

September 23-26, 2019 Santa Clara, CA

SNIA Swordfish[™] Overview

Richelle Ahlvers Broadcom Inc.



Disclaimer

September 23-26, 2019 Santa Clara, CA

- 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: <u>www.snia.org/swordfish</u>



2

Abstract

September 23-26, 2019 Santa Clara, CA SD©

- 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.
- This session will present an overview of the SNIA Swordfish specification, and will show how Swordfish takes and extends the Redfish specification to deliver the Swordfish storage model. It will also cover the drivers for the SNIA Swordfish approach, as well as providing a comprehensive overview of the functionality included in the Swordfish specification. It will also present an overview of common storage management use cases easily addressed by Swordfish.



SNIA

3

SD®

The SNIA SwordfishTM Approach

- Develop the management model from the point-of-view of what a client needs to accomplish and to provide information that the client needs
- Cover block, file, and object storage
- Extend traditional storage domain coverage to include converged environments (covering servers, storage and fabric together)
- Provide the option for implementation to utilize Class of Service (intent or service level) based provisioning, management, and monitoring
- Implement the Swordfish API as an extension of the Redfish API
- Build using DMTF's Redfish technologies
 - RESTful interface over HTTPS in JSON format based on OData v4



Who is Developing Redfish and Swordfish*?

American Megatrends, Inc. Artesyn Embedded Technologies Eaton Ericsson AB Insyde Software 10011 Corp. Mellanox DMTE **Technologies** New H3C Technologies Co., Ltd Redfish OSIsoft, LLC Quanta Computer Solarflare Communications Supermicro Vertiv

Arm Limited **Broadcom Inc.** Cray Cisco Dell Inc. 10106 Fujitsu lewlett Packard Enterprise Huawei** 1010 IBM Intel Corporation Lenovo Microchip Technology Inc. NetApp To hiba Memory Corporation Swordfish Western Digital VMware Inc

Hitachi Inspur Kalray ManageEngine Micron **NEC** Corporation NGD Systems, Inc. Pure Storage **Ouest Software** Seagate Technology Silicon Motion, Inc. SK Hynix StarWind Toshiba America Turbonomic

*as of September 20, 2019

** Membership suspended

SD®

Swordfish

Swordfish: Extending the Redfish REST Model





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.

2019 Storage Developer Conference. © Broadcom Inc. All Rights Reserved.

SD[®]



Supporting Class Of Service





Swordfish Capabilities

- Advertised using "SupportedFeatures" (Features)
 - Features are high-level descriptions of functionality 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

SD @

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.

Optional Elements:

- 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.

SDO

September 23-26, 2019 Santa Clara, CA



Swordfish: Walking the Model

See Example Swordfish Configurations

- As a work tool, the Technical Work Group (TWG) works with "mockups" (snapshots of a state in time) of different types of systems
- Published at <u>http://swordfishmockups.com</u> (/redfish/v1/)

Note: Mockups are representations of implementations, not normative

13

Overview of Swordfish Hierarchy

- Explore the Swordfish data model to see potential / typical implementation
- Navigate through the model to learn about, and see, various resources
- SNIA mockups show examples of block storage systems
 - Simple: A small external array
 - Complex: all of the elements in the block storage model, with remote replication
- Also show ISC vs HSC configurations
- .. and an example of a file server with multiple file shares



Navigating through the Mockups...

 Select the <u>..../redfish/v1/StorageStorageServices</u> link to see the "Collection" of Storage Services

- Click the "<u>.../StorageServices/Simple</u>" link to see the details of the Simple mockup
 - ".../StorageServices/1" to see the details of the complex storage service mockup
 - <u>".../StorageServices/FileService</u>" to see the filesystem mockup

<u>".../StorageServices/ISC</u>" to see the ISC mockup (look for links to the hosting system)



SD (®

What's in a Storage Service? (Block)

- Available Classes Of Service
 - Lines of Service that are used to compose the Classes of Service
- Volumes
- Pools
- Groups
- Endpoints
- ..
- Pointer to related resources (system, chassis,..)



SD @

What's in a Storage Service? (File)

Same structure:

- Available Classes Of Service
- File systems
- Pools
- Groups
- Endpoints
- Pointer to related resources (system, chassis, **block** service or drives)



SD @

17

September 23-26, 2019 Santa Clara, CA



Swordfish: Sample Use Case – Finding Capacity Information



Traverse the Service Root to find the selected volume and get its Capacity information:

- Read the Service Root resource
- Read the link to the Storage System Collection
- Pick a Storage System
- Read the link to the Volume Collection
- Pick desired Volume:
 - Collect the Capacity information
 - Look at the consumed vs. allocated capacity information

Swordfish Volume Capacity Step 1: Read the Service Root (Step 2: Read the link to the Storage Systems Collection)

```
SD ®
```

```
GET /redfish/v1/ HTTP/1.1
HTTP/1.1 200 OK
    "@odata.context": "/redfish/v1/$metadata#ServiceRoot.ServiceRoot",
    "@odata.id": "/redfish/v1/",
    "@odata.type": "#ServiceRoot.v1 0 0.ServiceRoot",
    "Id": "RootService",
. . .
    "StorageSystems": {"@odata.id": "/redfish/v1/StorageSystems" },
    "StorageServices": {"@odata.id": "/redfish/v1/StorageServices" },
    "Chassis": {"@odata.id": "/redfish/v1/Chassis" },
    "Links": {
        "Sessions": {"@odata.id": "/redfish/v1/SessionService/Sessions" }
    },
```

September 23-26, 2019

Swordfish Volume Capacity Step 3: Pick a Storage System

```
GET /redfish/v1/StorageSystems HTTP/1.1
HTTP/1.1 200 OK
    "@odata.context": "/redfish/v1/$metadata#ComputerSystemCollection.
ComputerSystemCollection",
    "@odata.id": "/redfish/v1/StorageSystems",
    "@odata.type": "#ComputerSystemCollection.v1 0 0. ComputerSystemCollection",
    "Name": "Storage System Collection",
    "Members@odata.count": 4,
    "Members": [
        { "@odata.id": "/redfish/v1/StorageSystems/1" },
        { "@odata.id": "/redfish/v1/StorageSystems/2" },
        { "@odata.id": "/redfish/v1/StorageSystems/FileService" },
        { "@odata.id": "/redfish/v1/StorageSystems/Simple1" }
```

Swordfish Volume Capacity Step 3: Find the Storage Collections in the System

```
GET /redfish/v1/StorageSystems/1 HTTP/1.1
HTTP/1.1 200 OK
  "@odata.context": "/redfish/v1/$metadata#ComputerSystem.ComputerSystem",
  "@odata.id": "/redfish/v1/StorageSystems/1"
  "@odata.type": "#ComputerSystem.v1 4 0.ComputerSystem",
  "Id": "437XR1138R2",
  "Name": "WebFrontEnd483",
  "Storage": {
    "@odata.id": "/redfish/v1/StorageSystems/1/Storage",
```

SD®

Swordfish Volume Capacity Step 4: Pick a Storage Controller

```
GET /redfish/v1/StorageSystems/1/Storage HTTP/1.1
HTTP/1.1 200 OK
    "@odata.context": "/redfish/v1/$metadata#StorageCollection.StorageCollection",
    "@odata.id": "/redfish/v1/StorageSystems",
    @odata.type": "#StorageCollection.StorageCollection",
    "Name": "Storage Collection",
    "Members@odata.count": 1,
    "Members": [
        { "@odata.id": "/redfish/v1/StorageSystems/1/Storage/1" }
```

Swordfish Volume Capacity Step 5: Read the Storage Entity and Find the Volumes Collection

```
SD©
```

```
GET /redfish/v1/StorageSystems/1/Storage/1 HTTP/1.1
HTTP/1.1 200 OK
    "@odata.context": "/redfish/v1/$metadata#Storage.Storage",
    "@odata.id": "/redfish/v1/StorageSystems/1/Storage/1",
    "@odata.type": "#Storage.v1 3 0.Storage",
    "Id": "1",
    "Name": "My Storage Controller",
    "Volumes": {
        "Members": [ { "@odata.id": "/redfish/v1/StorageSystems/1/Volumes" } ]
    },
    "Drives": { ... },
    "Links": { }
    . . .
```

SD®

Swordfish Volume Capacity Step 6: Pick Desired Volume

```
GET /redfish/v1/StorageSystems/1/Storage/1/Volumes HTTP/1.1
НТТР/1.1 200 ОК
    "Name": "Volumes",
    "Members@odata.count": 6,
    "Members": [
        { "@odata.id":
           /redfish/v1/StorageSystems/1/Storage/1/Volumes/61001234876545676100123487654567" },
        { "@odata.id":
           "/redfish/v1/StorageSystems/1/Storage/1/Volumes/65456765456761001234876100123487" },
        { "@odata.id": "/redfish/v1/StorageSystems/1/Storage/1/Volumes/Volumes/3" },
        { "@odata.id": "/redfish/v1/StorageSystems/1/Storage/1/Volumes/Volumes/4" },
        { "@odata.id": "/redfish/v1/StorageSystems/1/Storage/1/Volumes/Volumes/5" },
        { "@odata.id": "/redfish/v1/StorageSystems/1/Storage/1/Volumes/Volumes/6" }
```

Swordfish Volume Capacity Step 7: Look at Capacity Information **SD**[©]

-Santa Clara, CA

```
GET /redfish/v1/StorageSystems/1/Storage/1/Volumes/61001234876545676100123487654567 HTTP/1.1
HTTP/1.1 200 OK
    "Id": "61001234876545676100123487654567",
. . .
 "Capacity": {
        "Data": {
            "ConsumedBytes": 0,
            "AllocatedBytes": 10737418240,
            "GuaranteedBytes": 536870912,
            "ProvisionedBytes": 1099511627776
        },
        "Metadata": {
             . . .
        },
        "Snapshot": {
             . . .
```

Swordfish Specs and Technical Timeline SD@

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

Future Functionality

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

2019 Storage Developer Conference. © Broadcom Inc. All Rights Reserved.



27

Swordfish Info: 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





2019 Storage Developer Conference. © Broadcom Inc. All Rights Reserved.

SD (®

Open Source Tools and Infrastructure Development

- Available: <u>http://github.com/snia</u>
 - 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: <u>https://members.snia.org/apps/org/workgroup/ssmtwg</u>
- Through the SNIA feedback portal, providing feedback on "Work In Progress"
 - As the group produces "Works In Progress", you can provide feedback at <u>http://www.snia.org/feedback</u>



September 23-26, 2019 Santa Clara, CA





Q&A

2019 Storage Developer Conference. © Broadcom Inc. All Rights Reserved.

31