



Swordfish Scalable Storage Management API Specification

Version 1.0.0

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

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SNIA Technical Position

Released: 7 December 2016

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Revision History

| Date | Revision | Notes |
|-----------------|----------|-----------------|
| 7 December 2016 | 1.0 | Initial Release |

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1 Abstract

The Swordfish Scalable Storage Management API ("Swordfish") uses RESTful interface semantics and a standardized data model to provide a scalable, customer-centric interface for managing storage and related data services.

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.

2 Scope

The Swordfish specification extends the Redfish Scalable Platforms Management API Specification (DSP0266) from the DMTF. The Redfish specification provides the protocols, data model, and behaviors for the system. It also defines elements that are mandatory for all Redfish and Swordfish implementations, as well as optional elements that can be chosen by system vendors or manufacturers. The specifications also define points at which OEM (system vendor) -specific extensions can be provided by a given implementation. The specifications set normative requirements for Redfish Services and associated materials, such as Redfish Schema files. In general, the specifications do 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. Swordfish implementations should assume that all requirements specified in the Redfish specifications are also Swordfish requirements.

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

| Tag | Title (Version) | Author | URL |
|-----|--------------------|--------|-----|
|-----|--------------------|--------|-----|

| Tag | Title (Version) | Author | URL |
|------------|---|---|---|
| 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 (v1.0.4) | DMTF | http://www.dmtf.org/sites/default/files/standards/documents/DSP0266_1.0.4.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-v1-0.pdf |
| Units | The Unified Code for Units of Measure (v2.0.1) | Regenstrief Institute, Inc. and the UCUM Organization | http://unitsofmeasure.org/trac |

| Tag | Title (Version) | Author | URL |
|-----|---|--------|---|
| TLS | Transport Layer Security (TLS) Protocol Version 1.2 | IETF | https://www.ietf.org/rfc/rfc5246.txt |

3.3 References under development

None defined in this document.

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

4.2.1 Definitions

None in 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.

| Term | Definition |
|-----------------------------|--|
| 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 |
| OData service | A REST-based service that allow 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. |
| Schema | A formal language representation of a model that conforms to a metamodel. |
| Redfish Schema | The CSDL defintion 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. |
| Resource | A Resource is addressable by a URI and is able to receive and process messages. A Resource can be either an individual entity, or a collection that acts as a container for several other entities <i>Note:</i> There are discrete Redfish and Swordfish Resources |
| 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 |
| 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. |
| 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. |

4.4 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.

| 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 |

| Term(s) | Meaning |
|---------------------------|---|
| 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 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

6 Swordfish Overview

6.1 Introduction

Swordfish defines a scalable, REST-based interface for managing an ecosystem that includes storage systems, and that conforms to the requirements of Redfish.

6.2 Extension to Redfish

The Swordfish model is an extension to Redfish. A Swordfish cannot be implemented purely of Swordfish schema; it must include Redfish schema.

The Swordfish service interface is an extension to the Redfish service interface. As such, a Swordfish service is a Redfish service and all required elements of the Redfish model are present in a Swordfish model.

A complete Swordfish implementation includes a Redfish-defined Service Root, is instantiated upon a StorageSystem/ComputerSystem, and runs on a Redfish Chassis. The storage client may focus entirely on the storage schema instantiations and never interact with the Redfish portion of your system.

The combined model 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 (need

URL). 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) defined by the OData organization within OASIS (need URL).

Each Swordfish service is accessed via a single service location. The information at that location is defined by the ServiceRoot element. From there, the remainder of the modeled ecosystem can be discovered.

6.3 The Service Root

6.3.1 Discovery

Each Swordfish ServiceRoot has a well known URL, /redfish/v1. As noted above, this ServiceRoot also provides access to Redfish defined services.

ComputerSystems that expose Swordfish defined services will have a value of "StorageServer" in an entry of their HostingRoles property.

6.3.2 The ServiceRoot resource

A GET to the /redfish/v1 will return the ServiceRoot element. The retrieved ServiceRoot element provides links to the remainder of the system.

The following are the principal properties utilized for Swordfish management. All other ServiceRoot properties are as defined by Redfish.

- **Systems:** A reference to a ComputerSystemCollection with members that are of type ComputerSystem that support general applications.
- **StorageSystems:** A reference to a ComputerSystemCollection with members that are 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.
- **StorageServices:** A reference to a StorageServiceCollection with members that are of type StorageService.
- **Chassis:** A reference to a ChassisCollection with members that are of type Chassis.

6.3.2.1 The StorageSystems collection

The collected ComputerSystem resources each represent a storage server. Each will have an entry with the value of "StorageServer" in its HostingRoles property. A particular ComputerSystem resource can be on both the StorageSystems collection and the Systems collection.

6.3.2.2 The Systems collection

The collected ComputerSystem resources each represent a general purpose application server. Each will have an entry with the value of "ApplicationServer" in its HostingRoles property. A particular ComputerSystem resource can be on both the StorageSystems collection and the Systems collection.

6.3.2.3 The StorageServices collection

The collected `StorageService` resources each represent the resources managed by that storage service.

6.3.2.4 The Chassis collection

The collected `Chassis` resources the physical components for any system. This resource represents the 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.

6.4 Storage Services

6.4.1 The `StorageService` resource

A storage service is a service that runs on a system that exposes logical storage, resources and functionality. The base object in the model is the `StorageService`. It can be found in the service root storage services collection.

The following are the principal properties of the `StorageService`.

- `ClassesOfService`: A reference to a collection of `ClassOfService` resources supported by this `StorageService`.
- `Drives`: A reference to a collection of `Drive` resources used for storage managed by this `StorageService`.
- `Enclosures`: A reference to a collection of `Chassis` resources that contain resources managed by this `StorageService`.
- `Endpoints`: A reference to a collection of `Endpoint` resources used to access storage managed by this `StorageService`.
- `InitiatorEndpointGroups`: A reference to a collection of `InitiatorEndpointGroup` resources managed by this `StorageService`.
- `Links.HostingSystem`: A reference to the `ComputerSystem` instance that hosts this `StorageService`.
- `StorageControllers`: A reference to a collection of `StorageController` resources that are managed by this `StorageService`. Each represents `StorageController` resource a storage device that can independently produce `Volume` resources.
- `StorageGroups`: A reference to a collection of `StorageGroup` resources managed by this `StorageService`.
- `StoragePools`: A reference to a collection of `StorageGroup` resources managed by this `StorageService`.
- `StorageServiceCapabilites`: A reference to a `StorageServiceCapabilites` resource that describes the abilities of the storage system.
- `TargetEndpointGroups`: A reference to a collection of `TargetEndpointGroup` resources managed by this `StorageService`.
- `Volumes`: A reference to a collection of `Volume` resources managed by this `StorageService`.
- `FileSystems`: A reference to a collection of `FileSystem` resources managed by this `StorageService`.

6.4.2 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 [ITIL](#).)

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

A collection of supported `ClassOfService` resources is defined in the `StorageServices` resource.

Each `ClassOfService` is defined by an aggregation of line of service values. 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.

An incomplete `ClassOfService` may be used to define a service request. In this case, `ClassOfService` attributes with no value (i.e. Null) specify that any offered value for that attribute is acceptable. Otherwise, the attribute value specifies the range of acceptable values for the attribute.

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.

6.4.3 The Endpoint resource

Endpoints represent one end of a protocol specific connection that supports sending or receiving messages according to a particular protocol. The `InitiatorEndpointGroup` is a collection of Endpoints of the requesting systems.

6.4.4 InitiatorEndpointGroup resource

The `InitiatorEndpointGroup` is a collection of `Endpoint` resources used used to send block storage commands.

6.4.5 The StorageController resource

A `StorageController` resource represents a storage device (physical or virtual) that can produce Volumes.

6.4.6 The StorageGroup resource

`StorageGroups` represent a collection of volumes that are managed as a group with the same consistency requirements. They can be exposed or hidden collectively. The set of requestors to which the volumes of the `StorageGroups` can be exposed or hidden is defined by the `Target` and `Initiator` Endpoint groups.

6.4.7 The StoragePool resource

The `StoragePool` resource represents a factory that has amount of storage capacity and has the ability to produce storage volumes or other storage pools conforming to one or more classes of service. `Storage Devices` the physical capacity used to create storage pools.

6.4.8 The StorageServiceCapabilities resource

The `StorageServiceCapabilities` resource defines the supported line of service choices that can be composed into a `ClassOfService` resource.

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.

Each line of service is constructed of a set of related values that describe a choice of service for its line of service. The providing server must assure that the collected attribute values of a `ClassOfService` represents a supported choice of service.

6.4.9 The Volume resource

This `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 represent block addressable capacity that is conformant to a `ClassOfService`.

6.4.10 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.

6.4.11 TargetEndpointGroup resource

The `TargetEndpointGroup` is a collection of `Endpoint` resources used used to receive block storage commands.

6.5 Discovering Swordfish resources

A Swordfish service shares two entry-points with a Redfish service, each addressed by a well-known Uniform Resource Identifier (URI) consisting of two parts that conforms to the requirements of [RFC3986](#).

Both entry-points shall be as defined by [Redfish](#).

Note: Swordfish does not define a separate service from a Redfish service. A Swordfish service is a Redfish service with extensions to support storage management. No additional service entry-points are necessary.

The first part of each URI identifies a naming authority on a server. It consists of the `schema` and `authority` separated by `://`. The format for the `schema` and `authority` rules shall conform to [RFC3986](#).

The second part of each URI is one of two well-known names. Each conforms to the `path-absolute` rule of [RFC3986](#).

The first first well-known name provides [OData](#) conformant access to a Swordfish service. It names the OData service document and has a value of `/redfish/v1/odata`. A GET operation to `/redfish/v1/odata` shall retrieve the value of an instance of a `ServiceContainer` EntityContainer as defined in the [ServiceRoot_v1.xml](#) file.

The `ServiceContainer` contains a property named `Service`. That property has `ServiceRoot` as its type. A GET operation to `/redfish/v1/odata/Service` shall retrieve the value of the corresponding Swordfish `ServiceRoot`, (see following.)

The second well-known name provides [Redfish](#) conformant access to a Swordfish service and has a value of `/redfish/v1`. A GET operation to `/redfish/v1` shall retrieve the value of an instance of a `ServiceRoot` `EntityType` as defined in the [ServiceRoot_v1.xml](#) file.

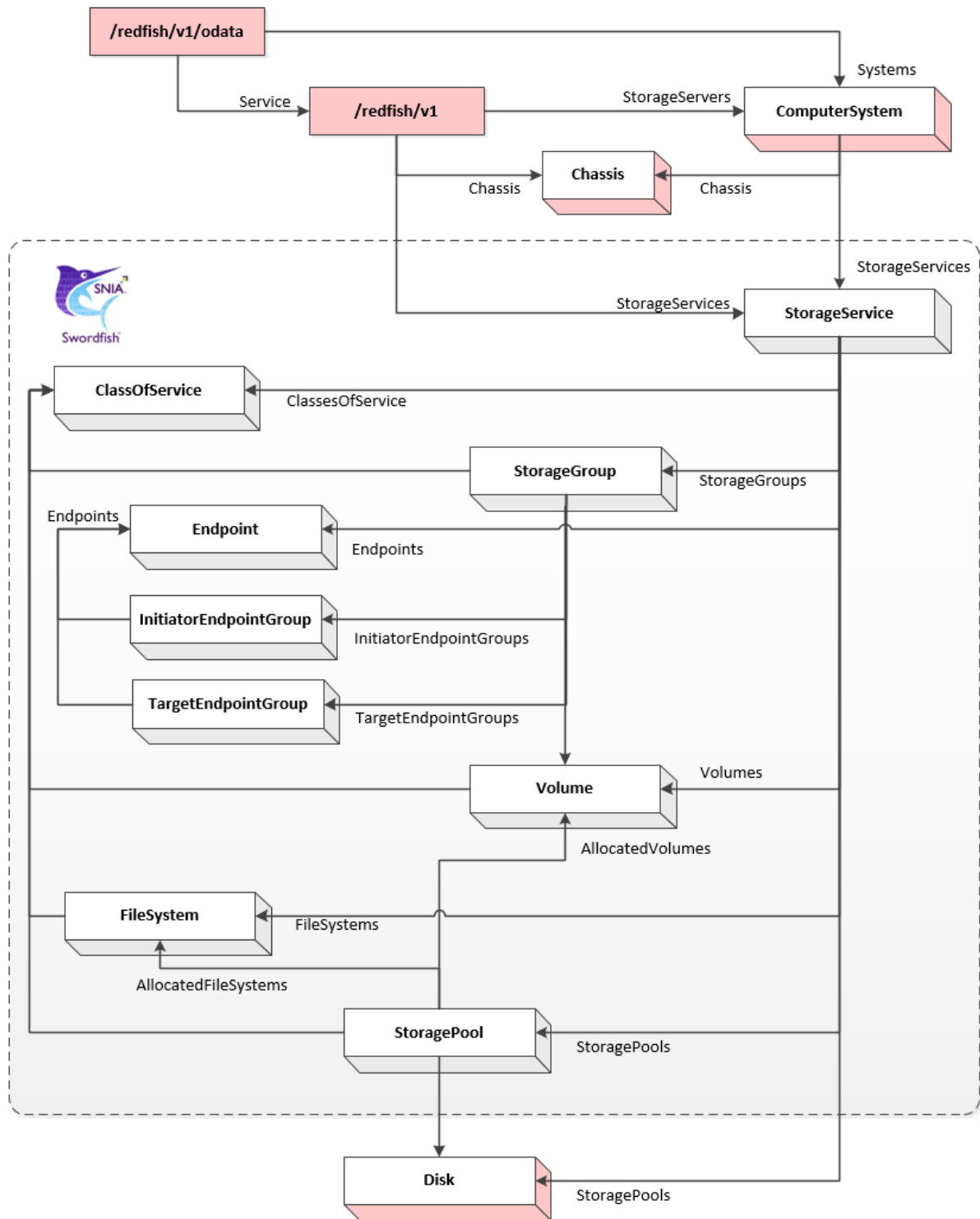
Regardless of starting point, the property values of the `ServiceRoot` instance enable navigation to all other resources exposed by the Swordfish service.

7 Data model and schema

7.1 Schema Introduction and Overview

The Swordfish model is an extension to Redfish, as illustrated in [Figure 1](#), where the Swordfish extensions are indicated in purple. A Swordfish instance cannot be implemented solely from Swordfish schema; it must include Redfish schema.

[Figure 1: Model Overview](#)



A complete Swordfish implementation includes a Redfish-defined Service Root, is instantiated upon a StorageSystem/ComputerSystem, and runs on a Redfish Chassis. At the same time, a storage client may focus entirely on the storage schema instantiations and never interact with the Redfish portion of an implementation.

Swordfish is defined in terms of schema extended from Redfish which are defined below. This section provides additional definition and context for these schema.

7.2 Swordfish extensions to Redfish

7.2.1 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.

7.2.2 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.

7.2.3 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 endpoint `/redfish/v1/odata`.

7.3 Common schema attributes

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

| 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 <code>Nullable=false</code> , 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 |

7.4 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](#),

| 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. |
| RequiredIOnCreate | NavigationProperty, Property | If true, property is required on creation |
| Unit | Property | The unit of measure for the value. |

7.5 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 dmtf.org site or to locally provided instances of the schema.

7.6 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.

8 Swordfish type definitions

8.1 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.

8.2 ClassOfService 1.0.0

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

| | | |
|---|--|--|
| ClassOfServiceVersion | string, null <i>read- write</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). |
| Description | null <i>read- write</i> | |
| Id | <i>read- write</i> | |
| Identifier | null <i>read- write</i> | The value shall be unique within the managed ecosystem. |
| IsDefault | boolean, null <i>read- write</i> | True if this class of service is the default. |
| LinesOfService { | object, null <i>read- write</i> | The value of this property shall define the required choices of utility or warranty. |
| 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. |

| | | |
|--|--------------------------------|--|
| DataSecurityLinesOfService [{}] | array <i>read-write</i> | The value shall be a set of data security service options. |
| DataStorageLinesOfService [{}] | array <i>read-write</i> | The value shall be a set of data protection service options. |
| 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. |
| IOPerformanceLinesOfService [{}] | array <i>read-write</i> | The value shall be a set of IO performance service options. |
| } | | |
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |

8.3 DataProtectionLoSCapabilities 1.0.0

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.

| | | |
|--------------------|-------------------------------|---|
| Description | null <i>read-write</i> | |
| Id | <i>read-write</i> | |
| Identifier | null <i>read-write</i> | The value shall be unique within the managed ecosystem. |

| | | |
|--|---|--|
| Links { | object <i>read-only</i> | The value of this property shall contains links to other resources that are not contained in this resource. |
| Oem | <i>read-write</i> | 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. |
| SupportedReplicaOptions [{}] | array <i>read-write</i> | The collection shall contain known and supported replica Classes of Service. |
| } | | |
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| SupportedDataProtectionLinesOfService [{}] | array <i>read-write</i> | The collection shall contain known and supported DataProtectionLinesOfService. |
| SupportedIsolated | boolean, null <i>read-write</i> | A value of true shall indicate that allocating a replica in a separate fault domain is supported. |
| SupportedMinLifetimeSeconds [{}] | array <i>read-write</i> | The value of each entry shall specify a supported minimum lifetime (seconds) that a replica must be maintained. |
| SupportedRecoveryGeographicObjectives [{}] | array <i>read-write</i> | The value of each entry shall specify a supported failure domain. |
| SupportedRecoveryPointObjectiveSeconds [{}] | array <i>read-write</i> | The value of each entry shall specify a supported time interval defining the maximum source information that may be lost on failure |
| SupportedRecoveryTimeObjectives [{}] | array <i>read-write</i> | The value of each entry shall specify a supported expectation for time to access an alternate replica. |

| | | |
|-------------------------------------|-------------------------------------|--|
| SupportedReplicaTypes [{}] | array <i>read- write</i> | The value of each entry shall specify a supported replica type |
|-------------------------------------|-------------------------------------|--|

8.4 DataSecurityLoSCapabilities 1.0.0

This resource may be used to describe data security capabilities.

| | | |
|---|-------------------------------------|---|
| Description | null <i>read- write</i> | |
| Id | <i>read- write</i> | |
| Identifier | null <i>read- write</i> | The value identifies this resource. The value shall be unique within the managed ecosystem. |
| Name | <i>read- write</i> | |
| Oem | <i>read- write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| SupportedAntivirusEngineProviders [{}] | array <i>read- write</i> | The entry values shall specify supported AntiVirus providers. |
| SupportedAntivirusScanPolicies [{}] | array <i>read- write</i> | The enumeration literal shall specify supported policies that trigger an AntiVirus scan. |
| SupportedChannelEncryptionStrengths [{}] | array <i>read- write</i> | The enumeration literal shall specify supported key sizes in a symmetric encryption algorithm (AES) for transport channel encryption. |
| SupportedDataSanitizationPolicies [{}] | array <i>read- write</i> | The enumeration literal shall specify supported data sanitization policies. |

| | | |
|---|--------------------------------|---|
| SupportedDataSecurityLinesOfService [{}] | array <i>read-write</i> | The collection shall contain supported DataSecurity service options. |
| SupportedHostAuthenticationTypes [{}] | array <i>read-write</i> | The enumeration literal shall specify supported authentication types for hosts (servers) or initiator endpoints. |
| SupportedMediaEncryptionStrengths [{}] | array <i>read-write</i> | The enumeration literal shall specify supported key sizes in a symmetric encryption algorithm (AES) for media encryption. |
| SupportedSecureChannelProtocols [{}] | array <i>read-write</i> | The enumeration literal shall specify supported protocols that provide encrypted communication. |
| SupportedUserAuthenticationTypes [{}] | array <i>read-write</i> | The enumeration literal shall specify supported authentication types for users (or programs). |

8.5 DataStorageLoSCapabilities 1.0.0

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

| | | |
|--------------------|-------------------------------|--|
| Description | null <i>read-write</i> | |
| Id | <i>read-write</i> | |
| Identifier | null <i>read-write</i> | The value shall be unique within the managed ecosystem. |
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |

| | | |
|--|--|---|
| SupportedAccessCapabilities [{}] | array <i>read- write</i> | Each entry specifies a storage access capability. |
| SupportedDataStorageLinesOfService [{}] | array <i>read- write</i> | The collection shall contain known and supported DataStorageLinesOfService. |
| SupportedProvisioningPolicies [{}] | array <i>read- write</i> | This collection specifies supported storage allocation policies. |
| SupportedRecoveryTimeObjectives [{}] | array <i>read- write</i> | This collection specifies supported expectations for time to access the primary store after recovery. |
| SupportsSpaceEfficiency | boolean, null <i>read- write</i> | The value specifies whether storage compression or deduplication is supported. |

8.6 DriveCollection

An instance of this resource shall reference the set of Drive resources known in the scope of its use.

| | | |
|-----------------------|------------------------------------|--|
| Description | null <i>read- write</i> | |
| Members [{}] | array <i>read- only</i> | The value of each entry of this property shall reference a Drive resource. |
| Name | <i>read- write</i> | |
| Oem | <i>read- write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |

8.7 EndpointCollection

An instance of this resource shall reference the set of Endpoint resources known in the scope of its use.

| | | |
|-----------------------|-------------------------------|--|
| Description | null <i>read-write</i> | |
| Members [{}] | array <i>read-only</i> | The value of each member entry shall reference an Endpoint resource. |
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |

8.8 FileShare 1.0.0

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

| | | |
|---------------------------------------|---|--|
| CASupported | boolean, null <i>read-write</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. |
| DefaultAccessPrivileges [{}] | array <i>read-only</i> | The value of this property shall be an array containing entries for the default access privileges for the file share. Each entry shall specify a default access privilege. The types of default access can include Read, Write, and/or Execute. |
| Description | null <i>read-write</i> | |
| ExecuteSupport | boolean, null <i>read-only</i> | The value of this property shall indicate whether Execute access is supported by the file share. |
| FileSharePath | string, null <i>read-only</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 | null <i>read-write</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. |

| | | |
|-------------------------------------|---|--|
| FileShareRemainingQuotaBytes | number, null (By) <i>read- write</i> | If present, the value of this property shall indicate the remaining number of bytes that may be consumed by this file share. |
| FileShareTotalQuotaBytes | number, null (By) <i>read- write</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 <i>read- only</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. |
| Id | <i>read- write</i> | |
| Links { | object <i>read- only</i> | This property shall contain links to other resources that are related to this resource. |
| ClassOfService { | object, null <i>read- write</i> | This value shall be a link to the ClassOfService for this file share. |
| EthernetInterfaces [{}] | array <i>read- only</i> | The value shall be a link to an EthernetInterfaceCollection with members that provide access to the file share. |
| FileSystem { | object, null <i>read- write</i> | The value shall be a link to the file system containing the file share. |
| Oem | <i>read- write</i> | 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. |
| } | | |

| | | |
|---|---|---|
| LowSpaceWarningThresholdPercents [{}] | array <i>read- write</i> | This property shall be an array containing entries for the percentages of file share capacity at which low space warning events are be issued. A LOW_SPACE_THRESHOLD_WARNING 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, percent = (SUM(AllocatedBytes) - SUM(ConsumedBytes))/SUM(AllocatedBytes) |
| Name | <i>read- write</i> | |
| Oem | <i>read- write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| RootAccess | boolean, null <i>read- only</i> | The value of this property shall indicate whether Root access is allowed by the file share. |
| Status | null <i>read- write</i> | This value of this property shall indicate the status of the file share. |
| WritePolicy | string, null <i>read- write</i> | The value of this property shall define how writes are replicated to the shared source. <i>See Property Details, below, for more information about this property.</i> |

8.8.1 Property Details

8.8.1.1 WritePolicy:

| 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. |

8.9 FileSystem 1.0.0

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

| | | |
|----------------------------------|--|--|
| AccessCapabilities [{}] | array <i>read- write</i> | This property shall be an array containing entries for the supported IO access capabilities. Each entry shall specify a current storage access capability. |
| BlockSizeBytes | number, null (By) <i>read- only</i> | The value of this property shall be the block size of the file system in bytes. |
| Capacity { | object, null <i>read- write</i> | The value of this property shall be the capacity allocated to the file system in bytes. |
| Data { } | object, null <i>read- write</i> | The value shall be capacity information relating to provisioned user data. |
| IsThinProvisioned | boolean, null <i>read- write</i> | If false, the capacity shall be fully allocated. |
| Metadata { } | object, null <i>read- write</i> | The value shall be capacity information relating to provisioned system (non-user accessible) data. |
| Snapshot { } | object, null <i>read- write</i> | The value shall be capacity information relating to provisioned snapshot or backup data. |
| } | | |
| CapacitySources [{ | array <i>read- write</i> | 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. |
| ProvidedCapacity { } | object, null <i>read- write</i> | The value shall be the amount of space that has been provided from the ProvidingDrives, ProvidingVolumes or ProvidingPools. |

| | | |
|-----------------------------------|---|--|
| ProvidedClassOfService { } | object, null <i>read- write</i> | The value shall reference the provided ClassOfService from the ProvidingDrives, ProvidingVolumes or ProvidingPools. |
| ProvidingDrives [{ }] | array <i>read- write</i> | The value shall be a reference to a contributing drive or drives. |
| ProvidingPools [{ }] | array <i>read- write</i> | The value shall be a reference to a contributing storage pool or storage pools. |
| ProvidingVolumes [{ }] | array <i>read- write</i> | The value shall be a reference to a contributing volume or volumes. |
| }] | | |
| CasePreserved | boolean, null <i>read- write</i> | 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, null <i>read- write</i> | 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 <i>read- write</i> | 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. |
| ClusterSizeBytes | number, null (By) <i>read- write</i> | 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 | null <i>read- write</i> | |
| ExportedShares [{ | array <i>read- only</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. |

| | | |
|---------------------------------------|---|--|
| CASupported | boolean, null <i>read- write</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. |
| DefaultAccessPrivileges [{}] | array <i>read- only</i> | The value of this property shall be an array containing entries for the default access privileges for the file share. Each entry shall specify a default access privilege. The types of default access can include Read, Write, and/or Execute. |
| Description | null <i>read- write</i> | |
| ExecuteSupport | boolean, null <i>read- only</i> | The value of this property shall indicate whether Execute access is supported by the file share. |
| FileSharePath | string, null <i>read- only</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 | null <i>read- write</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. |
| FileShareRemainingQuotaBytes | number, null (By) <i>read- write</i> | If present, the value of this property shall indicate the remaining number of bytes that may be consumed by this file share. |
| FileShareTotalQuotaBytes | number, null (By) <i>read- write</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 <i>read- only</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. |

| | | |
|---|---|--|
| Id | <i>read- write</i> | |
| Links {} | object <i>read- only</i> | This property shall contain links to other resources that are related to this resource. |
| LowSpaceWarningThresholdPercents [{}] | array <i>read- write</i> | 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 LOW_SPACE_THRESHOLD_WARNING 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, percent = (SUM(AllocatedBytes) - SUM(ConsumedBytes))/SUM(AllocatedBytes) |
| Name | <i>read- write</i> | |
| Oem | <i>read- write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| RootAccess | boolean, null <i>read- only</i> | The value of this property shall indicate whether Root access is allowed by the file share. |
| Status | null <i>read- write</i> | This value of this property shall indicate the status of the file share. |
| WritePolicy | string, null <i>read- write</i> | The value of this property shall define how writes are replicated to the shared source. <i>See Property Details, below, for more information about this property.</i> |
| }] | | |
| Id | <i>read- write</i> | |

| | | |
|--|--|--|
| Links { | object <i>read-only</i> | This property shall contain links to other resources that are related to this resource. |
| ClassOfService {} | object, null <i>read-write</i> | This value shall be a link to the ClassOfService for this file system. |
| Oem | <i>read-write</i> | 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. |
| ReplicaCollection [{}] | 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. |
| } | | |
| LowSpaceWarningThresholdPercents [{}] | array <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 LOW_SPACE_THRESHOLD_WARNING 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 = (SUM(AllocatedBytes) - SUM(ConsumedBytes))/SUM(AllocatedBytes) |
| MaxFileNameLengthBytes | number, null (By) <i>read-write</i> | If specified, this value shall specify the maximum length of a file name within the file system. |
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| RemainingCapacity { | object, null <i>read-write</i> | The value of this property shall be the remaining capacity allocated to the file system in bytes. |

| | | |
|---------------------------|--|--|
| Data {} | object, null <i>read- write</i> | The value shall be capacity information relating to provisioned user data. |
| IsThinProvisioned | boolean, null <i>read- write</i> | If false, the capacity shall be fully allocated. |
| Metadata {} | object, null <i>read- write</i> | The value shall be capacity information relating to provisioned system (non-user accessible) data. |
| Snapshot {} | object, null <i>read- write</i> | The value shall be capacity information relating to provisioned snapshot or backup data. |
| } | | |
| ReplicaInfo { | object, null <i>read- write</i> | 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. |
| ConsistencyEnabled | boolean, null <i>read- only</i> | True if consistency is enabled. |
| ConsistencyState | string, null <i>read- write</i> | The ConsistencyState enumeration literal shall indicate the current state of consistency. <i>See Property Details, below, for more information about this property.</i> |
| ConsistencyStatus | string, null <i>read- write</i> | The ConsistencyStatus enumeration literal shall specify the current status of consistency. Consistency may have been disabled or is experiencing an error condition. <i>See Property Details, below, for more information about this property.</i> |
| ConsistencyType | string, null <i>read- write</i> | The ConsistencyType enumeration literal shall indicate the consistency type used by the source and its associated target group. <i>See Property Details, below, for more information about this property.</i> |

| | | |
|------------------------------|--|---|
| FailedCopyStopsHostIO | boolean, null <i>read- only</i> | If true, the storage array shall stop receiving data to the source element if copying to a remote element fails. |
| PercentSynced | number, null (%) <i>read- only</i> | Specifies the percent of the work completed to reach synchronization. Shall not be instantiated if implementation is not capable of providing this information. If related to a group, then PercentSynced shall be an average of the PercentSynced across all members of the group. |
| Replica | null <i>read- write</i> | The value shall reference the resource that is the source of this replica. |
| ReplicaPriority | string, null <i>read- write</i> | The enumeration literal shall specify the priority of background copy engine I/O to be managed relative to host I/O operations during a sequential background copy operation. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaProgressStatus | string, null <i>read- write</i> | The ReplicaProgressStatus enumeration literal shall specify the status of the session with respect to Replication activity. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaReadOnlyAccess | string, null <i>read- write</i> | The enumeration literal shall specify whether the source, the target, or both elements are read only to the host. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaRecoveryMode | string, null <i>read- write</i> | The enumeration literal shall specify whether the copy operation continues after a broken link is restored. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaRole | string, null <i>read- write</i> | The ReplicaRole enumeration literal shall represent the source or target role of this replica as known to the containing resource. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaSkewBytes | number, null (By) <i>read- only</i> | Applies to Adaptive mode and it describes maximum number of bytes the SyncedElement (target) can be out of sync. If the number of out-of-sync bytes exceeds the skew value, ReplicaUpdateMode shall be switched to synchronous. |

| | | |
|------------------------------|---|--|
| ReplicaState | string, null <i>read- write</i> | The ReplicaState enumeration literal shall specify the state of the relationship with respect to Replication activity. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaSyncType | string, null <i>read- write</i> | The ReplicaSyncType enumeration literal shall describe the intended outcome of the replication. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaType | string, null <i>read- write</i> | The value shall indicate the type of Replica being maintained. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaUpdateMode | string, null <i>read- write</i> | The enumeration literal shall specify whether the target elements will be updated synchronously or asynchronously. <i>See Property Details, below, for more information about this property.</i> |
| RequestedReplicaState | string, null <i>read- write</i> | The last requested or desired state for the relationship. The actual state of the relationship shall be represented by ReplicaState. When RequestedState reaches the requested state, this property shall be null. <i>See Property Details, below, for more information about this property.</i> |
| SyncMaintained | boolean, null <i>read- only</i> | If true, Synchronization shall be maintained. |
| UndiscoveredElement | string, null <i>read- write</i> | The enumeration literal shall specify whether the source, the target, or both elements involved in a copy operation are undiscovered. An element is considered undiscovered if its object model is not known to the service performing the copy operation. <i>See Property Details, below, for more information about this property.</i> |
| WhenActivated | string, null (%) <i>read- only</i> | The value shall specify the time of day when the point-in-time copy was taken or when the replication relationship is activated, reactivated, resumed or re-established. This property shall be null if the implementation is not capable of providing this information. |

| | | |
|-------------------------|---|---|
| WhenDeactivated | string, null (%) <i>read- only</i> | Specifies when the replication relationship is deactivated. Do not instantiate this property if implementation is not capable of providing this information. |
| WhenEstablished | string, null (%) <i>read- only</i> | Specifies when the replication relationship is established. Do not instantiate this property if implementation is not capable of providing this information. |
| WhenSuspended | string, null (%) <i>read- only</i> | Specifies when the replication relationship is suspended. Do not instantiate this property if implementation is not capable of providing this information. |
| WhenSynced | string, null <i>read- only</i> | The value shall specify the time of day when the elements were synchronized. |
| WhenSynchronized | string, null (%) <i>read- only</i> | Specifies when the replication relationship is synchronized. Do not instantiate this property if implementation is not capable of providing this information. |
| } | | |

8.9.1 Property Details

8.9.1.1 ConsistencyState:

| string | Description |
|--------------|---|
| Consistent | This enumeration literal shall indicate that the source and target shall be consistent. |
| Inconsistent | This enumeration literal shall indicate that the source and target are not required to be consistent. |

8.9.1.2 ConsistencyStatus:

| string | Description |
|------------|---|
| Consistent | This enumeration literal shall indicate that the source and target are consistent. |
| Disabled | This enumeration literal shall indicate that the source and target have consistency disabled. |
| InError | This enumeration literal shall indicate that the source and target are not consistent. |

| string | Description |
|------------|---|
| InProgress | This enumeration literal shall indicate that the source and target are becoming consistent. |

8.9.1.3 ConsistencyType:

| string | Description |
|------------------------|--|
| SequentiallyConsistent | This enumeration literal shall indicate that the source and target shall be sequentially consistent. |

8.9.1.4 ReplicaPriority:

| string | Description |
|--------|---|
| High | Copy engine I/O shall have a higher priority than host I/O. |
| Low | Copy engine I/O shall have a lower priority than host I/O. |
| Same | Copy engine I/O shall have the same priority as host I/O. |
| Urgent | Regardless of the host I/O requests, the Copy operation shall be performed as soon as possible. |

8.9.1.5 ReplicaProgressStatus:

| string | Description |
|------------------|---|
| Aborting | This enumeration literal shall indicate that replication has an abort in progress. |
| Completed | This enumeration literal shall indicate that the request is completed. Data flow is idle. |
| Detaching | This enumeration literal shall indicate that replication has a detach in progress. |
| Dormant | This enumeration literal shall indicate that the data flow is inactive, suspended or quiesced. |
| FailingBack | This enumeration literal shall indicate that replication is undoing the result of failover. |
| FailingOver | This enumeration literal shall indicate that replication is in the process of switching source and target. |
| Fracturing | This enumeration literal shall indicate that replication has a fracture in progress. |
| Initializing | This enumeration literal shall indicate that replication is in the process of establishing source/replica relationship and the data flow has not started. |
| Mixed | This enumeration literal shall indicate that replication status is mixed across element pairs in a replication group. Generally, the individual statuses need to be examined. |
| Pending | This enumeration literal shall indicate that the flow of data has stopped momentarily due to limited bandwidth or a busy system. |
| Preparing | This enumeration literal shall indicate that replication has preparation in progress. |
| RequiresActivate | This enumeration literal shall indicate that the requested operation has completed, however, the synchronization relationship needs to be activated before further copy operations can be issued. |
| RequiresDetach | This enumeration literal shall indicate that the requested operation has completed, however, the synchronization relationship needs to be detached before further copy operations can be issued. |
| RequiresFracture | This enumeration literal shall indicate that the requested operation has completed, however, the synchronization relationship needs to be fractured before further copy operations can be issued. |
| RequiresResume | This enumeration literal shall indicate that the requested operation has completed, however, the synchronization relationship needs to be resumed before further copy operations can be issued. |

| string | Description |
|----------------|--|
| RequiresResync | This enumeration literal shall indicate that the requested operation has completed, however, the synchronization relationship needs to be resynced before further copy operations can be issued. |
| RequiresSplit | This enumeration literal shall indicate that the requested operation has completed, however, the synchronization relationship needs to be split before further copy operations can be issued. |
| Restoring | This enumeration literal shall indicate that replication has a restore in progress. |
| Resyncing | This enumeration literal shall indicate that replication has resynchronization in progress. |
| Splitting | This enumeration literal shall indicate that replication has a split in progress. |
| Suspending | This enumeration literal shall indicate that replication has a copy operation in the process of being suspended. |
| Synchronizing | This enumeration literal shall indicate that replication has synchronization in progress. |
| Terminating | This enumeration literal shall indicate that the replication relationship is in the process of terminating. |

8.9.1.6 ReplicaReadOnlyAccess:

| string | Description |
|----------------|---|
| Both | Both the source and the target elements shall be read only to the host. |
| ReplicaElement | The replica element shall be read-only to the host. |
| SourceElement | The source element shall be read-only to the host. |

8.9.1.7 ReplicaRecoveryMode:

| string | Description |
|-----------|--|
| Automatic | The copy operation shall resume automatically. |
| Manual | The ReplicaState shall be set to Suspended after the link is restored. It is required to issue the Resume operation to continue. |

8.9.1.8 ReplicaRole:

| string | Description |
|--------|---|
| Source | This enumeration literal shall indicate a source element. |
| Target | This enumeration literal shall indicate target element. |

8.9.1.9 ReplicaState:

| string | Description |
|------------|--|
| Aborted | This enumeration literal shall indicate that the copy operation is aborted with the Abort operation. The Resync Replica operation can be used to restart the copy operation. |
| Broken | This enumeration literal shall indicate that the relationship is non-functional due to errors in the source, the target, the path between the two or space constraints. |
| Failedover | This enumeration literal shall indicate that the reads and writes are sent to the target element. The source element may not be reachable. |

| string | Description |
|----------------|--|
| Fractured | This enumeration literal shall indicate that the Target is split from the source. The target may not be consistent. |
| Inactive | This enumeration literal shall indicate that data flow has stopped, writes to source element shall not be sent to target element. |
| Initialized | This enumeration literal shall indicate that the link to enable replication is established and source/replica elements are associated, but the data flow has not started. |
| Invalid | This enumeration literal shall indicate that the storage server is unable to determine the state of the replication relationship, for example, after the connection is restored; however, either source or target elements have an unknown status. |
| Mixed | This enumeration literal shall indicate the ReplicaState of GroupSynchronized. The value indicates the StorageSynchronized relationships of the elements in the group have different ReplicaState values. |
| Partitioned | This enumeration literal shall indicate that the state of replication relationship can not be determined, for example, due to a connection problem. |
| Prepared | This enumeration literal shall indicate that initialization is completed, however, the data flow has not started. |
| Restored | This enumeration literal shall indicate that the source element was restored from the target element. |
| Skewed | This enumeration literal shall indicate that the target has been modified and is no longer synchronized with the source element or the point-in-time view. |
| Split | This enumeration literal shall indicate that the target element was gracefully (or systematically) split from its source element -- consistency shall be guaranteed. |
| Suspended | This enumeration literal shall indicate that the data flow between the source and target elements has stopped. Writes to source element shall be held until the relationship is Resumed. |
| Synchronized | This enumeration literal shall indicate that for Mirror, Snapshot, or Clone replication, the target represents a copy of the source. |
| Unsynchronized | This enumeration literal shall indicate that not all the source element data has been copied to the target element. |

8.9.1.10 ReplicaSyncType:

| 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. |

8.9.1.11 ReplicaType:

| string | Description |
|---------------|---|
| AfterDelta | The replica shall be maintained as delta data from the source. The source shall contain a full and current copy of the data. Overwritten original data shall be contained in replica. |
| BeforeDelta | The source resource shall be maintained as delta data from the replica. The replica (a snap) shall contain a full copy of the source as of the time the replica was created. |

| string | Description |
|---------------|--|
| Continuous | Data for every change to the source shall be recorded allowing a replica representing any point in time of the source data to be produced. |
| Full | Neither the source or the replica may be dependent on data stored in the other. Each shall hold a full copy of the data as of some point in time (possibly current). |

8.9.1.12 ReplicaUpdateMode:

| 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. |

8.9.1.13 RequestedReplicaState:

| string | Description |
|---------------|--|
| Aborted | This enumeration literal shall indicate that the copy operation is aborted with the Abort operation. The Resync Replica operation can be used to restart the copy operation. |
| Broken | This enumeration literal shall indicate that the relationship is non-functional due to errors in the source, the target, the path between the two or space constraints. |
| Failedover | This enumeration literal shall indicate that the reads and writes are sent to the target element. The source element may not be reachable. |
| Fractured | This enumeration literal shall indicate that the Target is split from the source. The target may not be consistent. |
| Inactive | This enumeration literal shall indicate that data flow has stopped, writes to source element shall not be sent to target element. |
| Initialized | This enumeration literal shall indicate that the link to enable replication is established and source/replica elements are associated, but the data flow has not started. |
| Invalid | This enumeration literal shall indicate that the storage server is unable to determine the state of the replication relationship, for example, after the connection is restored; however, either source or target elements have an unknown status. |
| Mixed | This enumeration literal shall indicate the ReplicaState of GroupSynchronized. The value indicates the StorageSynchronized relationships of the elements in the group have different ReplicaState values. |
| Partitioned | This enumeration literal shall indicate that the state of replication relationship can not be determined, for example, due to a connection problem. |
| Prepared | This enumeration literal shall indicate that initialization is completed, however, the data flow has not started. |
| Restored | This enumeration literal shall indicate that the source element was restored from the target element. |
| Skewed | This enumeration literal shall indicate that the target has been modified and is no longer synchronized with the source element or the point-in-time view. |
| Split | This enumeration literal shall indicate that the target element was gracefully (or systematically) split from its source element -- consistency shall be guaranteed. |

| string | Description |
|----------------|--|
| Suspended | This enumeration literal shall indicate that the data flow between the source and target elements has stopped. Writes to source element shall be held until the relationship is Resumed. |
| Synchronized | This enumeration literal shall indicate that for Mirror, Snapshot, or Clone replication, the target represents a copy of the source. |
| Unsynchronized | This enumeration literal shall indicate that not all the source element data has been copied to the target element. |

8.9.1.14 UndiscoveredElement:

| string | Description |
|----------------|---|
| ReplicaElement | This enumeration literal shall indicate that the replica element is undiscovered. |
| SourceElement | This enumeration literal shall indicate that the source element is undiscovered. |

8.9.1.15 WritePolicy:

| 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. |

8.10 FileSystemCollection

This resource shall contain a collection of references to FileSystem resource instances.

| | | |
|-----------------------------------|--------------------------------|--|
| Description | null <i>read-write</i> | |
| Members [{ | array <i>read-only</i> | This property shall contain references to the members of this FileSystem collection. |
| AccessCapabilities [{ }] | array <i>read-write</i> | This property shall be an array containing entries for the supported IO access capabilities. Each entry shall specify a current storage access capability. |

| | | |
|--------------------------------|---|--|
| BlockSizeBytes | number, null (By) <i>read- only</i> | The value of this property shall be the block size of the file system in bytes. |
| Capacity {} | object, null <i>read- write</i> | The value of this property shall be the capacity allocated to the file system in bytes. |
| CapacitySources [{}] | array <i>read- write</i> | 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. |
| CasePreserved | boolean, null <i>read- write</i> | 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, null <i>read- write</i> | 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 <i>read- write</i> | 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. |
| ClusterSizeBytes | number, null (By) <i>read- write</i> | 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 | null <i>read- write</i> | |
| ExportedShares [{}] | array <i>read- only</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. |
| Id | <i>read- write</i> | |

| | | |
|--|--|---|
| Links {} | object <i>read-only</i> | This property shall contain links to other resources that are related to this resource. |
| LowSpaceWarningThresholdPercents [{}] | array <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 <code>CapacitySources</code> entries, $\text{percent} = (\text{SUM}(\text{AllocatedBytes}) - \text{SUM}(\text{ConsumedBytes})) / \text{SUM}(\text{AllocatedBytes})$ |
| MaxFileNameLengthBytes | number, null (By) <i>read-write</i> | If specified, this value shall specify the maximum length of a file name within the file system. |
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| RemainingCapacity {} | object, null <i>read-write</i> | The value of this property shall be the remaining capacity allocated to the file system in bytes. |
| ReplicaInfo {} | object, null <i>read-write</i> | 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. |
| }] | | |
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |

8.11 HostedStorageServices

A Collection of Hosted Storage Service resource instances.

| | | |
|---|--|---|
| Description | null <i>read-write</i> | |
| Members [{ | array <i>read-write</i> | The value of each member entry shall reference a StorageService resource. |
| Actions { | object <i>read-only</i> | The Actions property shall contain the available actions for this resource. |
| Description | null <i>read-write</i> | |
| Drives { | object <i>read-write</i> | A collection that indicates all the drives managed by this storage service. |
| Endpoints { | object, null <i>read-write</i> | The value of each entry in the array shall reference an Endpoint managed by this service. |
| FileSystems { | object <i>read-write</i> | An array of references to FileSystems managed by this storage service. |
| Id | <i>read-write</i> | |
| Identifier | null <i>read-write</i> | The value identifies this resource. The value shall be unique within the managed ecosystem. |
| InitiatorEndpointGroups [{ } | array <i>read-write</i> | The value of each entry in the array shall reference an InitiatorEndpointGroup. |

| | | |
|------------------------------------|---------------------------------|--|
| Links {} | object <i>read-only</i> | Contains links to other resources that are related to this resource. |
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| Redundancy [{}] | array <i>read-only</i> | Redundancy information for the storage subsystem |
| Status | null <i>read-write</i> | |
| StorageGroups [{}] | array <i>read-only</i> | The value of each entry in the array shall reference a StorageGroup. |
| StoragePools {} | object <i>read-write</i> | An array of references to StoragePools. |
| TargetEndpointGroups [{}] | array <i>read-write</i> | The value of each entry in the array shall reference a TargetEndpointGroup. |
| Volumes {} | object <i>read-write</i> | An array of references to Volumes managed by this storage service. |
| }] | | |
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |

8.12 IOConnectivityLoSCapabilities 1.0.0

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

| | | |
|---|---|--|
| Description | null <i>read- write</i> | |
| Id | <i>read- write</i> | |
| Identifier | null <i>read- write</i> | The value identifies this resource. The value shall be unique within the managed ecosystem. |
| MaxSupportedIOPS | number, null <i>read- write</i> | The value shall be the maximum IOPS that a connection can support. |
| Name | <i>read- write</i> | |
| Oem | <i>read- write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| SupportedAccessProtocols [{}] | array <i>read- write</i> | 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*'}). |
| SupportedIOConnectivityLinesOfService [{}] | array <i>read- write</i> | The collection shall contain known and supported IOConnectivityLinesOfService. |

8.13 IOPerformanceLoSCapabilities 1.0.0

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

| | | |
|--|---|--|
| Description | null <i>read- write</i> | |
| IOLimitingIsSupportedBoolean | boolean, null <i>read- write</i> | True implies that the system supports limiting IOPS to exceed $IOPSDensity * VolumeSize$. Otherwise, the system does not enforce a limit. |
| Id | <i>read- write</i> | |
| Identifier | null <i>read- write</i> | The value shall be unique within the managed ecosystem. |
| MaxSamplePeriodSeconds | number, null (s) <i>read- write</i> | The value shall be the maximum sampling period over which average values are calculated. |
| MinSamplePeriodSeconds | number, null (s) <i>read- write</i> | The value shall be the minimum sampling period over which average values are calculated. |
| MinSupportedIoOperationLatencyMicroseconds | number, null (us) <i>read- write</i> | The value shall be the minimum supported average IO latency in microseconds calculated over the SamplePeriod |
| Name | <i>read- write</i> | |
| Oem | <i>read- write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| SupportedIOPerformanceLinesOfService [{}] | array <i>read- write</i> | The value shall be a collection supported IO performance service options. |

| | | |
|------------------------------------|-------------------------------------|---|
| SupportedIOWorkloads [{}] | array <i>read- write</i> | The value shall be a collection of supported workloads. |
|------------------------------------|-------------------------------------|---|

8.14 InitiatorEndpointGroup 1.0.0

A group of initiator endpoints that shall be managed as a unit.

| | | |
|----------------------------|-------------------------------------|--|
| Description | null <i>read- write</i> | |
| Id | <i>read- write</i> | |
| Identifier | null <i>read- write</i> | The value shall be unique within the managed ecosystem. |
| Links { | object <i>read- only</i> | This structure shall contain references to resources that are not contained within this resource. |
| Endpoints [{}] | array <i>read- write</i> | The value of each entry shall reference an Endpoint resource that has an EntityRole value of 'Initiator' or 'Both'. |
| Oem | <i>read- write</i> | 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. |
| } | | |
| Name | <i>read- write</i> | |
| Oem | <i>read- write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |

8.15 StorageGroup 1.0.0

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.

| | | |
|--|--|--|
| AccessState | <p>null</p> <p><i>read-write</i></p> | 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. |
| Actions { | <p>object</p> <p><i>read-only</i></p> | The Actions property shall contain the available actions for this resource. |
| #StorageGroup.v1_o_o.ExposeVolumes {} | <p>object</p> <p><i>read-write</i></p> | Exposes the storage of this group via the target endpoints named in the TargetEndpointGroups to the initiator endpoints named in the InitiatorEndpointGroups. The property VolumesAreExposed shall be set to true when this action is completed. |
| #StorageGroup.v1_o_o.HideVolumes {} | <p>object</p> <p><i>read-write</i></p> | Hide the storage of this group from the initiator endpoints named in the InitiatorEndpointGroups. The property VolumesAreExposed shall be set to false when this action is completed. |
| Oem {} | <p>object</p> <p><i>read-write</i></p> | |
| } | | |
| Description | <p>null</p> <p><i>read-write</i></p> | |
| Id | <p><i>read-write</i></p> | |
| Identifier | <p>null</p> <p><i>read-write</i></p> | The value shall be unique within the managed ecosystem. |
| Links { | <p>object</p> <p><i>read-only</i></p> | 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 |
| ClassOfService {} | object, null <i>read-write</i> | The ClassOfService that all storage in this StorageGroup conforms to. |
| InitiatorEndpointGroups [{}] | array <i>read-write</i> | An array of references to InitiatorEndpointGroup exposed to by this StorageGroup. |
| Oem | <i>read-write</i> | 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. |
| ParentStorageGroups [{}] | array <i>read-only</i> | An array of references to StorageGroups that incorporate this StorageGroup |
| TargetEndpointGroups [{}] | array <i>read-write</i> | An array of references to TargetEndpointGroup used for exposure by this StorageGroup. |
| Volumes {} | object, null <i>read-write</i> | An array of references to Volumes managed by this StorageGroup. |
| } | | |
| MembersAreConsistent | boolean, null <i>read-only</i> | The value of this property shall be set to true if all members are in a consistent state. |
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |

| | | |
|------------------------------|--|---|
| ReplicaInfos [{ | array <i>read-only</i> | This property shall describe the replication relationship between this storage group and a corresponding source and/or target storage group. |
| ConsistencyEnabled | boolean, null <i>read-only</i> | True if consistency is enabled. |
| ConsistencyState | string, null <i>read-write</i> | The ConsistencyState enumeration literal shall indicate the current state of consistency. <i>See Property Details, below, for more information about this property.</i> |
| ConsistencyStatus | string, null <i>read-write</i> | The ConsistencyStatus enumeration literal shall specify the current status of consistency. Consistency may have been disabled or is experiencing an error condition. <i>See Property Details, below, for more information about this property.</i> |
| ConsistencyType | string, null <i>read-write</i> | The ConsistencyType enumeration literal shall indicate the consistency type used by the source and its associated target group. <i>See Property Details, below, for more information about this property.</i> |
| FailedCopyStopsHostIO | boolean, null <i>read-only</i> | If true, the storage array shall stop receiving data to the source element if copying to a remote element fails. |
| PercentSynced | number, null (%) <i>read-only</i> | Specifies the percent of the work completed to reach synchronization. Shall not be instantiated if implementation is not capable of providing this information. If related to a group, then PercentSynced shall be an average of the PercentSynced across all members of the group. |
| Replica | null <i>read-write</i> | The value shall reference the resource that is the source of this replica. |
| ReplicaPriority | string, null <i>read-write</i> | The enumeration literal shall specify the priority of background copy engine I/O to be managed relative to host I/O operations during a sequential background copy operation. <i>See Property Details, below, for more information about this property.</i> |

| | | |
|------------------------------|--|---|
| ReplicaProgressStatus | string, null read- write | The ReplicaProgressStatus enumeration literal shall specify the status of the session with respect to Replication activity. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaReadOnlyAccess | string, null read- write | The enumeration literal shall specify whether the source, the target, or both elements are read only to the host. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaRecoveryMode | string, null read- write | The enumeration literal shall specify whether the copy operation continues after a broken link is restored. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaRole | string, null read- write | The ReplicaRole enumeration literal shall represent the source or target role of this replica as known to the containing resource. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaSkewBytes | number, null (By) read- only | Applies to Adaptive mode and it describes maximum number of bytes the SyncedElement (target) can be out of sync. If the number of out-of-sync bytes exceeds the skew value, ReplicaUpdateMode shall be switched to synchronous. |
| ReplicaState | string, null read- write | The ReplicaState enumeration literal shall specify the state of the relationship with respect to Replication activity. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaSyncType | string, null read- write | The ReplicaSyncType enumeration literal shall describe the intended outcome of the replication. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaType | string, null read- write | The value shall indicate the type of Replica being maintained. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaUpdateMode | string, null read- write | The enumeration literal shall specify whether the target elements will be updated synchronously or asynchronously. <i>See Property Details, below, for more information about this property.</i> |

| | | |
|------------------------------|---|--|
| RequestedReplicaState | string, null <i>read- write</i> | The last requested or desired state for the relationship. The actual state of the relationship shall be represented by ReplicaState. When RequestedState reaches the requested state, this property shall be null. <i>See Property Details, below, for more information about this property.</i> |
| SyncMaintained | boolean, null <i>read- only</i> | If true, Synchronization shall be maintained. |
| UndiscoveredElement | string, null <i>read- write</i> | The enumeration literal shall specify whether the source, the target, or both elements involved in a copy operation are undiscovered. An element is considered undiscovered if its object model is not known to the service performing the copy operation. <i>See Property Details, below, for more information about this property.</i> |
| WhenActivated | string, null (%) <i>read- only</i> | The value shall specify the time of day when the point-in-time copy was taken or when the replication relationship is activated, reactivated, resumed or re-established. This property shall be null if the implementation is not capable of providing this information. |
| WhenDeactivated | string, null (%) <i>read- only</i> | Specifies when the replication relationship is deactivated. Do not instantiate this property if implementation is not capable of providing this information. |
| WhenEstablished | string, null (%) <i>read- only</i> | Specifies when the replication relationship is established. Do not instantiate this property if implementation is not capable of providing this information. |
| WhenSuspended | string, null (%) <i>read- only</i> | Specifies when the replication relationship is suspended. Do not instantiate this property if implementation is not capable of providing this information. |
| WhenSynced | string, null <i>read- only</i> | The value shall specify the time of day when the elements were synchronized. |

| | | |
|--------------------------|---|---|
| WhenSynchronized | string, null (%) <i>read- only</i> | Specifies when the replication relationship is synchronized. Do not instantiate this property if implementation is not capable of providing this information. |
| }] | | |
| Status | null <i>read- write</i> | |
| VolumesAreExposed | boolean, null <i>read- only</i> | The value of this property shall be set to true if a storage volumes are exposed to the initiator endpoints |

8.15.1 Property Details

8.15.1.1 ConsistencyState:

| string | Description |
|--------------|---|
| Consistent | This enumeration literal shall indicate that the source and target shall be consistent. |
| Inconsistent | This enumeration literal shall indicate that the source and target are not required to be consistent. |

8.15.1.2 ConsistencyStatus:

| string | Description |
|------------|---|
| Consistent | This enumeration literal shall indicate that the source and target are consistent. |
| Disabled | This enumeration literal shall indicate that the source and target have consistency disabled. |
| InError | This enumeration literal shall indicate that the source and target are not consistent. |
| InProgress | This enumeration literal shall indicate that the source and target are becoming consistent. |

8.15.1.3 ConsistencyType:

| string | Description |
|------------------------|--|
| SequentiallyConsistent | This enumeration literal shall indicate that the source and target shall be sequentially consistent. |

8.15.1.4 ReplicaPriority:

| string | Description |
|--------|---|
| High | Copy engine I/O shall have a higher priority than host I/O. |
| Low | Copy engine I/O shall have a lower priority than host I/O. |

| string | Description |
|---------------|---|
| Same | Copy engine I/O shall have the same priority as host I/O. |
| Urgent | Regardless of the host I/O requests, the Copy operation shall be performed as soon as possible. |

8.15.1.5 ReplicaProgressStatus:

| string | Description |
|------------------|---|
| Aborting | This enumeration literal shall indicate that replication has an abort in progress. |
| Completed | This enumeration literal shall indicate that the request is completed. Data flow is idle. |
| Detaching | This enumeration literal shall indicate that replication has a detach in progress. |
| Dormant | This enumeration literal shall indicate that the data flow is inactive, suspended or quiesced. |
| FailingBack | This enumeration literal shall indicate that replication is undoing the result of failover. |
| FailingOver | This enumeration literal shall indicate that replication is in the process of switching source and target. |
| Fracturing | This enumeration literal shall indicate that replication has a fracture in progress. |
| Initializing | This enumeration literal shall indicate that replication is in the process of establishing source/replica relationship and the data flow has not started. |
| Mixed | This enumeration literal shall indicate that replication status is mixed across element pairs in a replication group. Generally, the individual statuses need to be examined. |
| Pending | This enumeration literal shall indicate that the flow of data has stopped momentarily due to limited bandwidth or a busy system. |
| Preparing | This enumeration literal shall indicate that replication has preparation in progress. |
| RequiresActivate | This enumeration literal shall indicate that the requested operation has completed, however, the synchronization relationship needs to be activated before further copy operations can be issued. |
| RequiresDetach | This enumeration literal shall indicate that the requested operation has completed, however, the synchronization relationship needs to be detached before further copy operations can be issued. |
| RequiresFracture | This enumeration literal shall indicate that the requested operation has completed, however, the synchronization relationship needs to be fractured before further copy operations can be issued. |
| RequiresResume | This enumeration literal shall indicate that the requested operation has completed, however, the synchronization relationship needs to be resumed before further copy operations can be issued. |
| RequiresResync | This enumeration literal shall indicate that the requested operation has completed, however, the synchronization relationship needs to be resynced before further copy operations can be issued. |
| RequiresSplit | This enumeration literal shall indicate that the requested operation has completed, however, the synchronization relationship needs to be split before further copy operations can be issued. |
| Restoring | This enumeration literal shall indicate that replication has a restore in progress. |
| Resyncing | This enumeration literal shall indicate that replication has resynchronization in progress. |
| Splitting | This enumeration literal shall indicate that replication has a split in progress. |
| Suspending | This enumeration literal shall indicate that replication has a copy operation in the process of being suspended. |
| Synchronizing | This enumeration literal shall indicate that replication has synchronization in progress. |
| Terminating | This enumeration literal shall indicate that the replication relationship is in the process of terminating. |

8.15.1.6 ReplicaReadOnlyAccess:

| string | Description |
|----------------|---|
| Both | Both the source and the target elements shall be read only to the host. |
| ReplicaElement | The replica element shall be read-only to the host. |
| SourceElement | The source element shall be read-only to the host. |

8.15.1.7 ReplicaRecoveryMode:

| string | Description |
|-----------|--|
| Automatic | The copy operation shall resume automatically. |
| Manual | The ReplicaState shall be set to Suspended after the link is restored. It is required to issue the Resume operation to continue. |

8.15.1.8 ReplicaRole:

| string | Description |
|--------|---|
| Source | This enumeration literal shall indicate a source element. |
| Target | This enumeration literal shall indicate target element. |

8.15.1.9 ReplicaState:

| string | Description |
|-------------|--|
| Aborted | This enumeration literal shall indicate that the copy operation is aborted with the Abort operation. The Resync Replica operation can be used to restart the copy operation. |
| Broken | This enumeration literal shall indicate that the relationship is non-functional due to errors in the source, the target, the path between the two or space constraints. |
| Failedover | This enumeration literal shall indicate that the reads and writes are sent to the target element. The source element may not be reachable. |
| Fractured | This enumeration literal shall indicate that the Target is split from the source. The target may not be consistent. |
| Inactive | This enumeration literal shall indicate that data flow has stopped, writes to source element shall not be sent to target element. |
| Initialized | This enumeration literal shall indicate that the link to enable replication is established and source/replica elements are associated, but the data flow has not started. |
| Invalid | This enumeration literal shall indicate that the storage server is unable to determine the state of the replication relationship, for example, after the connection is restored; however, either source or target elements have an unknown status. |
| Mixed | This enumeration literal shall indicate the ReplicaState of GroupSynchronized. The value indicates the StorageSynchronized relationships of the elements in the group have different ReplicaState values. |
| Partitioned | This enumeration literal shall indicate that the state of replication relationship can not be determined, for example, due to a connection problem. |
| Prepared | This enumeration literal shall indicate that initialization is completed, however, the data flow has not started. |
| Restored | This enumeration literal shall indicate that the source element was restored from the target element. |

| string | Description |
|----------------|--|
| Skewed | This enumeration literal shall indicate that the target has been modified and is no longer synchronized with the source element or the point-in-time view. |
| Split | This enumeration literal shall indicate that the target element was gracefully (or systematically) split from its source element -- consistency shall be guaranteed. |
| Suspended | This enumeration literal shall indicate that the data flow between the source and target elements has stopped. Writes to source element shall be held until the relationship is Resumed. |
| Synchronized | This enumeration literal shall indicate that for Mirror, Snapshot, or Clone replication, the target represents a copy of the source. |
| Unsynchronized | This enumeration literal shall indicate that not all the source element data has been copied to the target element. |

8.15.1.10 ReplicaSyncType:

| 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. |

8.15.1.11 ReplicaType:

| string | Description |
|-------------|---|
| AfterDelta | The replica shall be maintained as delta data from the source. The source shall contain a full and current copy of the data. Overwritten original data shall be contained in replica. |
| BeforeDelta | The source resource shall be maintained as delta data from the replica. The replica (a snap) shall contain a full copy of the source as of the time the replica was created. |
| Continuous | Data for every change to the source shall be recorded allowing a replica representing any point in time of the source data to be produced. |
| Full | Neither the source or the replica may be dependent on data stored in the other. Each shall hold a full copy of the data as of some point in time (possibly current). |

8.15.1.12 ReplicaUpdateMode:

| 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. |

8.15.1.13 RequestedReplicaState:

| string | Description |
|----------------|--|
| Aborted | This enumeration literal shall indicate that the copy operation is aborted with the Abort operation. The Resync Replica operation can be used to restart the copy operation. |
| Broken | This enumeration literal shall indicate that the relationship is non-functional due to errors in the source, the target, the path between the two or space constraints. |
| Failedover | This enumeration literal shall indicate that the reads and writes are sent to the target element. The source element may not be reachable. |
| Fractured | This enumeration literal shall indicate that the Target is split from the source. The target may not be consistent. |
| Inactive | This enumeration literal shall indicate that data flow has stopped, writes to source element shall not be sent to target element. |
| Initialized | This enumeration literal shall indicate that the link to enable replication is established and source/replica elements are associated, but the data flow has not started. |
| Invalid | This enumeration literal shall indicate that the storage server is unable to determine the state of the replication relationship, for example, after the connection is restored; however, either source or target elements have an unknown status. |
| Mixed | This enumeration literal shall indicate the ReplicaState of GroupSynchronized. The value indicates the StorageSynchronized relationships of the elements in the group have different ReplicaState values. |
| Partitioned | This enumeration literal shall indicate that the state of replication relationship can not be determined, for example, due to a connection problem. |
| Prepared | This enumeration literal shall indicate that initialization is completed, however, the data flow has not started. |
| Restored | This enumeration literal shall indicate that the source element was restored from the target element. |
| Skewed | This enumeration literal shall indicate that the target has been modified and is no longer synchronized with the source element or the point-in-time view. |
| Split | This enumeration literal shall indicate that the target element was gracefully (or systematically) split from its source element -- consistency shall be guaranteed. |
| Suspended | This enumeration literal shall indicate that the data flow between the source and target elements has stopped. Writes to source element shall be held until the relationship is Resumed. |
| Synchronized | This enumeration literal shall indicate that for Mirror, Snapshot, or Clone replication, the target represents a copy of the source. |
| Unsynchronized | This enumeration literal shall indicate that not all the source element data has been copied to the target element. |

8.15.1.14 UndiscoveredElement:

| string | Description |
|----------------|---|
| ReplicaElement | This enumeration literal shall indicate that the replica element is undiscovered. |
| SourceElement | This enumeration literal shall indicate that the source element is undiscovered. |

8.16 StoragePool 1.0.0

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.

| | | |
|---------------------------|---|---|
| AllocatedPools { | object, null <i>read- write</i> | The value of this property shall contain a reference to the collection of storage pools allocated from this storage pool. |
| Description | null <i>read- write</i> | |
| Members [{}] | array <i>read- only</i> | The value of each member entry shall reference a StoragePool resource. |
| Name | <i>read- write</i> | |
| Oem | <i>read- write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| } | | |
| AllocatedVolumes { | object, null <i>read- write</i> | The value of this property shall contain a reference to the collection of volumes allocated from this storage pool. |
| Description | null <i>read- write</i> | |
| Members [{}] | array <i>read- write</i> | The value of each member entry shall reference a Volume resource. |
| Name | <i>read- write</i> | |
| Oem | <i>read- write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| } | | |

| | | |
|---------------------------------|--|---|
| BlockSizeBytes | number, null (By) <i>read- only</i> | 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. |
| Capacity { | object, null <i>read- write</i> | The value of this property shall provide an information about the actual utilization of the capacity within this storage pool. |
| Data { | object, null <i>read- write</i> | The value shall be capacity information relating to provisioned user data. |
| IsThinProvisioned | boolean, null <i>read- write</i> | If false, the capacity shall be fully allocated. |
| Metadata { | object, null <i>read- write</i> | The value shall be capacity information relating to provisioned system (non-user accessible) data. |
| Snapshot { | object, null <i>read- write</i> | The value shall be capacity information relating to provisioned snapshot or backup data. |
| } | | |
| CapacitySources [{ | array <i>read- only</i> | Fully or partially consumed storage from a source resource. Each entry shall provide capacity allocation data from a named source resource. |
| ProvidedCapacity { | object, null <i>read- write</i> | The value shall be the amount of space that has been provided from the ProvidingDrives, ProvidingVolumes or ProvidingPools. |
| ProvidedClassOfService { | object, null <i>read- write</i> | The value shall reference the provided ClassOfService from the ProvidingDrives, ProvidingVolumes or ProvidingPools. |

| | | |
|--|-------------------------------------|---|
| ProvidingDrives [{}] | array <i>read- write</i> | The value shall be a reference to a contributing drive or drives. |
| ProvidingPools [{}] | array <i>read- write</i> | The value shall be a reference to a contributing storage pool or storage pools. |
| ProvidingVolumes [{}] | array <i>read- write</i> | The value shall be a reference to a contributing volume or volumes. |
| }] | | |
| Description | null <i>read- write</i> | |
| Id | <i>read- write</i> | |
| Identifier | null <i>read- write</i> | The value identifies this resource. The value shall be unique within the managed ecosystem. |
| Links { | object <i>read- only</i> | This structure shall contain references to resources that are not contained within this resource. |
| ClassesOfService [{}] | array <i>read- write</i> | 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. |
| Oem | <i>read- write</i> | 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. |
| } | | |
| LowSpaceWarningThresholdPercents [{}] | array <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). |

| | | |
|---------------|---------------------------|--|
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| Status | null <i>read-write</i> | |

8.17 StoragePoolCollection

This collection shall contain references to all StoragePool resource instances sharing the same parent resource.

| | | |
|---------------------------|---|---|
| Description | null <i>read-write</i> | |
| Members [{ | array <i>read-only</i> | The value of each member entry shall reference a StoragePool resource. |
| AllocatedPools { | object, null <i>read-write</i> | The value of this property shall contain a reference to the collection of storage pools allocated from this storage pool. |
| AllocatedVolumes { | object, null <i>read-write</i> | The value of this property shall contain a reference to the collection of volumes allocated from this storage pool. |
| BlockSizeBytes | number, null (By) <i>read-only</i> | 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. |

| | | |
|--|---|--|
| Capacity {} | object, null <i>read- write</i> | The value of this property shall provide an information about the actual utilization of the capacity within this storage pool. |
| CapacitySources [{}] | array <i>read- only</i> | Fully or partially consumed storage from a source resource. Each entry shall provide capacity allocation data from a named source resource. |
| Description | null <i>read- write</i> | |
| Id | <i>read- write</i> | |
| Identifier | null <i>read- write</i> | The value identifies this resource. The value shall be unique within the managed ecosystem. |
| Links {} | object <i>read- only</i> | This structure shall contain references to resources that are not contained within this resource. |
| LowSpaceWarningThresholdPercents [{}] | array <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 = $(\text{SUM}(\text{AllocatedBytes}) - \text{SUM}(\text{ConsumedBytes})) / \text{SUM}(\text{AllocatedBytes})$. |
| Name | <i>read- write</i> | |
| Oem | <i>read- write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| Status | null <i>read- write</i> | |
| }] | | |

| | | |
|-------------|------------------------|--|
| Name | <i>read- write</i> | |
| Oem | <i>read- write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |

8.18 StorageService 1.0.0

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.

| | | |
|--|----------------------------------|---|
| Actions { | object <i>read- only</i> | The Actions property shall contain the available actions for this resource. |
| #StorageService.SetEncryptionKey {} | object <i>read- write</i> | This defines the name of the custom action supported on this resource. |
| Oem {} | object <i>read- write</i> | |
| } | | |
| Description | null <i>read- write</i> | |
| Drives { | object <i>read- write</i> | A collection that indicates all the drives managed by this storage service. |
| Description | null <i>read- write</i> | |
| Members [{}] | array <i>read- only</i> | The value of each entry of this property shall reference a Drive resource. |

| | | |
|-----------------------|--|---|
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| } | | |
| Endpoints { | object, null <i>read-write</i> | The value of each entry in the array shall reference an Endpoint managed by this service. |
| Description | null <i>read-write</i> | |
| Members [{}] | array <i>read-only</i> | The value of each member entry shall reference an Endpoint resource. |
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| } | | |
| FileSystems { | object <i>read-write</i> | An array of references to FileSystems managed by this storage service. |
| Description | null <i>read-write</i> | |
| Members [{}] | array <i>read-only</i> | This property shall contain references to the members of this FileSystem collection. |

| | | |
|------------------------------------|----------------------------|---|
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| } | | |
| Id | <i>read-write</i> | |
| Identifier | null <i>read-write</i> | The value identifies this resource. The value shall be unique within the managed ecosystem. |
| InitiatorEndpointGroups [{ | array <i>read-write</i> | The value of each entry in the array shall reference an InitiatorEndpointGroup. |
| Description | null <i>read-write</i> | |
| Id | <i>read-write</i> | |
| Identifier | null <i>read-write</i> | The value shall be unique within the managed ecosystem. |
| Links { } | object <i>read-only</i> | This structure shall contain references to resources that are not contained within this resource. |
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| }] | | |

| | | |
|---|--|--|
| Links { | object <i>read-only</i> | Contains links to other resources that are related to this resource. |
| ClassesOfService [{}] | array <i>read-write</i> | The value of each entry in the array shall reference a ClassOfService supported by this service. |
| DataProtectionLoSCapabilities {} | object, null <i>read-write</i> | The value shall reference the data protection capabilities of this service. |
| DataSecurityLoSCapabilities {} | object, null <i>read-write</i> | The value shall reference the data security capabilities of this service. |
| DataStorageLoSCapabilities {} | object, null <i>read-write</i> | The value shall reference the data storage capabilities of this service. |
| HostingSystem | null <i>read-write</i> | The value shall reference the ComputerSystem that hosts this service. |
| IOConnectivityLoSCapabilities {} | object, null <i>read-write</i> | The value shall reference the IO connectivity capabilities of this service. |
| IOPerformanceLoSCapabilities {} | object, null <i>read-write</i> | The value shall reference the IO performance capabilities of this service. |
| Oem | <i>read-write</i> | 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. |
| } | | |
| Name | <i>read-write</i> | |

| | | |
|-----------------------------|--------------------------------------|--|
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| Redundancy [{}] | array <i>read-only</i> | Redundancy information for the storage subsystem |
| Status | null <i>read-write</i> | |
| StorageGroups [{ | array <i>read-only</i> | The value of each entry in the array shall reference a StorageGroup. |
| AccessState | null <i>read-write</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. |
| Actions { } | object <i>read-only</i> | The Actions property shall contain the available actions for this resource. |
| Description | null <i>read-write</i> | |
| Id | <i>read-write</i> | |
| Identifier | null <i>read-write</i> | The value shall be unique within the managed ecosystem. |
| Links { } | object <i>read-only</i> | This structure shall contain references to resources that are not contained within this resource. |
| MembersAreConsistent | boolean, null <i>read-only</i> | The value of this property shall be set to true if all members are in a consistent state. |

| | | |
|----------------------------|--------------------------------------|--|
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| ReplicaInfos [{}] | array <i>read-only</i> | This property shall describe the replication relationship between this storage group and a corresponding source and/or target storage group. |
| Status | null <i>read-write</i> | |
| VolumesAreExposed | boolean, null <i>read-only</i> | The value of this property shall be set to true if a storage volumes are exposed to the initiator endpoints |
| }] | | |
| StoragePools { | object <i>read-write</i> | An array of references to StoragePools. |
| Description | null <i>read-write</i> | |
| Members [{}] | array <i>read-only</i> | The value of each member entry shall reference a StoragePool resource. |
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| } | | |

| | | |
|--------------------------------------|--|--|
| TargetEndpointGroups [{ | array <i>read- write</i> | The value of each entry in the array shall reference a TargetEndpointGroup. |
| AccessState | null <i>read- write</i> | Access to all associated resources through all aggregated endpoints shall share this access state. |
| Description | null <i>read- write</i> | |
| Id | <i>read- write</i> | |
| Identifier | null <i>read- write</i> | The value shall be unique within the managed ecosystem. |
| Links { } | object <i>read- only</i> | This structure shall contain references to resources that are not contained within this resource. |
| Name | <i>read- write</i> | |
| Oem | <i>read- write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| Preferred | boolean, null <i>read- write</i> | A value of True in this property shall indicate that access to the associated resource through the endpoints in this target endpoint group is preferred over access through other endpoints. |
| TargetEndpointGroupIdentifier | number, null <i>read- write</i> | If SCSI, this 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. |
| }] | | |

| | | |
|-----------------------|---------------------------------|--|
| Volumes { | object <i>read-write</i> | An array of references to Volumes managed by this storage service. |
| Description | null <i>read-write</i> | |
| Members [{}] | array <i>read-write</i> | The value of each member entry shall reference a Volume resource. |
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| } | | |

8.19 StorageServiceCollection

An instance of this resource shall reference the set of StorageService resources known in the scope of its use.

| | | |
|--------------------|--------------------------------|---|
| Description | null <i>read-write</i> | |
| Members [{ | array <i>read-only</i> | The value of each member entry shall reference a StorageService resource. |
| Actions {} | object <i>read-only</i> | The Actions property shall contain the available actions for this resource. |
| Description | null <i>read-write</i> | |

| | | |
|--|--|---|
| Drives {} | object <i>read-write</i> | A collection that indicates all the drives managed by this storage service. |
| Endpoints {} | object, null <i>read-write</i> | The value of each entry in the array shall reference an Endpoint managed by this service. |
| FileSystems {} | object <i>read-write</i> | An array of references to FileSystems managed by this storage service. |
| Id | <i>read-write</i> | |
| Identifier | null <i>read-write</i> | The value identifies this resource. The value shall be unique within the managed ecosystem. |
| InitiatorEndpointGroups [{}] | array <i>read-write</i> | The value of each entry in the array shall reference an InitiatorEndpointGroup. |
| Links {} | object <i>read-only</i> | Contains links to other resources that are related to this resource. |
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| Redundancy [{}] | array <i>read-only</i> | Redundancy information for the storage subsystem |
| Status | null <i>read-write</i> | |

| | | |
|------------------------------------|---------------------------------|--|
| StorageGroups [{}] | array <i>read-only</i> | The value of each entry in the array shall reference a StorageGroup. |
| StoragePools {} | object <i>read-write</i> | An array of references to StoragePools. |
| TargetEndpointGroups [{}] | array <i>read-write</i> | The value of each entry in the array shall reference a TargetEndpointGroup. |
| Volumes {} | object <i>read-write</i> | An array of references to Volumes managed by this storage service. |
| }] | | |
| Name | <i>read-write</i> | |
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |

8.20 StorageSystemCollection

An instance of this resource shall reference the set of ComputerSystem resources known in the scope of its use and and that has a HostingRoles entry with a value of 'StorageServer'.

| | | |
|-----------------------|-------------------------------|--|
| Description | null <i>read-write</i> | |
| 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'. |
| Name | <i>read-write</i> | |

| | | |
|------------|-------------------|--|
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
|------------|-------------------|--|

8.21 TargetEndpointGroup 1.0.0

A group of target endpoints that shall be managed as a unit.

| | | |
|-------------------------|--------------------------------|--|
| AccessState | null <i>read-write</i> | Access to all associated resources through all aggregated endpoints shall share this access state. |
| Description | null <i>read-write</i> | |
| Id | <i>read-write</i> | |
| Identifier | null <i>read-write</i> | The value shall be unique within the managed ecosystem. |
| Links { | object <i>read-only</i> | This structure shall contain references to resources that are not contained within this resource. |
| Endpoints [{}] | array <i>read-write</i> | The value of each entry shall reference an Endpoint resource that has an EntityRole value of 'Target' or 'Both'. |
| Oem | <i>read-write</i> | 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. |
| } | | |
| Name | <i>read-write</i> | |

| | | |
|--------------------------------------|---|--|
| Oem | <i>read-write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| Preferred | boolean, null <i>read-write</i> | A value of True in this property shall indicate that access to the associated resource through the endpoints in this target endpoint group is preferred over access through other endpoints. |
| TargetEndpointGroupIdentifier | number, null <i>read-write</i> | If SCSI, this 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. |

8.22 Volume 1.1.0

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

| | | |
|--|--|---|
| AccessCapabilities (v1.1+) [{}] | array <i>read-write</i> | Each entry shall specify a current storage access capability. |
| Actions { | object <i>read-only</i> | The Actions property shall contain the available actions for this resource. |
| #Volume.Initialize {} | object <i>read-write</i> | This defines the name of the custom action supported on this resource. |
| Oem {} | object <i>read-write</i> | |
| } | | |
| AllocatedPools (v1.1+) [{ | array <i>read-only</i> | The value of this property shall contain references to all storage pools allocated from this volume. |
| AllocatedPools {} | object, null <i>read-write</i> | The value of this property shall contain a reference to the collection of storage pools allocated from this storage pool. |

| | | |
|--|--|---|
| AllocatedVolumes {} | object, null <i>read- write</i> | The value of this property shall contain a reference to the collection of volumes allocated from this storage pool. |
| BlockSizeBytes | number, null (By) <i>read- only</i> | 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. |
| Capacity {} | object, null <i>read- write</i> | The value of this property shall provide an information about the actual utilization of the capacity within this storage pool. |
| CapacitySources [{}] | array <i>read- only</i> | Fully or partially consumed storage from a source resource. Each entry shall provide capacity allocation data from a named source resource. |
| Description | null <i>read- write</i> | |
| Id | <i>read- write</i> | |
| Identifier | null <i>read- write</i> | The value identifies this resource. The value shall be unique within the managed ecosystem. |
| Links {} | object <i>read- only</i> | This structure shall contain references to resources that are not contained within this resource. |
| LowSpaceWarningThresholdPercents [{}] | array <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). |
| Name | <i>read- write</i> | |

| | | |
|---------------------------|--|--|
| Oem | <i>read- write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| Status | null <i>read- write</i> | |
| }] | | |
| BlockSizeBytes | number, null (By) <i>read- only</i> | This property shall contain size of the smallest addressable unit of the associated volume. |
| Capacity (v1.1+) { | object, null <i>read- write</i> | Information about the utilization of capacity allocated to this storage volume. |
| Data { | object, null <i>read- write</i> | The value shall be capacity information relating to provisioned user data. |
| IsThinProvisioned | boolean, null <i>read- write</i> | If false, the capacity shall be fully allocated. |
| Metadata { | object, null <i>read- write</i> | The value shall be capacity information relating to provisioned system (non-user accessible) data. |
| Snapshot { | object, null <i>read- write</i> | The value shall be capacity information relating to provisioned snapshot or backup data. |
| } | | |

| | | |
|------------------------------------|--|---|
| CapacityBytes | number, null (By) <i>read- only</i> | This property shall contain the size in bytes of the associated volume. |
| CapacitySources (v1.1+) [{ | 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. |
| ProvidedCapacity { } | object, null <i>read- write</i> | The value shall be the amount of space that has been provided from the ProvidingDrives, ProvidingVolumes or ProvidingPools. |
| ProvidedClassOfService { } | object, null <i>read- write</i> | The value shall reference the provided ClassOfService from the ProvidingDrives, ProvidingVolumes or ProvidingPools. |
| ProvidingDrives [{ }] | array <i>read- write</i> | The value shall be a reference to a contributing drive or drives. |
| ProvidingPools [{ }] | array <i>read- write</i> | The value shall be a reference to a contributing storage pool or storage pools. |
| ProvidingVolumes [{ }] | array <i>read- write</i> | The value shall be a reference to a contributing volume or volumes. |
| }] | | |
| Description | null <i>read- write</i> | |
| Encrypted | boolean, null <i>read- write</i> | This property shall contain a boolean indicator if the Volume is currently utilizing encryption or not. |
| EncryptionTypes [{ }] | array <i>read- write</i> | This property shall contain the types of encryption used by this Volume. |

| | | |
|--|---|---|
| Id | <i>read-write</i> | |
| Identifiers [{}] | array <i>read-only</i> | This property shall contain a list of all known durable names for the associated volume. |
| Links { | object <i>read-only</i> | 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 { | object, null <i>read-write</i> | This property shall contain a reference to the ClassOfService that this storage volume conforms to. |
| 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. |
| Oem | <i>read-write</i> | 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. |
| } | | |
| LowSpaceWarningThresholdPercents (v1.1+) [{}] | array <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: $\text{Across all CapacitySources entries, percent} = \frac{\text{SUM(AllocatedBytes)} - \text{SUM(ConsumedBytes)}}{\text{SUM(AllocatedBytes)}}$ |
| Manufacturer (v1.1+) | string, null <i>read-only</i> | This property shall contain a value that represents the manufacturer or implementer of the storage volume. |
| MaxBlockSizeBytes (v1.1+) | number, null (By) <i>read-only</i> | This property shall contain size of the largest addressable unit of this storage volume. |

| | | |
|--|--|--|
| Model (<i>v1.1+</i>) | string, null <i>read- only</i> | The value is assigned by the manufacturer and shall represents a specific storage volume implementation. |
| Name | <i>read- write</i> | |
| Oem | <i>read- write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| Operations [{ | array <i>read- only</i> | This property shall contain a list of all currently running on the Volume. |
| AssociatedTask | <i>read- only</i> | A reference to the task associated with the operation if any. |
| OperationName | string, null <i>read- only</i> | The name of the operation. |
| PercentageComplete | number, null <i>read- only</i> | The percentage of the operation that has been completed. |
| }] | | |
| OptimumIOSizeBytes | number, null (By) <i>read- only</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. |
| ReplicaInfos (<i>v1.1+</i>) [{ | array <i>read- only</i> | This property shall describe the replica relationship between this storage volume and a corresponding source and/or target volume. |

| | | |
|------------------------------|---|---|
| ConsistencyEnabled | boolean, null <i>read- only</i> | True if consistency is enabled. |
| ConsistencyState | string, null <i>read- write</i> | The ConsistencyState enumeration literal shall indicate the current state of consistency. <i>See Property Details, below, for more information about this property.</i> |
| ConsistencyStatus | string, null <i>read- write</i> | The ConsistencyStatus enumeration literal shall specify the current status of consistency. Consistency may have been disabled or is experiencing an error condition. <i>See Property Details, below, for more information about this property.</i> |
| ConsistencyType | string, null <i>read- write</i> | The ConsistencyType enumeration literal shall indicate the consistency type used by the source and its associated target group. <i>See Property Details, below, for more information about this property.</i> |
| FailedCopyStopsHostIO | boolean, null <i>read- only</i> | If true, the storage array shall stop receiving data to the source element if copying to a remote element fails. |
| PercentSynced | number, null (%) <i>read- only</i> | Specifies the percent of the work completed to reach synchronization. Shall not be instantiated if implementation is not capable of providing this information. If related to a group, then PercentSynced shall be an average of the PercentSynced across all members of the group. |
| Replica | null <i>read- write</i> | The value shall reference the resource that is the source of this replica. |
| ReplicaPriority | string, null <i>read- write</i> | The enumeration literal shall specify the priority of background copy engine I/O to be managed relative to host I/O operations during a sequential background copy operation. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaProgressStatus | string, null <i>read- write</i> | The ReplicaProgressStatus enumeration literal shall specify the status of the session with respect to Replication activity. <i>See Property Details, below, for more information about this property.</i> |

| | | |
|------------------------------|--|--|
| ReplicaReadOnlyAccess | string, null read- write | The enumeration literal shall specify whether the source, the target, or both elements are read only to the host. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaRecoveryMode | string, null read- write | The enumeration literal shall specify whether the copy operation continues after a broken link is restored. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaRole | string, null read- write | The ReplicaRole enumeration literal shall represent the source or target role of this replica as known to the containing resource. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaSkewBytes | number, null (By) read- only | Applies to Adaptive mode and it describes maximum number of bytes the SyncedElement (target) can be out of sync. If the number of out-of-sync bytes exceeds the skew value, ReplicaUpdateMode shall be switched to synchronous. |
| ReplicaState | string, null read- write | The ReplicaState enumeration literal shall specify the state of the relationship with respect to Replication activity. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaSyncType | string, null read- write | The ReplicaSyncType enumeration literal shall describe the intended outcome of the replication. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaType | string, null read- write | The value shall indicate the type of Replica being maintained. <i>See Property Details, below, for more information about this property.</i> |
| ReplicaUpdateMode | string, null read- write | The enumeration literal shall specify whether the target elements will be updated synchronously or asynchronously. <i>See Property Details, below, for more information about this property.</i> |
| RequestedReplicaState | string, null read- write | The last requested or desired state for the relationship. The actual state of the relationship shall be represented by ReplicaState. When RequestedState reaches the requested state, this property shall be null. <i>See Property Details, below, for more information about this property.</i> |

| | | |
|----------------------------|--|--|
| SyncMaintained | boolean, null <i>read-only</i> | If true, Synchronization shall be maintained. |
| UndiscoveredElement | string, null <i>read-write</i> | The enumeration literal shall specify whether the source, the target, or both elements involved in a copy operation are undiscovered. An element is considered undiscovered if its object model is not known to the service performing the copy operation. <i>See Property Details, below, for more information about this property.</i> |
| WhenActivated | string, null (%) <i>read-only</i> | The value shall specify the time of day when the point-in-time copy was taken or when the replication relationship is activated, reactivated, resumed or re-established. This property shall be null if the implementation is not capable of providing this information. |
| WhenDeactivated | string, null (%) <i>read-only</i> | Specifies when the replication relationship is deactivated. Do not instantiate this property if implementation is not capable of providing this information. |
| WhenEstablished | string, null (%) <i>read-only</i> | Specifies when the replication relationship is established. Do not instantiate this property if implementation is not capable of providing this information. |
| WhenSuspended | string, null (%) <i>read-only</i> | Specifies when the replication relationship is suspended. Do not instantiate this property if implementation is not capable of providing this information. |
| WhenSynced | string, null <i>read-only</i> | The value shall specify the time of day when the elements were synchronized. |
| WhenSynchronized | string, null (%) <i>read-only</i> | Specifies when the replication relationship is synchronized. Do not instantiate this property if implementation is not capable of providing this information. |
| }] | | |

| | | |
|--|---|--|
| Status | <i>read- write</i> | |
| StorageGroups (<i>v1.1+</i>) [{} | array <i>read- only</i> | The value of this property shall contain references to all storage groups that include this volume. |
| AccessState | null <i>read- write</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. |
| Actions {} | object <i>read- only</i> | The Actions property shall contain the available actions for this resource. |
| Description | null <i>read- write</i> | |
| Id | <i>read- write</i> | |
| Identifier | null <i>read- write</i> | The value shall be unique within the managed ecosystem. |
| Links {} | object <i>read- only</i> | This structure shall contain references to resources that are not contained within this resource. |
| MembersAreConsistent | boolean, null <i>read- only</i> | The value of this property shall be set to true if all members are in a consistent state. |
| Name | <i>read- write</i> | |
| Oem | <i>read- write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |

| | | |
|----------------------------|--|--|
| ReplicaInfos [{}] | array <i>read-only</i> | This property shall describe the replication relationship between this storage group and a corresponding source and/or target storage group. |
| Status | null <i>read-write</i> | |
| VolumesAreExposed | boolean, null <i>read-only</i> | The value of this property shall be set to true if a storage volumes are exposed to the initiator endpoints |
| }] | | |
| VolumeType | string, null <i>read-write</i> | This property shall contain the type of the associated Volume. <i>See Property Details, below, for more information about this property.</i> |

8.22.1 Property Details

8.22.1.1 ConsistencyState:

| string | Description |
|--------------|---|
| Consistent | This enumeration literal shall indicate that the source and target shall be consistent. |
| Inconsistent | This enumeration literal shall indicate that the source and target are not required to be consistent. |

8.22.1.2 ConsistencyStatus:

| string | Description |
|------------|---|
| Consistent | This enumeration literal shall indicate that the source and target are consistent. |
| Disabled | This enumeration literal shall indicate that the source and target have consistency disabled. |
| InError | This enumeration literal shall indicate that the source and target are not consistent. |
| InProgress | This enumeration literal shall indicate that the source and target are becoming consistent. |

8.22.1.3 ConsistencyType:

| string | Description |
|------------------------|--|
| SequentiallyConsistent | This enumeration literal shall indicate that the source and target shall be sequentially consistent. |

8.22.1.4 ReplicaPriority:

| string | Description |
|---------------|---|
| High | Copy engine I/O shall have a higher priority than host I/O. |
| Low | Copy engine I/O shall have a lower priority than host I/O. |
| Same | Copy engine I/O shall have the same priority as host I/O. |
| Urgent | Regardless of the host I/O requests, the Copy operation shall be performed as soon as possible. |

8.22.1.5 ReplicaProgressStatus:

| string | Description |
|------------------|---|
| Aborting | This enumeration literal shall indicate that replication has an abort in progress. |
| Completed | This enumeration literal shall indicate that the request is completed. Data flow is idle. |
| Detaching | This enumeration literal shall indicate that replication has a detach in progress. |
| Dormant | This enumeration literal shall indicate that the data flow is inactive, suspended or quiesced. |
| FailingBack | This enumeration literal shall indicate that replication is undoing the result of failover. |
| FailingOver | This enumeration literal shall indicate that replication is in the process of switching source and target. |
| Fracturing | This enumeration literal shall indicate that replication has a fracture in progress. |
| Initializing | This enumeration literal shall indicate that replication is in the process of establishing source/replica relationship and the data flow has not started. |
| Mixed | This enumeration literal shall indicate that replication status is mixed across element pairs in a replication group. Generally, the individual statuses need to be examined. |
| Pending | This enumeration literal shall indicate that the flow of data has stopped momentarily due to limited bandwidth or a busy system. |
| Preparing | This enumeration literal shall indicate that replication has preparation in progress. |
| RequiresActivate | This enumeration literal shall indicate that the requested operation has completed, however, the synchronization relationship needs to be activated before further copy operations can be issued. |
| RequiresDetach | This enumeration literal shall indicate that the requested operation has completed, however, the synchronization relationship needs to be detached before further copy operations can be issued. |
| RequiresFracture | This enumeration literal shall indicate that the requested operation has completed, however, the synchronization relationship needs to be fractured before further copy operations can be issued. |
| RequiresResume | This enumeration literal shall indicate that the requested operation has completed, however, the synchronization relationship needs to be resumed before further copy operations can be issued. |
| RequiresResync | This enumeration literal shall indicate that the requested operation has completed, however, the synchronization relationship needs to be resynced before further copy operations can be issued. |
| RequiresSplit | This enumeration literal shall indicate that the requested operation has completed, however, the synchronization relationship needs to be split before further copy operations can be issued. |
| Restoring | This enumeration literal shall indicate that replication has a restore in progress. |
| Resyncing | This enumeration literal shall indicate that replication has resynchronization in progress. |
| Splitting | This enumeration literal shall indicate that replication has a split in progress. |
| Suspending | This enumeration literal shall indicate that replication has a copy operation in the process of being suspended. |
| Synchronizing | This enumeration literal shall indicate that replication has synchronization in progress. |
| Terminating | This enumeration literal shall indicate that the replication relationship is in the process of terminating. |

8.22.1.6 ReplicaReadOnlyAccess:

| string | Description |
|----------------|---|
| Both | Both the source and the target elements shall be read only to the host. |
| ReplicaElement | The replica element shall be read-only to the host. |
| SourceElement | The source element shall be read-only to the host. |

8.22.1.7 ReplicaRecoveryMode:

| string | Description |
|-----------|--|
| Automatic | The copy operation shall resume automatically. |
| Manual | The ReplicaState shall be set to Suspended after the link is restored. It is required to issue the Resume operation to continue. |

8.22.1.8 ReplicaRole:

| string | Description |
|--------|---|
| Source | This enumeration literal shall indicate a source element. |
| Target | This enumeration literal shall indicate target element. |

8.22.1.9 ReplicaState:

| string | Description |
|-------------|--|
| Aborted | This enumeration literal shall indicate that the copy operation is aborted with the Abort operation. The Resync Replica operation can be used to restart the copy operation. |
| Broken | This enumeration literal shall indicate that the relationship is non-functional due to errors in the source, the target, the path between the two or space constraints. |
| Failedover | This enumeration literal shall indicate that the reads and writes are sent to the target element. The source element may not be reachable. |
| Fractured | This enumeration literal shall indicate that the Target is split from the source. The target may not be consistent. |
| Inactive | This enumeration literal shall indicate that data flow has stopped, writes to source element shall not be sent to target element. |
| Initialized | This enumeration literal shall indicate that the link to enable replication is established and source/replica elements are associated, but the data flow has not started. |
| Invalid | This enumeration literal shall indicate that the storage server is unable to determine the state of the replication relationship, for example, after the connection is restored; however, either source or target elements have an unknown status. |
| Mixed | This enumeration literal shall indicate the ReplicaState of GroupSynchronized. The value indicates the StorageSynchronized relationships of the elements in the group have different ReplicaState values. |
| Partitioned | This enumeration literal shall indicate that the state of replication relationship can not be determined, for example, due to a connection problem. |
| Prepared | This enumeration literal shall indicate that initialization is completed, however, the data flow has not started. |

| string | Description |
|----------------|--|
| Restored | This enumeration literal shall indicate that the source element was restored from the target element. |
| Skewed | This enumeration literal shall indicate that the target has been modified and is no longer synchronized with the source element or the point-in-time view. |
| Split | This enumeration literal shall indicate that the target element was gracefully (or systematically) split from its source element -- consistency shall be guaranteed. |
| Suspended | This enumeration literal shall indicate that the data flow between the source and target elements has stopped. Writes to source element shall be held until the relationship is Resumed. |
| Synchronized | This enumeration literal shall indicate that for Mirror, Snapshot, or Clone replication, the target represents a copy of the source. |
| Unsynchronized | This enumeration literal shall indicate that not all the source element data has been copied to the target element. |

8.22.1.10 ReplicaSyncType:

| 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. |

8.22.1.11 ReplicaType:

| string | Description |
|---------------|---|
| AfterDelta | The replica shall be maintained as delta data from the source. The source shall contain a full and current copy of the data. Overwritten original data shall be contained in replica. |
| BeforeDelta | The source resource shall be maintained as delta data from the replica. The replica (a snap) shall contain a full copy of the source as of the time the replica was created. |
| Continuous | Data for every change to the source shall be recorded allowing a replica representing any point in time of the source data to be produced. |
| Full | Neither the source or the replica may be dependent on data stored in the other. Each shall hold a full copy of the data as of some point in time (possibly current). |

8.22.1.12 ReplicaUpdateMode:

| 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. |

8.22.1.13 RequestedReplicaState:

| string | Description |
|----------------|--|
| Aborted | This enumeration literal shall indicate that the copy operation is aborted with the Abort operation. The Resync Replica operation can be used to restart the copy operation. |
| Broken | This enumeration literal shall indicate that the relationship is non-functional due to errors in the source, the target, the path between the two or space constraints. |
| Failedover | This enumeration literal shall indicate that the reads and writes are sent to the target element. The source element may not be reachable. |
| Fractured | This enumeration literal shall indicate that the Target is split from the source. The target may not be consistent. |
| Inactive | This enumeration literal shall indicate that data flow has stopped, writes to source element shall not be sent to target element. |
| Initialized | This enumeration literal shall indicate that the link to enable replication is established and source/replica elements are associated, but the data flow has not started. |
| Invalid | This enumeration literal shall indicate that the storage server is unable to determine the state of the replication relationship, for example, after the connection is restored; however, either source or target elements have an unknown status. |
| Mixed | This enumeration literal shall indicate the ReplicaState of GroupSynchronized. The value indicates the StorageSynchronized relationships of the elements in the group have different ReplicaState values. |
| Partitioned | This enumeration literal shall indicate that the state of replication relationship can not be determined, for example, due to a connection problem. |
| Prepared | This enumeration literal shall indicate that initialization is completed, however, the data flow has not started. |
| Restored | This enumeration literal shall indicate that the source element was restored from the target element. |
| Skewed | This enumeration literal shall indicate that the target has been modified and is no longer synchronized with the source element or the point-in-time view. |
| Split | This enumeration literal shall indicate that the target element was gracefully (or systematically) split from its source element -- consistency shall be guaranteed. |
| Suspended | This enumeration literal shall indicate that the data flow between the source and target elements has stopped. Writes to source element shall be held until the relationship is Resumed. |
| Synchronized | This enumeration literal shall indicate that for Mirror, Snapshot, or Clone replication, the target represents a copy of the source. |
| Unsynchronized | This enumeration literal shall indicate that not all the source element data has been copied to the target element. |

8.22.1.14 UndiscoveredElement:

| string | Description |
|----------------|---|
| ReplicaElement | This enumeration literal shall indicate that the replica element is undiscovered. |
| SourceElement | This enumeration literal shall indicate that the source element is undiscovered. |

8.22.1.15 VolumeType:

| string | Description |
|---------------|---------------------------------|
| Mirrored | The volume is a mirrored device |

| string | Description |
|--------------------------|--|
| 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 |

8.23 VolumeCollection

This collection shall contain references to all Volume resource instances sharing the same parent resource.

| | | |
|---------------------------------|---|--|
| Description | null <i>read-write</i> | |
| Members [{ | array <i>read-write</i> | The value of each member entry shall reference a Volume resource. |
| AccessCapabilities [{ } | array <i>read-write</i> | Each entry shall specify a current storage access capability. |
| Actions { } | object <i>read-only</i> | The Actions property shall contain the available actions for this resource. |
| AllocatedPools [{ } | array <i>read-only</i> | The value of this property shall contain references to all storage pools allocated from this volume. |
| BlockSizeBytes | number, null (By) <i>read-only</i> | This property shall contain size of the smallest addressable unit of the associated volume. |
| Capacity { } | object, null <i>read-write</i> | Information about the utilization of capacity allocated to this storage volume. |

| | | |
|--|--|--|
| CapacityBytes | number, null (By) <i>read- only</i> | This property shall contain the size in bytes of the associated volume. |
| CapacitySources [{}] | 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. |
| Description | null <i>read- write</i> | |
| Encrypted | boolean, null <i>read- write</i> | This property shall contain a boolean indicator if the Volume is currently utilizing encryption or not. |
| EncryptionTypes [{}] | array <i>read- write</i> | This property shall contain the types of encryption used by this Volume. |
| Id | <i>read- write</i> | |
| Identifiers [{}] | array <i>read- only</i> | This property shall contain a list of all known durable names for the associated volume. |
| Links {} | object <i>read- only</i> | 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. |
| LowSpaceWarningThresholdPercents [{}] | array <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 | string, null <i>read- only</i> | This property shall contain a value that represents the manufacturer or implementer of the storage volume. |

| | | |
|-----------------------------|--|--|
| MaxBlockSizeBytes | number, null (By) <i>read- only</i> | This property shall contain size of the largest addressable unit of this storage volume. |
| Model | string, null <i>read- only</i> | The value is assigned by the manufacturer and shall represents a specific storage volume implementation. |
| Name | <i>read- write</i> | |
| Oem | <i>read- write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |
| Operations [{}] | array <i>read- only</i> | This property shall contain a list of all currently running on the Volume. |
| OptimumIOSizeBytes | number, null (By) <i>read- only</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. |
| ReplicaInfos [{}] | array <i>read- only</i> | This property shall describe the replica relationship between this storage volume and a corresponding source and/or target volume. |
| Status | <i>read- write</i> | |
| StorageGroups [{}] | array <i>read- only</i> | The value of this property shall contain references to all storage groups that include this volume. |
| VolumeType | string, null <i>read- write</i> | This property shall contain the type of the associated Volume. <i>See Property Details, below, for more information about this property.</i> |

| | | |
|-------------|------------------------|--|
| }] | | |
| Name | <i>read- write</i> | |
| Oem | <i>read- write</i> | The value of this string shall be of the format for the reserved word <i>Oem</i> . |

8.23.1 Property Details

8.23.1.1 VolumeType:

| 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 |