroups

/redfish/v1/StorageServices/{StorageServiceId}/Volumes/{VolumeId}/StorageGroups

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Description	string <i>read-only</i> <i>(null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Members [{	array <i>read-only</i>	The value of each member entry shall reference a StorageGroup resource.
@odata.id	string <i>read-only</i>	Link to a StorageGroup resource. See the Links section and the <i>StorageGroup</i> schema for details.
}]		
Members@odata.nextLink	string <i>read-only</i>	The value of this property shall be a URI to a resource, with the same @odata.type, containing the next set of partial members.
Name	string <i>read-only</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the <i>redfish.dmtf.org/schemas/v1/Resource.json</i> schema for details on this property.

9.28 StoragePool 1.2.0

A container of data storage capable of providing capacity conforming to one of its supported classes of service. The storage pool does not support IO to its data storage.

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
--------------------	--------------------------------	---

AllocatedPools {	object (null)	The value of this property shall contain a reference to the collection of storage pools allocated from this storage pool. Contains a link to a resource.
@odata.id	string read-only	Link to Collection of <i>StoragePool</i> . See the <i>StoragePool</i> schema for details.
}		
AllocatedVolumes {	object (null)	The value of this property shall contain a reference to the collection of volumes allocated from this storage pool. Contains a link to a resource.
@odata.id	string read-only	Link to Collection of <i>Volume</i> . See the <i>Volume</i> schema for details.
}		
BlockSizeBytes (<i>deprecated v1.1</i>)	integer (By) read-only (null)	Maximum size in bytes of the blocks which form this Volume. If the block size is variable, then the maximum block size in bytes should be specified. If the block size is unknown or if a block concept is not valid (for example, with Memory), enter a 1. <i>Deprecated v1.1+. This property has been Deprecated in favor of StoragePool.v1_1_1.StoragePool.MaxBlockSizeBytes</i>
Capacity {	object (null)	The value of this property shall provide an information about the actual utilization of the capacity within this storage pool. See the <i>CapacitySource</i> schema for details on this property.
@odata.id	string read-only	Link to a Capacity resource. See the Links section and the <i>CapacitySource</i> schema for details.
}		
CapacitySources [{	array read-only	Fully or partially consumed storage from a source resource. Each entry shall provide capacity allocation data from a named source resource.
@odata.id	string read-only	Link to a CapacitySource resource. See the Links section and the <i>CapacitySource</i> schema for details.
}]		

ClassesOfService {	object (null)	This property shall contain references to all classes of service supported by this storage pool. Capacity allocated from this storage pool shall conform to one of the referenced classes of service. Contains a link to a resource.
@odata.id	string read-only	Link to Collection of <i>ClassOfService</i> . See the <i>ClassOfService</i> schema for details.
}		
DefaultClassOfService {	object (null)	If present, this property shall reference the default class of service for entities allocated from this storage pool. If the <i>ClassesOfService</i> collection is not empty, then the value of this property shall be one of its entries. If not present, the default class of service of the containing <i>StorageService</i> entity shall be used. See the <i>ClassOfService</i> schema for details on this property.
@odata.id	string read-only	Link to a <i>ClassOfService</i> resource. See the Links section and the <i>ClassOfService</i> schema for details.
}		
Description	string read-only (null)	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Id	string read-only required	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Identifier {}	object (null)	The value identifies this resource. The value shall be unique within the managed ecosystem. See the redfish.dmtf.org/schemas/v1/Resource.v1_7_0.json schema for details on this property.
IOStatistics {}	object (null)	The value shall represent IO statistics for this <i>StoragePool</i> . See the <i>IOStatistics</i> schema for details on this property.
Links {	object	This structure shall contain references to resources that are not contained within this resource.

DedicatedSpareDrives (<i>v1.2+</i>) [{	array <i>read-only</i>	The value of this property shall be a reference to the resources that this StoragePool is associated with and shall reference resources of type Drive. This property shall only contain references to Drive entities which are currently assigned as a dedicated spare and are able to support this StoragePool.
@odata.id	string <i>read-only</i>	The value of this property shall be the unique identifier for the resource and it shall be of the form defined in the Redfish specification.
}]		
DedicatedSpareDrives@odata.count (<i>v1.2+</i>)	integer <i>read-only</i>	The value of this property shall be an integer representing the number of items in a collection.
DefaultClassOfService (<i>deprecated v1.1</i>) {	object <i>(null)</i>	If present, this property shall reference the default class of service for entities allocated from this storage pool. If the ClassesOfService collection is not empty, then the value of this property shall be one of its entries. If not present, the default class of service of the containing StorageService entity shall be used. See the <i>ClassOfService</i> schema for details on this property. <i>Deprecated v1.1+. Default ClassOfService moved from Links to NavigationProperty.</i>
@odata.id	string <i>read-only</i>	Link to a ClassOfService resource. See the Links section and the <i>ClassOfService</i> schema for details.
}		
Oem { }	object	This object represents the Oem property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
SpareResourceSets (<i>v1.2+</i>) [{	array <i>read-write</i>	Each referenced SpareResourceSet shall contain resources that may be utilized to replace the capacity provided by a failed resource having a compatible type.
@odata.id	string <i>read-only</i>	Link to a SpareResourceSet resource. See the Links section and the <i>SpareResourceSet</i> schema for details.
}]		

SpareResourceSets@odata.count (v1.2+)	integer <i>read-only</i>	The value of this property shall be an integer representing the number of items in a collection.
}		
LowSpaceWarningThresholdPercents []	array (%) (integer, null) <i>read-write</i>	Each time the following value is less than one of the values in the array the LOW_SPACE_THRESHOLD_WARNING event shall be triggered: Across all CapacitySources entries, percent = (SUM(AllocatedBytes) - SUM(ConsumedBytes))/SUM(AllocatedBytes).
MaxBlockSizeBytes (v1.2+)	integer (By) <i>read-only</i> (null)	If present, the value is the maximum block size of an allocated resource. If the block size is unknown or if a block concept is not valid (for example, with Memory), this property shall be NULL.
Name	string <i>read-only</i> <i>required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem {}	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
RecoverableCapacitySourceCount (v1.2+)	integer <i>read-write</i> (null)	The value is the number of available capacity source resources currently available in the event that an equivalent capacity source resource fails.
RemainingCapacityPercent (v1.1+)	integer <i>read-only</i> (null)	If present, this value shall return $\{[(\text{SUM}(\text{AllocatedBytes}) - \text{SUM}(\text{ConsumedBytes}))/\text{SUM}(\text{AllocatedBytes})]*100$ represented as an integer value.
Status {}	object (null)	This type shall contain any status or health properties of a resource. See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.

9.29 StoragePoolCollection

URIs:

/redfish/v1/StorageServices/{StorageServiceId}/FileSystems/{FileSystemId}/CapacitySources/{CapacitySourceId}/ProvidingPools
 /redfish/v1/StorageServices/{StorageServiceId}/StoragePools
 /redfish/v1/StorageServices/{StorageServiceId}/StoragePools/{StoragePoolId}/AllocatedPools
 /redfish/v1/StorageServices/{StorageServiceId}/StoragePools/{StoragePoolId}/CapacitySources/{CapacitySourceId}/ProvidingPools
 /redfish/v1/StorageServices/{StorageServiceId}/Volumes/{VolumeId}/AllocatedPools
 /redfish/v1/StorageServices/{StorageServiceId}/Volumes/{VolumeId}/CapacitySources/{CapacitySourceId}/ProvidingPools

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Description	string <i>read-only</i> <i>(null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Members [{	array <i>read-only</i>	The value of each member entry shall reference a StoragePool resource.
@odata.id	string <i>read-only</i>	Link to a StoragePool resource. See the Links section and the <i>StoragePool</i> schema for details.
}]		
Members@odata.nextLink	string <i>read-only</i>	The value of this property shall be a URI to a resource, with the same @odata.type, containing the next set of partial members.
Name	string <i>read-only</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the <i>redfish.dmtf.org/schemas/v1/Resource.json</i> schema for details on this property.

9.30 StorageReplicaInfo 1.1.1

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
--------------------	--------------------------------	---

Description	string <i>read-only</i> <i>(null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Id	string <i>read-only</i> <i>required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Name	string <i>read-only</i> <i>required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.

9.31 StorageService 1.2.0

Collection of resources that the system can make available to one or more host systems. The collection can contain: block, file, or object storage; local system access points through which the collection is made available; hosts, or host access points to which the collection is made available.

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Actions {	object	The Actions property shall contain the available actions for this resource.
#StorageService.SetEncryptionKey { }	object	This defines the name of the custom action supported on this resource. <i>For more information, see the Action Details section below.</i>
}		
ClassesOfService {	object <i>(null)</i>	The value of each entry in the array shall reference a ClassOfService supported by this service. Contains a link to a resource.
@odata.id	string <i>read-only</i>	Link to Collection of <i>ClassOfService</i> . See the <i>ClassOfService</i> schema for details.
}		

ClientEndpointGroups {	object (null)	The value of each entry in the array shall reference an EndpointGroup. Contains a link to a resource.
@odata.id	string read-only	Link to Collection of <i>EndpointGroup</i> . See the EndpointGroup schema for details.
}		
DataProtectionLoSCapabilities {	object (null)	The value shall reference the data protection capabilities of this service. See the <i>DataProtectionLoSCapabilities</i> schema for details on this property.
@odata.id	string read-only	Link to a DataProtectionLoSCapabilities resource. See the Links section and the <i>DataProtectionLoSCapabilities</i> schema for details.
}		
DataSecurityLoSCapabilities {	object (null)	The value shall reference the data security capabilities of this service. See the <i>DataSecurityLoSCapabilities</i> schema for details on this property.
@odata.id	string read-only	Link to a DataSecurityLoSCapabilities resource. See the Links section and the <i>DataSecurityLoSCapabilities</i> schema for details.
}		
DataStorageLoSCapabilities {	object (null)	The value shall reference the data storage capabilities of this service. See the <i>DataStorageLoSCapabilities</i> schema for details on this property.
@odata.id	string read-only	Link to a DataStorageLoSCapabilities resource. See the Links section and the <i>DataStorageLoSCapabilities</i> schema for details.
}		
DefaultClassOfService {	object (null)	If present, this property shall reference the default class of service for entities allocated by this storage service. This default may be overridden by the DefaultClassOfService property values within contained StoragePools. See the <i>ClassOfService</i> schema for details on this property.

@odata.id	string <i>read-only</i>	Link to a <i>ClassOfService</i> resource. See the Links section and the <i>ClassOfService</i> schema for details.
}		
Description	string <i>read-only</i> <i>(null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Drives {	object	A collection that indicates all the drives managed by this storage service. Contains a link to a resource.
@odata.id	string <i>read-only</i>	Link to Collection of <i>redfish.dmtf.org/schemas/v1/Drive.json</i> . See the <i>redfish.dmtf.org/schemas/v1/Drive.json</i> schema for details.
}		
EndpointGroups {	object <i>(null)</i>	The value of each entry in the array shall reference an <i>EndpointGroup</i> . Contains a link to a resource.
@odata.id	string <i>read-only</i>	Link to Collection of <i>EndpointGroup</i> . See the <i>EndpointGroup</i> schema for details.
}		
Endpoints {	object <i>(null)</i>	The value of each entry in the array shall reference an <i>Endpoint</i> managed by this service.
@odata.id	string <i>read-only</i>	The value of this property shall be the unique identifier for the resource and it shall be of the form defined in the Redfish specification.
}		
FileSystems {	object	An array of references to <i>FileSystems</i> managed by this storage service. Contains a link to a resource.
@odata.id	string <i>read-only</i>	Link to Collection of <i>FileSystem</i> . See the <i>FileSystem</i> schema for details.
}		

Id	string <i>read-only</i> <i>required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Identifier {	object <i>(null)</i>	The value identifies this resource. The value shall be unique within the managed ecosystem. See the redfish.dmtf.org/schemas/v1/Resource.v1_7_0.json schema for details on this property.
IOConnectivityLoSCapabilities {	object <i>(null)</i>	The value shall reference the IO connectivity capabilities of this service. See the <i>IOConnectivityLoSCapabilities</i> schema for details on this property.
@odata.id	string <i>read-only</i>	Link to a <i>IOConnectivityLoSCapabilities</i> resource. See the Links section and the <i>IOConnectivityLoSCapabilities</i> schema for details.
}		
IOPerformanceLoSCapabilities {	object <i>(null)</i>	The value shall reference the IO performance capabilities of this service. See the <i>IOPerformanceLoSCapabilities</i> schema for details on this property.
@odata.id	string <i>read-only</i>	Link to a <i>IOPerformanceLoSCapabilities</i> resource. See the Links section and the <i>IOPerformanceLoSCapabilities</i> schema for details.
}		
IOStatistics {	object <i>(null)</i>	The value shall represent IO statistics for this <i>StorageService</i> . See the <i>IOStatistics</i> schema for details on this property.
Links {	object	This property shall contain links to other resources related to this resource.
DataProtectionLoSCapabilities <i>(deprecated v1.1)</i> {	object <i>(null)</i>	The value shall reference the data protection capabilities of this service. See the <i>DataProtectionLoSCapabilities</i> schema for details on this property. <i>Deprecated v1.1+. Moved up to StorageServices</i>
@odata.id	string <i>read-only</i>	Link to a <i>DataProtectionLoSCapabilities</i> resource. See the Links section and the <i>DataProtectionLoSCapabilities</i> schema for details.
}		

DataSecurityLoSCapabilities <i>(deprecated v1.1)</i> {	object <i>(null)</i>	The value shall reference the data security capabilities of this service. See the <i>DataSecurityLoSCapabilities</i> schema for details on this property. <i>Deprecated v1.1+. Moved up to StorageServices</i>
@odata.id	string <i>read-only</i>	Link to a DataSecurityLoSCapabilities resource. See the Links section and the <i>DataSecurityLoSCapabilities</i> schema for details.
}		
DataStorageLoSCapabilities <i>(deprecated v1.1)</i> {	object <i>(null)</i>	The value shall reference the data storage capabilities of this service. See the <i>DataStorageLoSCapabilities</i> schema for details on this property. <i>Deprecated v1.1+. Moved up to StorageServices</i>
@odata.id	string <i>read-only</i>	Link to a DataStorageLoSCapabilities resource. See the Links section and the <i>DataStorageLoSCapabilities</i> schema for details.
}		
DefaultClassOfService <i>(deprecated v1.1)</i> {	object <i>(null)</i>	If present, this property shall reference the default class of service for entities allocated by this storage service. This default may be overridden by the DefaultClassOfService property values within contained StoragePools. See the <i>ClassOfService</i> schema for details on this property. <i>Deprecated v1.1+. DefaultClassOfService moved outside of Links complex type.</i>
@odata.id	string <i>read-only</i>	Link to a ClassOfService resource. See the Links section and the <i>ClassOfService</i> schema for details.
}		
HostingSystem	 <i>read-write</i> <i>(null)</i>	The value shall reference the ComputerSystem or StorageController that hosts this service.
IOConnectivityLoSCapabilities <i>(deprecated v1.1)</i> {	object <i>(null)</i>	The value shall reference the IO connectivity capabilities of this service. See the <i>IOConnectivityLoSCapabilities</i> schema for details on this property. <i>Deprecated v1.1+. Moved up to StorageServices</i>

@odata.id	string <i>read-only</i>	Link to a IOConnectivityLoSCapabilities resource. See the Links section and the <i>IOConnectivityLoSCapabilities</i> schema for details.
}		
IOPerformanceLoSCapabilities <i>(deprecated v1.1) {</i>	object <i>(null)</i>	The value shall reference the IO performance capabilities of this service. See the <i>IOPerformanceLoSCapabilities</i> schema for details on this property. <i>Deprecated v1.1+. Moved up to StorageServices</i>
@odata.id	string <i>read-only</i>	Link to a IOPerformanceLoSCapabilities resource. See the Links section and the <i>IOPerformanceLoSCapabilities</i> schema for details.
}		
Oem {	object	This object represents the Oem property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. See the <i>redfish.dmtf.org/schemas/v1/Resource.json</i> schema for details on this property.
}		
Name	string <i>read-only</i> <i>required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem {	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the <i>redfish.dmtf.org/schemas/v1/Resource.json</i> schema for details on this property.
Redundancy [{	array <i>read-only</i>	This collection shall contain the redundancy information for the storage subsystem.
@odata.id	string <i>read-only</i>	The value of this property shall be the unique identifier for the resource and it shall be of the form defined in the Redfish specification.
}]		
ServerEndpointGroups {	object <i>(null)</i>	The value of each entry in the array shall reference a EndpointGroup. Contains a link to a resource.

@odata.id	string <i>read-only</i>	Link to Collection of <i>EndpointGroup</i> . See the <i>EndpointGroup</i> schema for details.
}		
SpareResourceSets (<i>v1.2+</i>) [{	array <i>read-write</i>	Each contained <i>SpareResourceSet</i> shall contain resources that may be utilized to replace the capacity provided by a failed resource having a compatible type.
@odata.id	string <i>read-only</i>	Link to a <i>SpareResourceSet</i> resource. See the Links section and the <i>SpareResourceSet</i> schema for details.
}]		
Status {	object <i>(null)</i>	This type shall contain any status or health properties of a resource. See the <i>redfish.dmtf.org/schemas/v1/Resource.json</i> schema for details on this property.
StorageGroups {	object <i>(null)</i>	The value of each entry in the array shall reference a <i>StorageGroup</i> . Contains a link to a resource.
@odata.id	string <i>read-only</i>	Link to Collection of <i>StorageGroup</i> . See the <i>StorageGroup</i> schema for details.
}		
StoragePools {	object	An array of references to <i>StoragePools</i> . Contains a link to a resource.
@odata.id	string <i>read-only</i>	Link to Collection of <i>StoragePool</i> . See the <i>StoragePool</i> schema for details.
}		
StorageSubsystems {	object	The value shall be a link to a collection of type <i>StorageCollection</i> having members that represent storage subsystems managed by this storage service.
@odata.id	string <i>read-only</i>	The value of this property shall be the unique identifier for the resource and it shall be of the form defined in the Redfish specification.
}		
Volumes {	object	An array of references to <i>Volumes</i> managed by this storage service. Contains a link to a resource.

@odata.id	string <i>read-only</i>	Link to Collection of <i>Volume</i> . See the Volume schema for details.
}		

9.31.1 Action Details

9.31.1.0.0.1 SetEncryptionKey

This defines the name of the custom action supported on this resource.

The following table shows the parameters for the action which are included in the POST body to the URI shown in the "target" property of the Action.

{		
EncryptionKey	string <i>read-write</i>	This defines the property name for the action.
}		

9.32 StorageServiceCollection

URIs:

/redfish/v1/StorageServices

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Description	string <i>read-only (null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Members [{	array <i>read-only</i>	The value of each member entry shall reference a StorageService resource.
@odata.id	string <i>read-only</i>	Link to a StorageService resource. See the Links section and the <i>StorageService</i> schema for details.
}]		

Members@odata.nextLink	string <i>read-only</i>	The value of this property shall be a URI to a resource, with the same @odata.type, containing the next set of partial members.
Name	string <i>read-only</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.

9.33 StorageSystemCollection

URIs:

/redfish/v1/StorageSystems

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Description	string <i>read-only</i> <i>(null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Members [{	array <i>read-only</i>	The value of each member entry shall reference a ComputerSystem resource that shall have a HostingRoles entry with a value of 'StorageServer'.
@odata.id	string <i>read-only</i>	The value of this property shall be the unique identifier for the resource and it shall be of the form defined in the Redfish specification.
}]		
Members@odata.nextLink	string <i>read-only</i>	The value of this property shall be a URI to a resource, with the same @odata.type, containing the next set of partial members.

Name	string <i>read-only</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.

9.34 Volume 1.3.1

This resource shall be used to represent a volume, virtual disk, logical disk, LUN, or other logical storage for a Redfish implementation.

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
AccessCapabilities []	array (string (enum)) <i>read-write</i> (null)	Each entry shall specify a current storage access capability. StorageAccessCapability enumeration literals may be used to describe abilities to read or write storage. <i>See AccessCapabilities in Property Details, below, for the possible values of this property.</i>
Actions {	object	The Actions property shall contain the available actions for this resource.
#Volume.CheckConsistency { }	object	This defines the name of the custom action supported on this resource. <i>For more information, see the Action Details section below.</i>
#Volume.Initialize { }	object	This defines the name of the custom action supported on this resource. If InitializeType is not specified in the request body, the InitializeType should be Fast. <i>For more information, see the Action Details section below.</i>
}		
AllocatedPools {	object (null)	The value of this property shall contain references to all storage pools allocated from this volume. Contains a link to a resource.
@odata.id	string <i>read-only</i>	Link to Collection of <i>StoragePool</i> . See the StoragePool schema for details.

}		
BlockSizeBytes	integer (By) <i>read-only</i> (null)	This property shall contain size of the smallest addressable unit of the associated volume.
Capacity {	object (null)	Information about the utilization of capacity allocated to this storage volume. See the <i>CapacitySource</i> schema for details on this property.
@odata.id	string <i>read-only</i>	Link to a Capacity resource. See the Links section and the <i>CapacitySource</i> schema for details.
}		
CapacityBytes	integer (By) <i>read-only</i> (null)	This property shall contain the size in bytes of the associated volume.
CapacitySources (<i>v1.1+</i>) [{	array <i>read-write</i>	Fully or partially consumed storage from a source resource. Each entry provides capacity allocation information from a named source resource.
@odata.id	string <i>read-only</i>	Link to a CapacitySource resource. See the Links section and the <i>CapacitySource</i> schema for details.
}]		
Description	string <i>read-only</i> (null)	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Encrypted	boolean <i>read-write</i> (null)	This property shall contain a boolean indicator if the Volume is currently utilizing encryption or not.

EncryptionTypes []	array (string (enum)) <i>read- write</i>	This property shall contain the types of encryption used by this Volume. <i>See EncryptionTypes in Property Details, below, for the possible values of this property.</i>
Id	string <i>read- only required</i>	This property represents an identifier for the resource. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Identifiers [{}]	array (object)	This property shall contain a list of all known durable names for the associated volume. This type shall contain any additional identifiers of a resource. See the redfish.dmtf.org/schemas/v1/Resource.v1_7_0.json schema for details on this property.
IOStatistics { }	object <i>(null)</i>	The value shall represent IO statistics for this volume. See the <i>IOStatistics</i> schema for details on this property.
Links {	object	The Links property, as described by the Redfish Specification, shall contain references to resources that are related to, but not contained by (subordinate to), this resource.
ClassOfService (<i>v1.1+</i>) {	object <i>(null)</i>	This property shall contain a reference to the ClassOfService that this storage volume conforms to. See the <i>ClassOfService</i> schema for details on this property.
@odata.id	string <i>read- only</i>	Link to a ClassOfService resource. See the Links section and the <i>ClassOfService</i> schema for details.
}		
DedicatedSpareDrives (<i>v1.2+</i>) [{	array <i>read- only</i>	The value of this property shall be a reference to the resources that this volume is associated with and shall reference resources of type Drive. This property shall only contain references to Drive entities which are currently assigned as a dedicated spare and are able to support this Volume.
@odata.id	string <i>read- only</i>	The value of this property shall be the unique identifier for the resource and it shall be of the form defined in the Redfish specification.
}]		

DedicatedSpareDrives@odata.count (v1.2+)	integer <i>read-only</i>	The value of this property shall be an integer representing the number of items in a collection.
Drives [{	array <i>read-only</i>	The value of this property shall be a reference to the resources that this volume is associated with and shall reference resources of type Drive. This property shall only contain references to Drive entities which are currently members of the Volume, not hot spare Drives which are not currently a member of the volume.
@odata.id	string <i>read-only</i>	The value of this property shall be the unique identifier for the resource and it shall be of the form defined in the Redfish specification.
}]		
Drives@odata.count	integer <i>read-only</i>	The value of this property shall be an integer representing the number of items in a collection.
Oem { }	object	This object represents the Oem property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
SpareResourceSets (v1.3+) [{	array <i>read-write</i>	Each referenced SpareResourceSet shall contain resources that may be utilized to replace the capacity provided by a failed resource having a compatible type.
@odata.id	string <i>read-only</i>	Link to a SpareResourceSet resource. See the Links section and the <i>SpareResourceSet</i> schema for details.
}]		
SpareResourceSets@odata.count (v1.3+)	integer <i>read-only</i>	The value of this property shall be an integer representing the number of items in a collection.
}		

LowSpaceWarningThresholdPercents (v1.1+) []	array (%) (integer, null) <i>read- write</i>	Each time the following value is less than one of the values in the array the LOW_SPACE_THRESHOLD_WARNING event shall be triggered: Across all CapacitySources entries, percent = (SUM(AllocatedBytes) - SUM(ConsumedBytes))/SUM(AllocatedBytes).
Manufacturer (v1.1+)	string <i>read- only (null)</i>	This property shall contain a value that represents the manufacturer or implementer of the storage volume.
MaxBlockSizeBytes (v1.1+)	integer (By) <i>read- only (null)</i>	This property shall contain size of the largest addressable unit of this storage volume.
Model (v1.1+)	string <i>read- only (null)</i>	The value is assigned by the manufacturer and shall represents a specific storage volume implementation.
Name	string <i>read- only required</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
Operations [{	array <i>read- write</i>	This property shall contain a list of all currently running on the Volume.
AssociatedTask {	object	This resource shall be used to represent a task for a Redfish implementation.
@odata.id	string <i>read- only</i>	The value of this property shall be the unique identifier for the resource and it shall be of the form defined in the Redfish specification.
}		

OperationName	string <i>read-only</i> <i>(null)</i>	The name of the operation.
PercentageComplete	integer <i>read-only</i> <i>(null)</i>	The percentage of the operation that has been completed.
}]		
OptimumIOSizeBytes	integer (By) <i>read-only</i> <i>(null)</i>	This property shall contain the optimum IO size to use when performing IO on this volume. For logical disks, this is the stripe size. For physical disks, this describes the physical sector size.
RAIDType	string (enum) <i>read-only</i> <i>(null)</i>	This property shall contain the RAID type of the associated Volume. <i>See RAIDType in Property Details, below, for the possible values of this property.</i>
RecoverableCapacitySourceCount <i>(v1.3+)</i>	integer <i>read-write</i> <i>(null)</i>	The value is the number of available capacity source resources currently available in the event that an equivalent capacity source resource fails.
RemainingCapacityPercent <i>(v1.2+)</i>	integer <i>read-only</i> <i>(null)</i>	If present, this value shall return $\{[(\text{SUM}(\text{AllocatedBytes}) - \text{SUM}(\text{ConsumedBytes}))/\text{SUM}(\text{AllocatedBytes})]*100$ represented as an integer value.
ReplicaInfo {	object <i>(null)</i>	This property shall describe the replica relationship between this storage volume and a corresponding source volume. See the <i>StorageReplicaInfo</i> schema for details on this property.
@odata.id	string <i>read-only</i>	Link to a ReplicaInfo resource. See the Links section and the <i>StorageReplicaInfo</i> schema for details.
}		
ReplicaTargets <i>(v1.3+)</i> [{	array <i>read-only</i>	The value shall reference the target replicas that are sourced by this replica.

@odata.id	string <i>read-only</i>	The value of this property shall be the unique identifier for the resource and it shall be of the form defined in the Redfish specification.
}]		
Status {	object	This type shall contain any status or health properties of a resource. See the redfish.dmtf.org/schemas/v1/Resource.json schema for details on this property.
StorageGroups {	object <i>(null)</i>	The value of this property shall contain references to all storage groups that include this volume. Contains a link to a resource.
@odata.id	string <i>read-only</i>	Link to Collection of <i>StorageGroup</i> . See the <i>StorageGroup</i> schema for details.
}		
VolumeType	string (enum) <i>read-only</i> <i>(null)</i>	This property shall contain the type of the associated Volume. <i>See VolumeType in Property Details, below, for the possible values of this property.</i>

9.34.1 Action Details

9.34.1.0.0.1 CheckConsistency

This defines the name of the custom action supported on this resource.

(This action takes no parameters.)

9.34.1.0.0.2 Initialize

This defines the name of the custom action supported on this resource. If *InitializeType* is not specified in the request body, the *InitializeType* should be *Fast*.

The following table shows the parameters for the action which are included in the POST body to the URI shown in the "target" property of the Action.

{		
---	--	--

InitializeType	string (enum) read- write	This defines the property name for the action. <i>See InitializeType in Property Details, below, for the possible values of this property.</i>
}		

9.34.2 Property Details

9.34.2.1 AccessCapabilities:

Each entry shall specify a current storage access capability. StorageAccessCapability enumeration literals may be used to describe abilities to read or write storage.

string	Description
Append	This enumeration literal shall indicate that the storage may be written only to append.
Execute	This value shall indicate that Execute access is allowed by the file share.
Read	This enumeration literal shall indicate that the storage may be read.
Streaming	This enumeration literal shall indicate that the storage may be read sequentially.
Write	This enumeration literal shall indicate that the storage may be written multiple times.
WriteOnce	This enumeration literal shall indicate that the storage may be written only once.

9.34.2.2 EncryptionTypes:

This property shall contain the types of encryption used by this Volume.

string	Description
ControllerAssisted	The volume is being encrypted by the storage controller entity.
NativeDriveEncryption	The volume is utilizing the native drive encryption capabilities of the drive hardware.
SoftwareAssisted	The volume is being encrypted by software running on the system or the operating system.

9.34.2.3 InitializeType:

This defines the property name for the action.

string	Description
Fast	The volume is prepared for use quickly, typically by erasing just the beginning and end of the space so that partitioning can be performed.
Slow	The volume is prepared for use slowly, typically by completely erasing the volume.

9.34.2.4 RAIDType:

This property shall contain the RAID type of the associated Volume.

string	Description
RAID0	A placement policy where consecutive logical blocks of data are uniformly distributed across a set of independent storage devices without offering any form of redundancy. This is commonly referred to as data striping. This form of RAID will encounter data loss with the failure of any storage device in the set.
RAID00	A placement policy that creates a RAID 0 stripe set over two or more RAID 0 sets. This is commonly referred to as RAID 0+0. This form of data layout is not fault tolerant; if any storage device fails there will be data loss.
RAID01	A data placement policy that creates a mirrored device (RAID 1) over a set of striped devices (RAID 0). This is commonly referred to as RAID 0+1 or RAID 0/1. Data stored using this form of RAID is able to survive a single RAID 0 data set failure without data loss.
RAID1	A placement policy where each logical block of data is stored on more than one independent storage device. This is commonly referred to as mirroring. Data stored using this form of RAID is able to survive a single storage device failure without data loss.
RAID10	A placement policy that creates a striped device (RAID 0) over a set of mirrored devices (RAID 1). This is commonly referred to as RAID 1/0. Data stored using this form of RAID is able to survive storage device failures in each RAID 1 set without data loss.
RAID10E	A placement policy that uses a RAID 0 stripe set over two or more RAID 10 sets. This is commonly referred to as Enhanced RAID 10. Data stored using this form of RAID is able to survive a single device failure within each nested RAID 1 set without data loss.
RAID10Triple	A placement policy that uses a striped device (RAID 0) over a set of triple mirrored devices (RAID 1Triple). This form of RAID can survive up to two failures in each triple mirror set without data loss.
RAID1E	A placement policy that uses a form of mirroring implemented over a set of independent storage devices where logical blocks are duplicated on a pair of independent storage devices so that data is uniformly distributed across the storage devices. This is commonly referred to as RAID 1 Enhanced. Data stored using this form of RAID is able to survive a single storage device failure without data loss.
RAID1Triple	A placement policy where each logical block of data is mirrored three times across a set of three independent storage devices. This is commonly referred to as three-way mirroring. This form of RAID can survive two device failures without data loss.
RAID3	A placement policy using parity-based protection where logical bytes of data are uniformly distributed across a set of independent storage devices and where the parity is stored on a dedicated independent storage device. Data stored using this form of RAID is able to survive a single storage device failure without data loss. If the storage devices use rotating media, they are assumed to be rotationally synchronized, and the data stripe size should be no larger than the exported block size.
RAID4	A placement policy using parity-based protection where logical blocks of data are uniformly distributed across a set of independent storage devices and where the parity is stored on a dedicated independent storage device. Data stored using this form of RAID is able to survive a single storage device failure without data loss.

string	Description
RAID5	A placement policy using parity-based protection for storing stripes of 'n' logical blocks of data and one logical block of parity across a set of 'n+1' independent storage devices where the parity and data blocks are interleaved across the storage devices. Data stored using this form of RAID is able to survive a single storage device failure without data loss.
RAID50	A placement policy that uses a RAID 0 stripe set over two or more RAID 5 sets of independent storage devices. Data stored using this form of RAID is able to survive a single storage device failure within each RAID 5 set without data loss.
RAID6	A placement policy using parity-based protection for storing stripes of 'n' logical blocks of data and two logical blocks of independent parity across a set of 'n+2' independent storage devices where the parity and data blocks are interleaved across the storage devices. Data stored using this form of RAID is able to survive any two independent storage device failures without data loss.
RAID60	A placement policy that uses a RAID 0 stripe set over two or more RAID 6 sets of independent storage devices. Data stored using this form of RAID is able to survive two device failures within each RAID 6 set without data loss.
RAID6TP	

9.34.2.5 VolumeType:

This property shall contain the type of the associated Volume.

string	Description
Mirrored	The volume is a mirrored device.
NonRedundant	The volume is a non-redundant storage device.
RawDevice	The volume is a raw physical device without any RAID or other virtualization applied.
SpannedMirrors	The volume is a spanned set of mirrored devices.
SpannedStripesWithParity	The volume is a spanned set of devices which uses parity to retain redundant information.
StripedWithParity	The volume is a device which uses parity to retain redundant information.

9.35 VolumeCollection

URIs:

[/redfish/v1/StorageServices/{StorageServiceId}/FileSystems/{FileSystemId}/CapacitySources/{CapacitySourceId}/ProvidingVolum](#)
[/redfish/v1/StorageServices/{StorageServiceId}/StoragePools/{StoragePoolId}/AllocatedVolumes](#)
[/redfish/v1/StorageServices/{StorageServiceId}/StoragePools/{StoragePoolId}/CapacitySources/{CapacitySourceId}/ProvidingVoh](#)
[/redfish/v1/StorageServices/{StorageServiceId}/Volumes](#)
[/redfish/v1/StorageServices/{StorageServiceId}/Volumes/{VolumeId}/CapacitySources/{CapacitySourceId}/ProvidingVolumes](#)

@odata.etag	string <i>read-only</i>	The value of this property shall be a string that is defined by the ETag HTTP header definition in RFC7232.
Description	string <i>read-only (null)</i>	This object represents the Description property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification.
Members [{	array <i>read-write</i>	The value of each member entry shall reference a Volume resource.
@odata.id	string <i>read-only</i>	Link to a Volume resource. See the Links section and the <i>Volume</i> schema for details.
}]		
Members@odata.nextLink	string <i>read-only</i>	The value of this property shall be a URI to a resource, with the same @odata.type, containing the next set of partial members.
Name	string <i>read-only</i>	This object represents the Name property. All values for resources described by this schema shall comply to the requirements as described in the Redfish specification. The value of this string shall be of the format for the reserved word <i>Name</i> .
Oem { }	object	The value of this string shall be of the format for the reserved word <i>Oem</i> . See the <i>redfish.dmtf.org/schemas/v1/Resource.json</i> schema for details on this property.