



September 23-26, 2019  
Santa Clara, CA

# Emerging Scalable Storage Management Functionality: What's New in 2019

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# Disclaimer

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- The information in this presentation represents a snapshot of work in progress within SNIA
- This information is subject to change without notice.
- For additional information, see the SNIA website: [www.snia.org/swordfish](http://www.snia.org/swordfish)



# Abstract

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- By now, you have a good understanding of SNIA Swordfish™ and how it extends the DMTF Redfish® specification to manage storage equipment and services. This presentation covers what's new and how the specification has evolved in the last year.
- Developed by the Storage Networking Industry Association (SNIA), SNIA Swordfish™ is an extension of the DMTF Redfish specification to provide a unified approach for the management of storage equipment and services in converged, hyper-converged, hyperscale and cloud infrastructure environments, making it easier for IT administrators and DevOps to integrate scalable solutions into their data centers.



# Swordfish Specs and Technical Timeline

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2016: v1.0.0 Released: Block and File functionality with Class of Service Interface

2017: v1.0.2 – 1.0.5: Enhancements, etc..

2018:

- v1.0.6: Introduction of two StorageSystem models, updated on-demand replica models
- v1.0.7 Swordfish WIP Release: Enhanced Spare Capacity Management, Rebuild Management, Volume types, YAML schema support
- Spare Management White Paper

2019:

- **v1.1.0 - Swordfish Features and Profiles WIP release**
  - Closed “gap” between Redfish Storage model and Swordfish
  - Enhanced features and functionality requested to support scalability in direct-attach use cases
  - Updated Swordfish mockups: [swordfishmockups.com](http://swordfishmockups.com)

## Future Functionality

- *Full NVMe Enablement: Functionality alignment across DMTF, NVMeExpress/NVMe-MI and SNIA for NVMe use cases*
- *Storage-specific security roles*
- *Object Storage*
- *Enhanced profile support for SNIA Alliance partner organizations*



# Other Expanded Functionality

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- Added Consistency Groups
- Added Replication controls to Volumes and Consistency Groups
  - AssignReplicaTarget
  - CreateReplicaTarget
  - RemoveReplicaRelationship
  - ResumeReplication
  - ReverseReplicationRelationship
  - SplitReplication
  - SuspendReplication
- Expanded Volume schema
- User's Guide significantly expanded
  - Use cases covering RF, SF and SF with CoS
    - Volume creation, Storage Group creation, Replication management
  - Sorted by Feature



# Lifecycle: From Definition to Implementations

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Redfish



Swordfish



OPEN  
Compute Project



opendatacenter.cn



openstack



Redfish



Swordfish



OpenBMC



Redfish



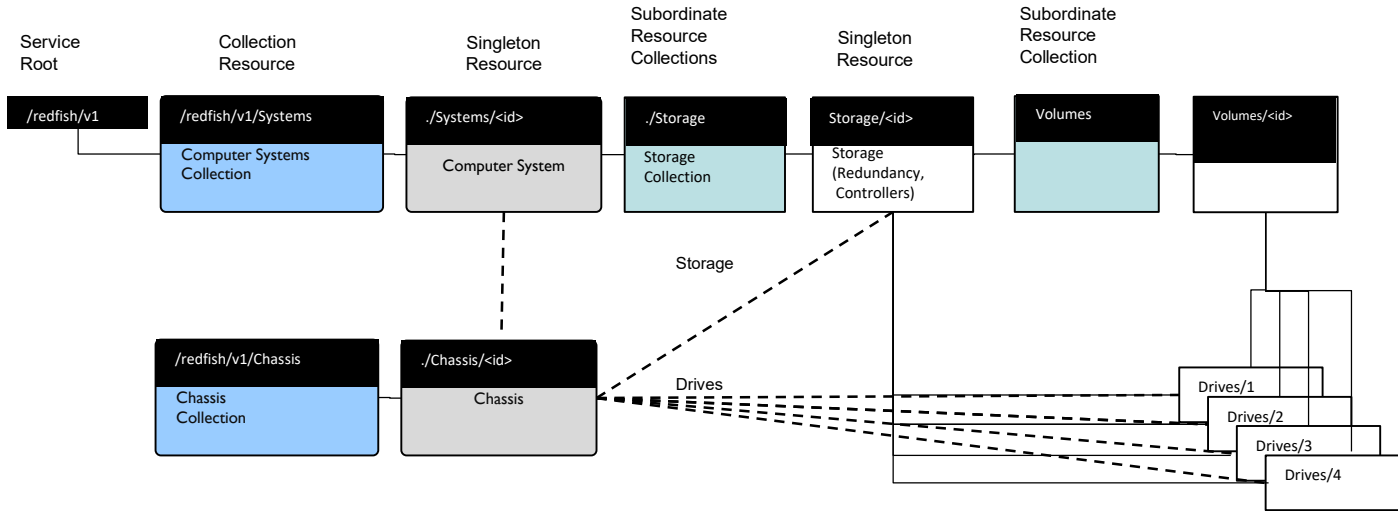
STORAGE  
MANAGEMENT



Swordfish



# Starting with Redfish: Simple Storage



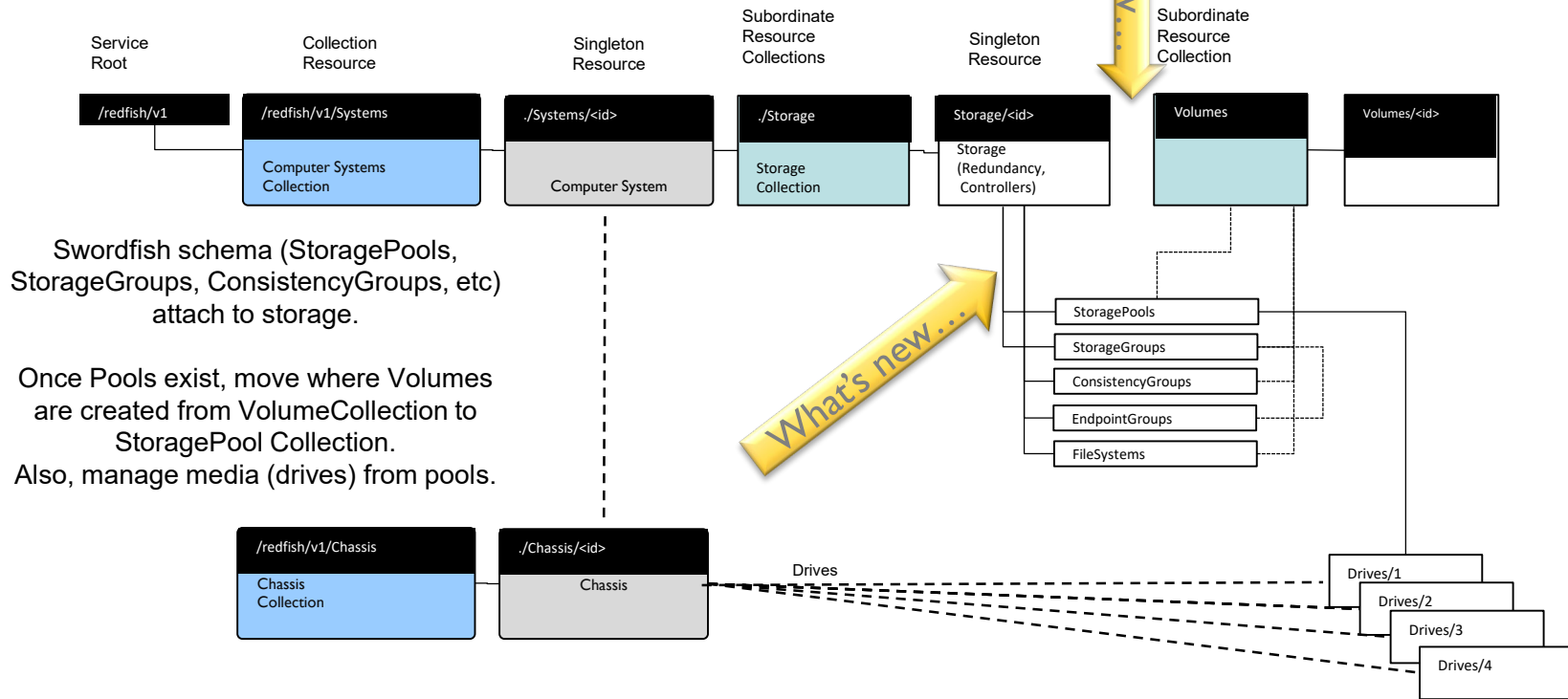
Volumes are in Collections off of the Storage resource, drives are in arrays off of the storage resource, and optionally, the Chassis.

# Adding Swordfish..

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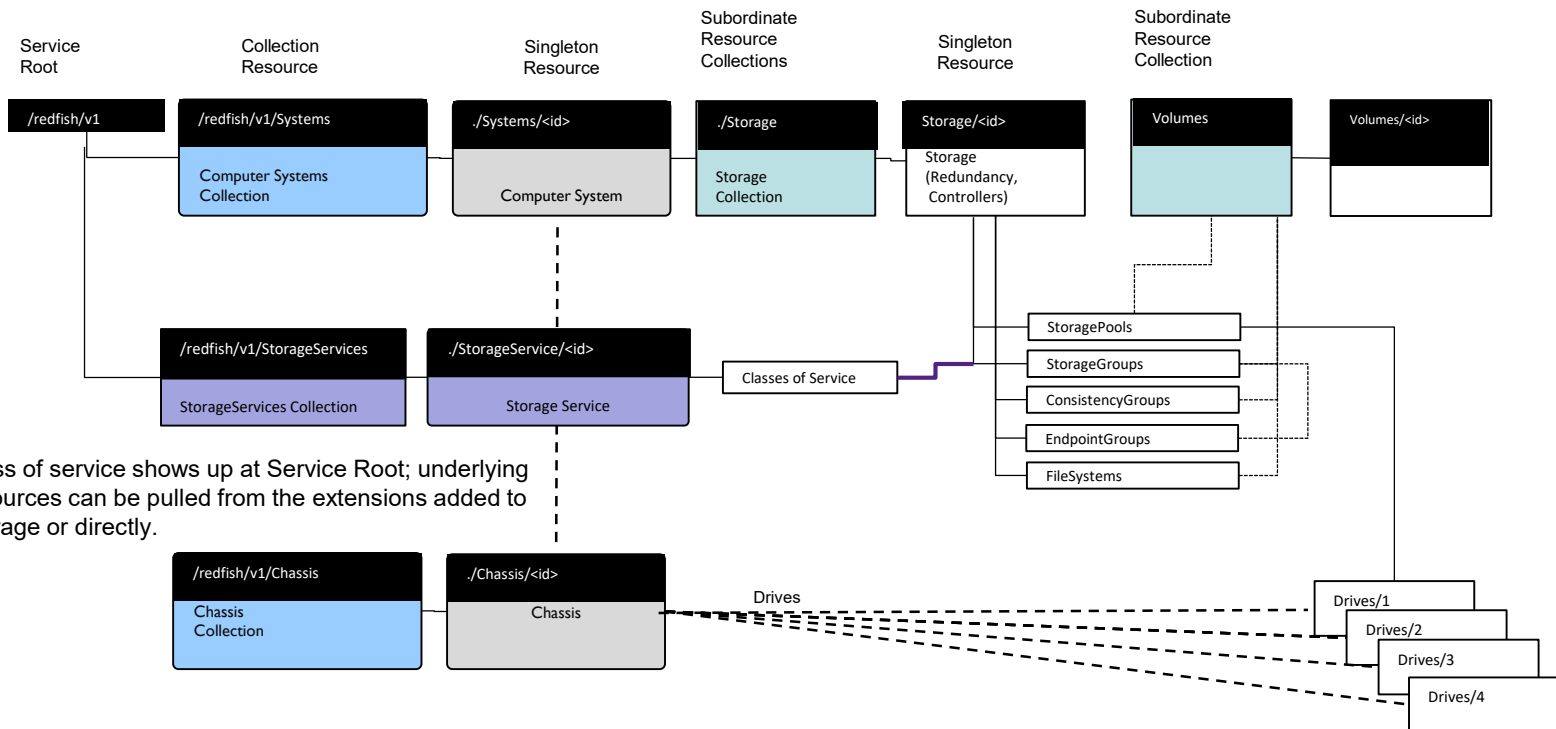




# Supporting Class Of Service



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Class of service shows up at Service Root; underlying resources can be pulled from the extensions added to Storage or directly.

# Swordfish Capabilities

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What's New...

- Advertised using “SupportedFeatures” (Features)
  - Features are high-level descriptions of functionality that an implementation advertises that it currently supports
  - Profiles are detailed descriptions that describe down to the individual property level what functionality is required in order to advertise features
- Block storage
  - Provisioning with optional class of service control
    - Resource provisioning from disk, volume, pool, and persistent memory
  - Volume Mapping and Masking
  - Local and Remote Replication
  - Capacity and health metrics
  - Performance metrics
- File system storage
  - Adds File System and File Share
  - Leverages all other concepts – provisioning with class of service, replication, Solution level connectivity
- Fabric connect, host connect
  - Endpoint abstraction
- Additional content
  - Object drive storage



# Primary Swordfish Elements

- Volume: Block addressable storage.
- Filesystem: File-addressable storage.
- StoragePools: Storage capacity that can be used to produce volumes or other storage pools.
- StorageGroup: A set of volumes and endpoints that are managed as a group for mapping and masking.
- ConsistencyGroup: A set of volumes that are treated by an application or set of applications as a single entity.
- Fileshare: A shared set of files with a common directory structure that is exported for use by remote systems.

What's New...

## Optional Elements:

What's New...

- ClassOfService: A choice of utility or warranty offered to customers by a service. Defined by selecting from available LinesOfService.
- StorageService: Represents a service that provides ClassOfService based provisioning, management, and monitoring for logical storage and associated resources.





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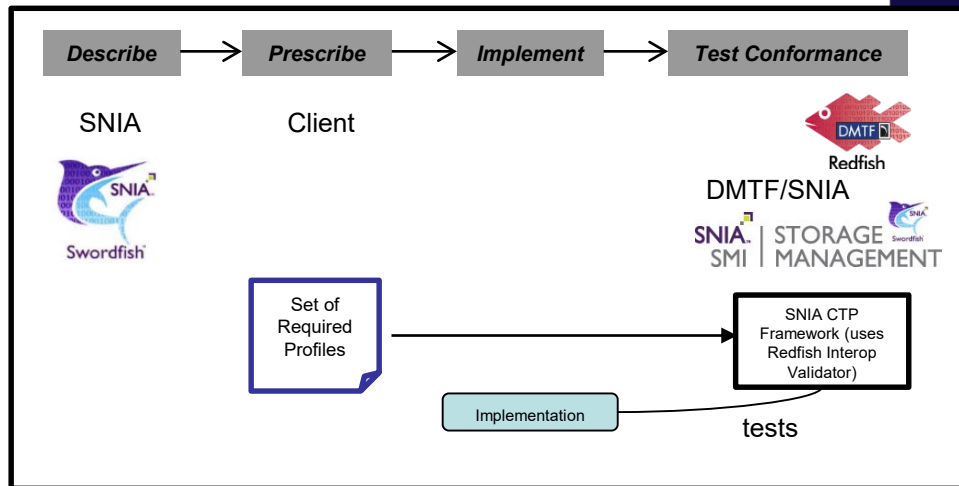
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## Features and Profiles: Specifying Required Functionality

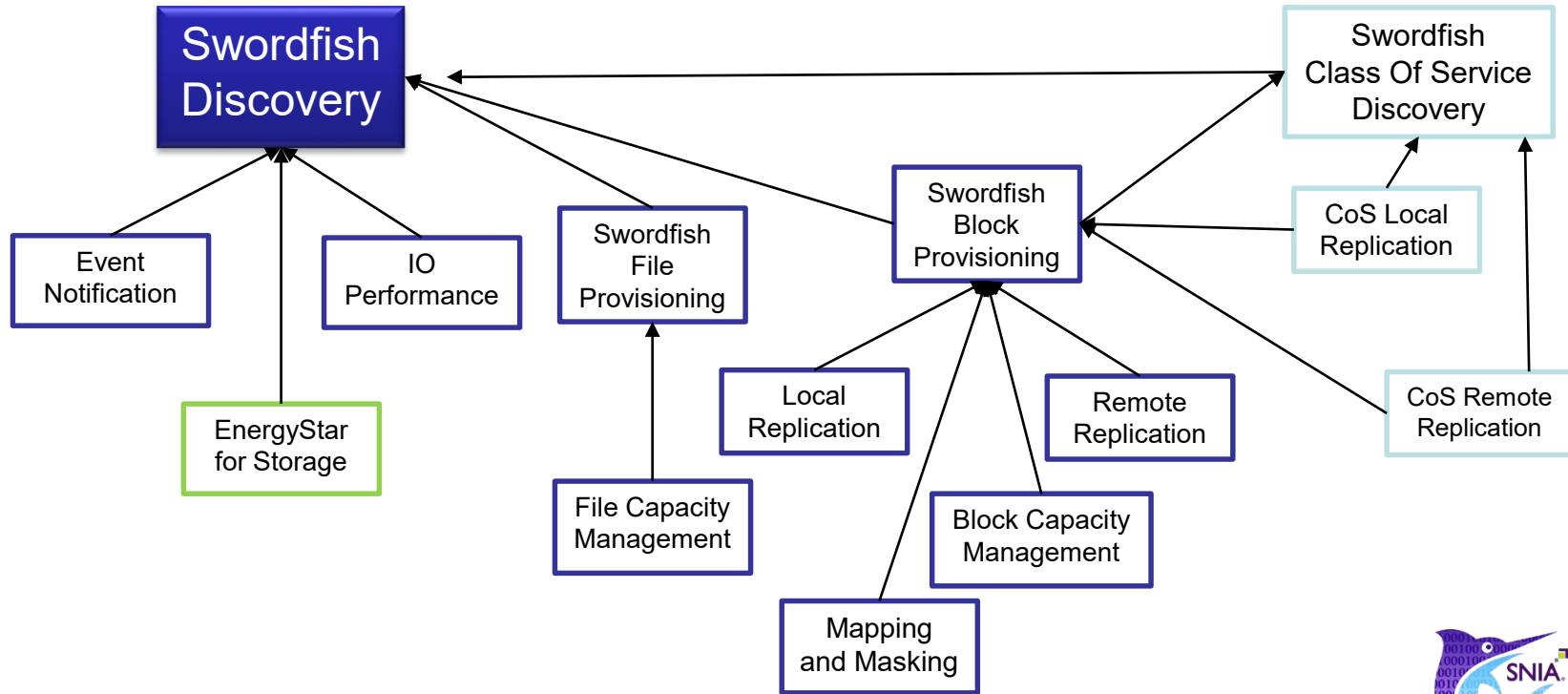
# Swordfish Features and Profiles

- Features
  - High-level descriptions of functionality that an implementation advertises that it currently supports
- Profiles
  - Profiles are detailed descriptions that describe down to the individual property level what functionality is required in order to advertise features
- Client / Storage Profile
  - Selected combination of Swordfish profiles

- The Profile Files
  - JSON formatted files
  - Specifies required Redfish/Swordfish interface elements (resources, properties, values)



# Swordfish Profiles Inheritance Hierarchy



- Accessed from FeaturesRegistry
  - Accessible at the ServiceRoot
- Set of SupportedFeatures that contains:
  - Feature Name
  - Description
  - Version
  - Corresponding Profile Definition



# SupportedFeatures: Defined in Feature Registries

## SwordfishFeaturesRegistry.1.0.2.json

```
"@Redfish.Copyright": "Copyright 2019 SNIA. All rights reserved.",
"@odata.type": "#FeaturesRegistry.v1_0_0.FeaturesRegistry",
"Id": "SwordfishFeatures.1.0.2",
"Name": "Swordfish Features Registry",
"Language": "en",
"Description": "This registry defines the Swordfish features.",
"RegistryPrefix": "SwordfishFeatures",
"RegistryVersion": "1.0.2",
"OwningEntity": "SNIA",
"Features": {
  "SNIA.Swordfish.Discovery": {
    "Description": "Supports discovery of resources in a Swordfish system.",
    "Version": "1.0.1",
    "CorrespondingProfileDefinition": "SwordfishDiscovery.json"
  },
```

```
"SNIA.Swordfish.EventNotification": {
  "Description": "Supports the Swordfish Event Notification Feature.",
  "Version": "1.0.1",
  "CorrespondingProfileDefinition":
    "SwordfishEventNotification.json"
},
"SNIA.Swordfish.Block.IOPerformance": {
  "Description": "Supports the Swordfish Block IOPerformance Feature.",
  "Version": "1.0.1",
  "CorrespondingProfileDefinition":
    "SwordfishIOPerformance.json"
},
...
```



# Profile Definition Deep-Dive: Swordfish Discovery - Requirements

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Requirement Area	Detail
Required behaviors:	"Get" on all system object implemented "Get" on all object properties implemented
Required properties:	ComputerSystem -> HostingRoles property must be set to StorageServer. Volumes Collection in Storage. Storage Pools Collection in Storage. Must have a Collection for storage media (either Drives or in an attached CapacitySources structure). StorageSystem Collection in ServiceRoot, at least one member.

# Profile Definition Deep-Dive:

## Swordfish Discovery – Profile Headers

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```
{
  "SchemaDefinition": "./RedfishInteroperabilityProfile.v1_3_0.json",
  "ProfileName": "SwordfishDiscovery",
  "ProfileVersion": "1.0.1",
  "OwningEntity": "SNIA.org",
  "Purpose": "Define requirements for discovery of resources and relationships that are common to all Swordfish conformant implementations.",
  "ContactInfo": "SNIA.org",
  "RequiredProfiles": {},
  "Registries": {
    "Features": {
      "MinVersion": "1.0.2",
      "Repository": "https://redfish.dmtf.org/profiles/swordfish",
      "SupportedFeatures": {
        "SNIA.Swordfish.Discovery": {}
      }
    }
  }
}
```

# Profile Definition Deep-Dive:

## Swordfish Discovery – Set HostingRoles Property

```
"Resources": {  
  "ServiceRoot": {  
    "PropertyRequirements": {  
      "StorageSystems": {},  
      "Systems": {  
        "ComputerSystem": {  
          "PropertyRequirements": {  
            "HostingRoles": {  
              "ConditionalRequirements": [{  
                "Purpose": "Swordfish implementations must specify a hosting role type of StorageServer.",  
                "CompareValues": "StorageServer"  
              }  
            }  
          },  
          ...  
        }  
      }  
    }  
  }  
}
```

# Profile Definition Deep-Dive:

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## Swordfish Discovery – Requirements for Volumes, StoragePools, Media Collections

```
"Resources": {
  "ServiceRoot": {
    "PropertyRequirements": {
      "StorageSystems": {},
      "Systems": {
        "ComputerSystem": {
          ...
          "Storage": {
            "Volumes": {
              "PropertyRequirements": {
                "Members": {
                  "MinCount": 0
                }
              },
              "StoragePools": {
                "PropertyRequirements": {
                  "Members": {
                    "MinCount": 0
                  }
                }
              }
            }
          }
        }
      }
    }
  }
}
```

```
"Drives": {
  "ReadRequirement": "Recommended",
  "ConditionalRequirements": [{
    "Purpose": "ConditionalRequirements: The
implementation must choose at least one selected media container
(appropriate for the system's selected media type) and instantiate a
collection for it. This may be instantiated as a CapacitySources
structure to feed a StoragePool, FileSystem, or Volume. When drives
are used, the Drives Collection in either Storage or, when
implementing the ClassOfService Feature, StorageServices shall be
implemented.",
    "CompareType": "Absent",
    "ReadRequirement": "Mandatory",
    "Comparison": "AnyOf",
    "CompareValues": ["StoragePool/CapacitySource",
"FileSystem/CapacitySource", "Volume/CapacitySource"]
  }]
}
```

# Profile Definition Deep-Dive:

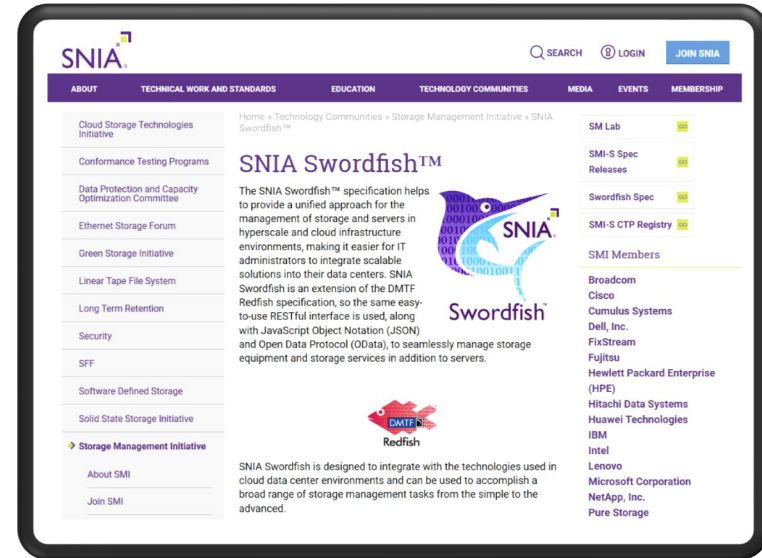
## Swordfish Discovery – General Requirements

```
"StorageSystemCollection": {  
  "PropertyRequirements": {  
    "Members": {  
      "MinCount": 1  
    }  
  }  
},  
"StoragePoolCollection": {  
  "PropertyRequirements": {  
    "Members": {  
      "MinCount": 0  
    }  
  }  
},  
"VolumeCollection": {  
  "PropertyRequirements": {  
    "Members": {  
      "MinCount": 0  
    }  
  }  
},  
...
```

# Swordfish Info: [www.snia.org/swordfish](http://www.snia.org/swordfish)



- Resources
  - Specifications
  - User's Guide
  - GitHub for Swordfish Tools
  - Practical Guide
  - Other Documentation
- Swordfish Mockups Site
  - ISC and HSC configurations
  - Block vs. file configurations
  - Small and large configurations
- Education/Community
  - Whitepapers, Presentations
  - YouTube shorts & Webinars
- Participate
  - Join SNIA and the SSM TWG
  - Implement



- Available: <http://github.com/snia>
  - Swordfish Emulator Extensions
    - Extends the Redfish emulator – adds all Swordfish schema (behave like dynamic objects)
  - Basic Swordfish Web client
    - Discover, display and edit Swordfish services
  - DataDog and Power BMI Client Sample Dashboards
    - Sample implementations show integration concepts with sample code:
    - PowerBI: Point-in-time dashboard; Datadog: Data trending dashboard
  - NEW! Swordfish Powershell Toolkit
    - Powershell toolkit integration for Windows and Linux



# How to Participate: Shaping the Standard

- Find pointers to the latest technical content:
  - <http://snia.org/swordfish>
  - <http://www.snia.org/publicreview#swordfish>
- Join the SSM TWG
  - By Joining the SNIA and SSM TWG, you can shape the standard:  
<https://members.snia.org/apps/org/workgroup/ssmtwg>
- Through the SNIA feedback portal, providing feedback on “Work In Progress”
  - As the group produces “Works In Progress”, you can provide feedback at <http://www.snia.org/feedback>





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# Q&A