SNIA DSI '16
DATA STORAGE INNOVATION CONFERENCE

Innovation in Storage Products,
Services, and Solutions

June 13-15, 2016 | Marriott San Mateo | San Mateo, CA

Introduction to Swordfish: Scalable Storage Management

Richelle Ahlvers

Chair, SNIA Scalable Storage Management Technical Work Group (SSM TWG)

Principal Storage Management Architect, Broadcom

Disclaimer

- 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

What are the Drivers for Swordfish?

- Customers (and vendors) asking for improvements in storage management APIs
  - Make them simpler to implement and consume
  - Improve access efficiency
    - Fewer transactions, with more useful information in each
  - Provide useful access via a standard browser
  - Expand coverage to include converged, hyper-converged, and hyper-scale
  - Provide compatibility with standard DevOps environments

The Swordfish Approach

- ***The What:***
  - Refactor and leverage SMI-S schema into a simplified model that is client oriented
  - Move to Class of Service based provisioning and monitoring
  - Cover block, file and object storage
  - Extend traditional storage domain coverage to include converged environments (covering servers, storage and fabric together)
- ***The How:***
  - Leverage and extend new (v1.0 in late 2015) DMTF Redfish Specification
  - Build using DMTF's Redfish technologies
    - RESTful interface over HTTPS in JSON format based on OData v4
  - Implement Swordfish as an extension of the Redfish API

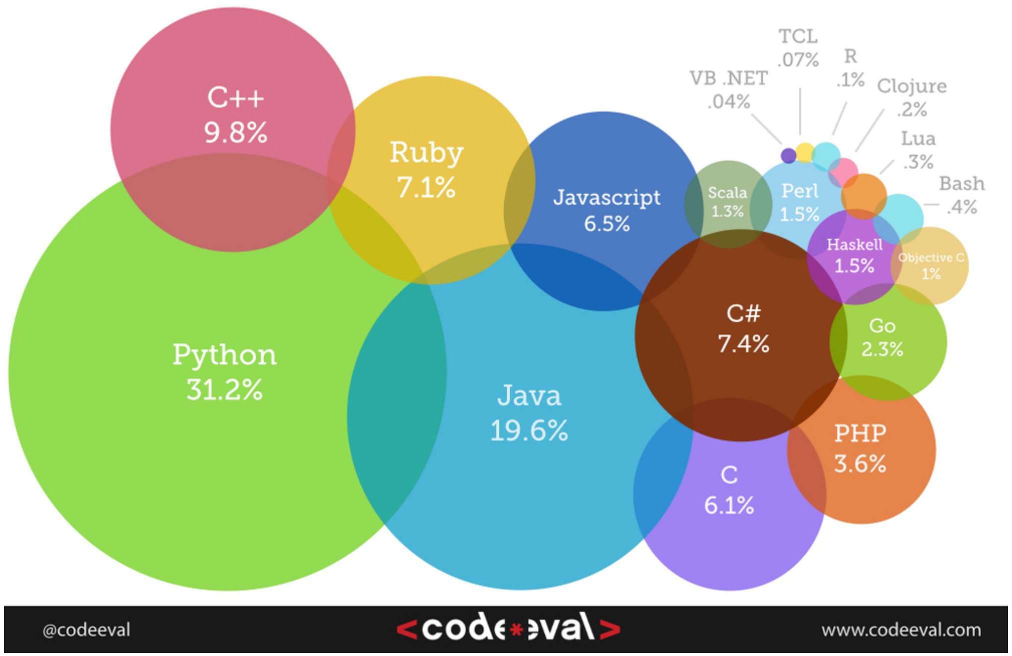
Functionality Targeted for the Swordfish v1.0 API Specification

- Block storage
  - Provisioning with **class of service** control
  - Volume Mapping and Masking
  - Replication
  - Capacity and health metrics
- File system storage
- Additional content
  - Object drive storage

Why REST, HTTP and JSON?

- **REST:** The API architecture
  - Rapidly replacing SOAP
- **HTTPS:** The Web protocol
  - Well-understood by admins
  - Known security model
  - Known network configuration
- **JSON:** Modern data format
  - Human-readable
  - Simpler than XML
  - Modern language support

Most Popular Coding Languages of 2015



- The combination of language support and ubiquity of REST, HTTP and JSON means that systems management tasks can be performed using the same skill set and tool chain as all other IT and dev/ops tasks.

How simple is REST using JSON?

Example Python code to retrieve serial number from a server:

```
rawData =
urllib.urlopen(‘http://192.168.1.135/redfish/v1/Systems/1’)

jsonData = json.loads(rawData)

print( jsonData[‘SerialNumber’] )
```

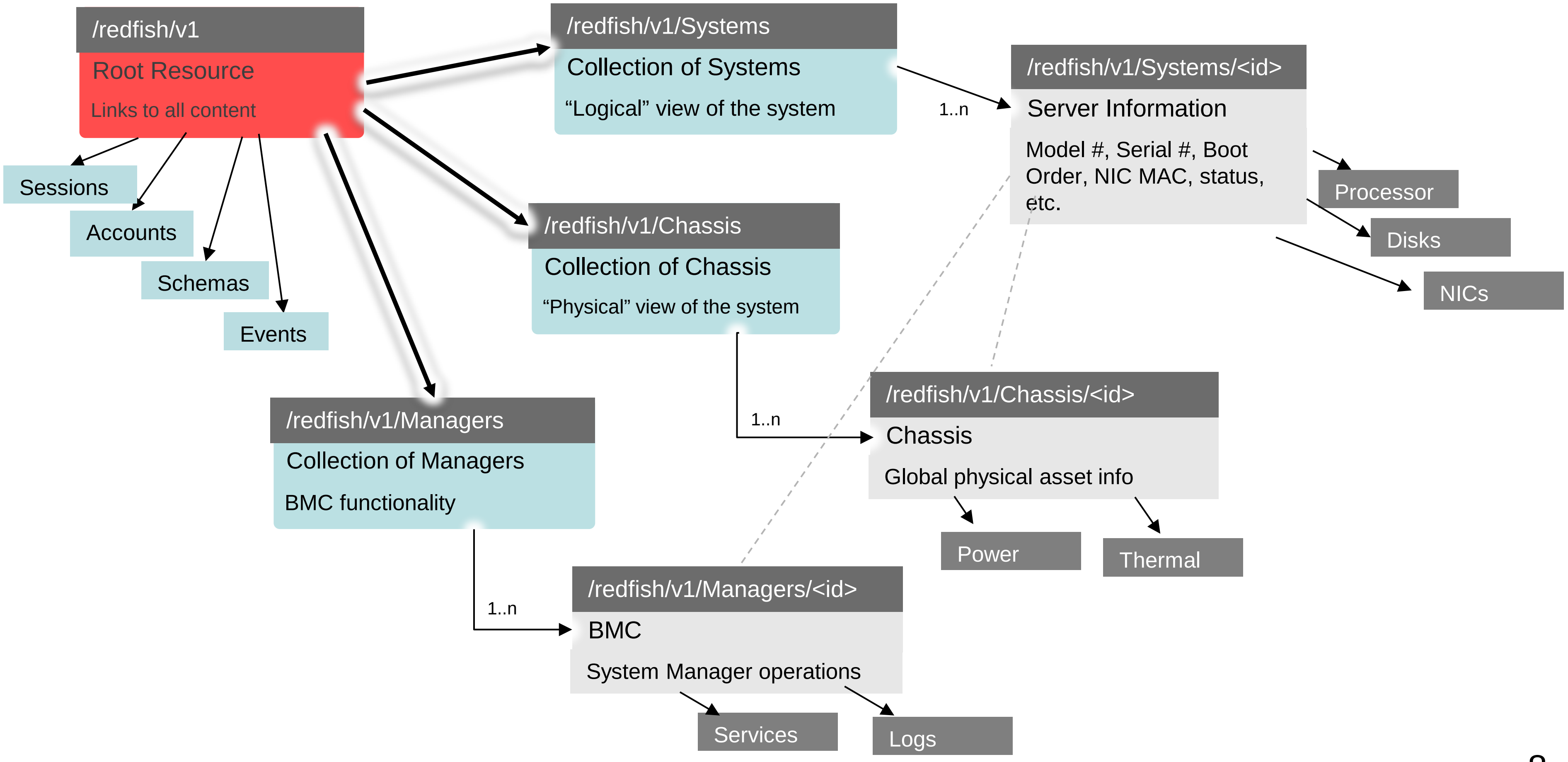
Output is:

```
1A87CA442K
```

*Example uses Redfish ComputerSystem resource; authentication not shown

Starting with Redfish: An Overview

Redfish Resource Map



/redfish/v1

Root Resource

Links to all content

Sessions

Accounts

Schemas

Events

/redfish/v1/Systems

Collection of Systems

"Logical" view of the system

/redfish/v1/Systems/<id>

Server Information

Model #, Serial #, Boot Order, NIC MAC, status, etc.

/redfish/v1/Chassis

Collection of Chassis

"Physical" view of the system

/redfish/v1/Chassis/<id>

Chassis

Global physical asset info

/redfish/v1/Managers

Collection of Managers

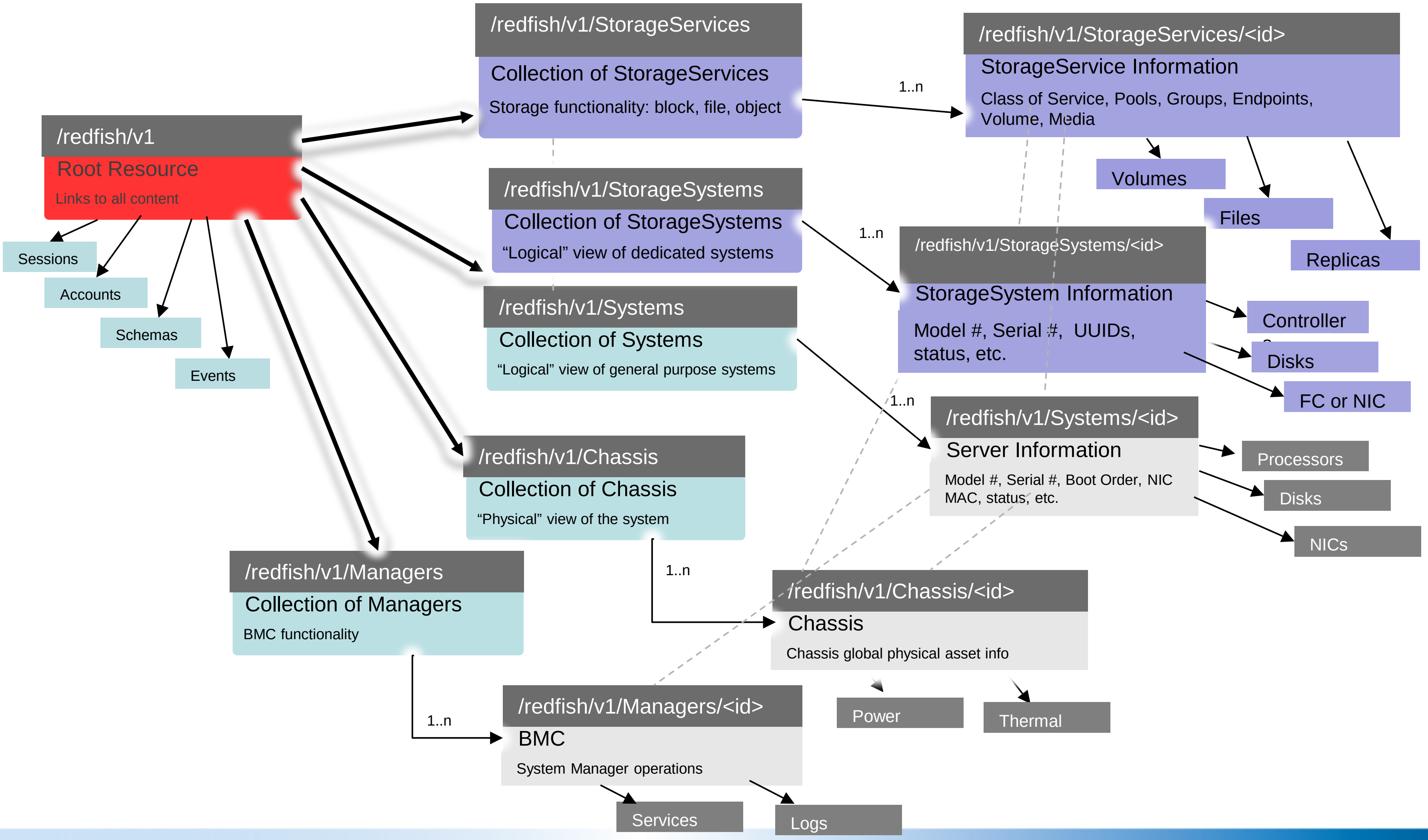
BMC functionality

/redfish/v1/Managers/<id>

BMC

System Manager operations

Adding Storage to Redfish: Swordfish



/redfish/v1

Root Resource

Links to all content

Sessions

Accounts

Schemas

Events

/redfish/v1/StorageServices

Collection of StorageServices

Storage functionality: block, file, object

1..n

/redfish/v1/StorageServices/<id>

StorageService Information

Class of Service, Pools, Groups, Endpoints, Volume, Media

Volumes

Files

Replicas

/redfish/v1/StorageSystems

Collection of StorageSystems

“Logical” view of dedicated systems

1..n

/redfish/v1/StorageSystems/<id>

StorageSystem Information

Model #, Serial #, UUIDs, status, etc.

Controller

Disks

FC or NIC

/redfish/v1/Systems

Collection of Systems

“Logical” view of general purpose systems

1..n

/redfish/v1/Systems/<id>

Server Information

Model #, Serial #, Boot Order, NIC MAC, status, etc.

Processors

Disks

NICs

/redfish/v1/Chassis

Collection of Chassis

“Physical” view of the system

1..n

/redfish/v1/Chassis/<id>

Chassis

Chassis global physical asset info

Power

Thermal

/redfish/v1/Managers

Collection of Managers

BMC functionality

1..n

/redfish/v1/Managers/<id>

BMC

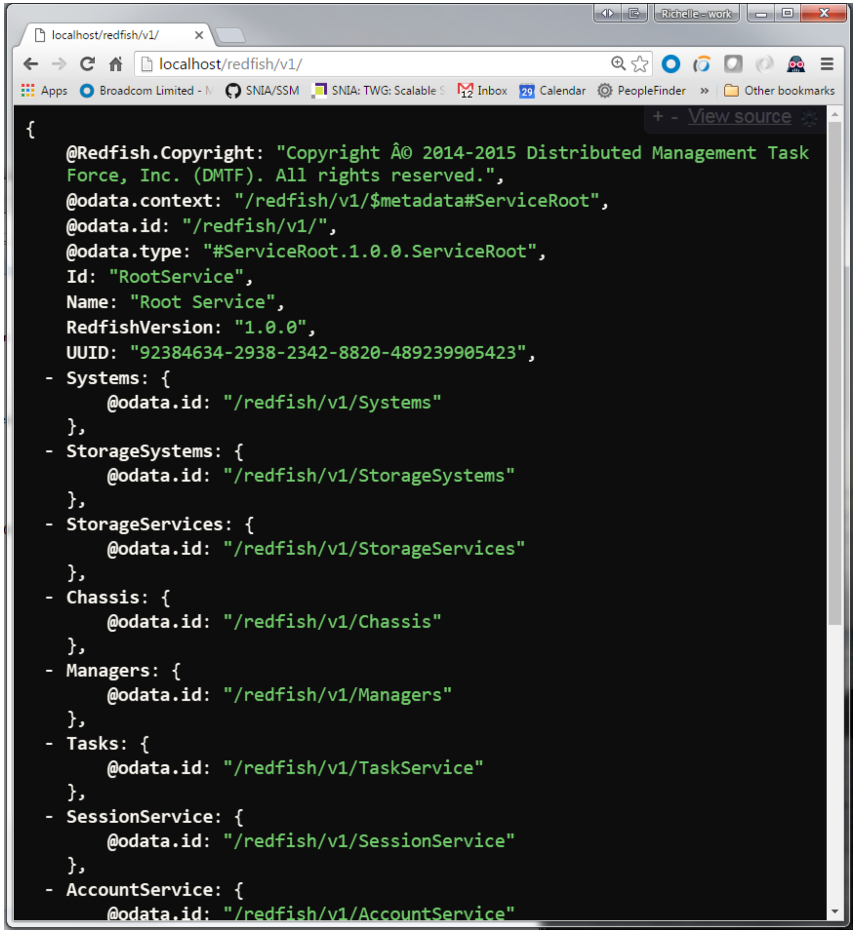
System Manager operations

Services

Logs

Overview of Swordfish Mockups

- Explore “mockups” of the Swordfish data model in a typical implementation
- Navigate via links through the model to various resources
- SNIA mockups show two examples of storage systems
  - Simple: A small external array
  - Complex: all of the elements in the block storage model, with remote replication



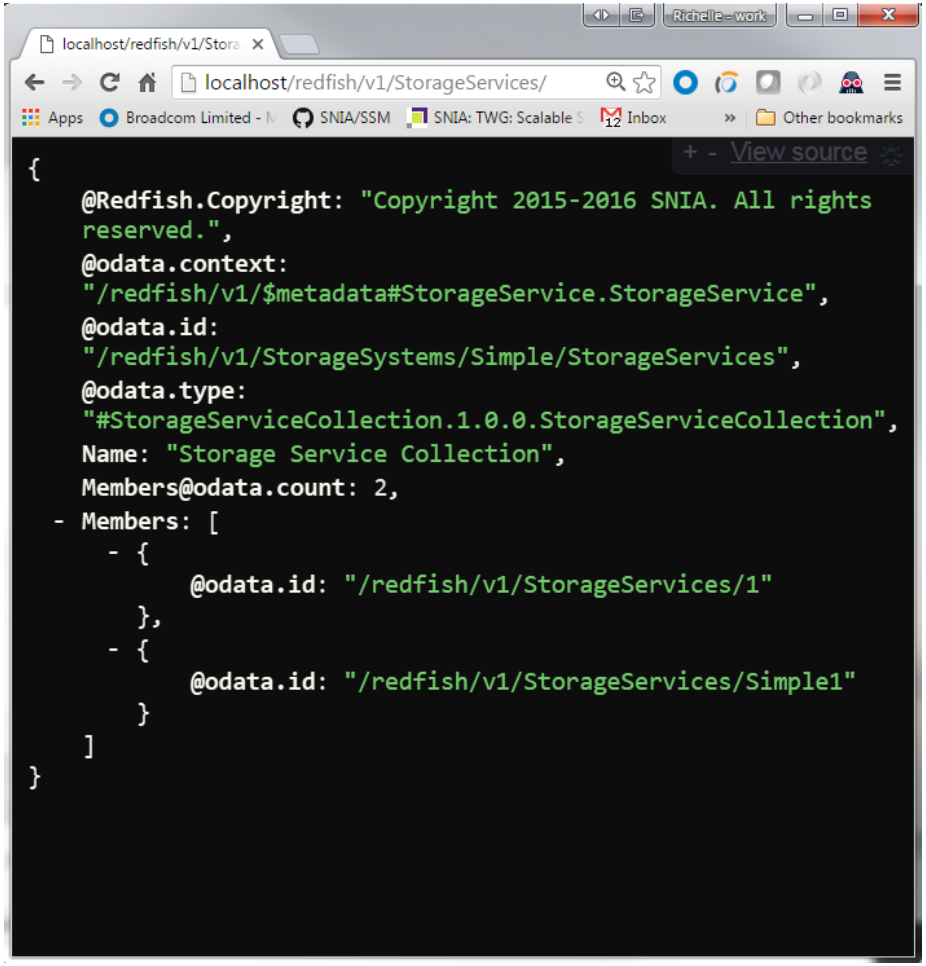
```
{
    @Redfish.Copyright: "Copyright Â© 2014-2015 Distributed Management Task
    Force, Inc. (DMTF). All rights reserved.",
    @odata.context: "/redfish/v1/$metadata#ServiceRoot",
    @odata.id: "/redfish/v1/",
    @odata.type: "#ServiceRoot.1.0.0.ServiceRoot",
    Id: "RootService",
    Name: "Root Service",
    RedfishVersion: "1.0.0",
    UUID: "92384634-2938-2342-8820-489239905423",
  - Systems: {
        @odata.id: "/redfish/v1/Systems"
    },
  - StorageSystems: {
        @odata.id: "/redfish/v1/StorageSystems"
    },
  - StorageServices: {
        @odata.id: "/redfish/v1/StorageServices"
    },
  - Chassis: {
        @odata.id: "/redfish/v1/Chassis"
    },
  - Managers: {
        @odata.id: "/redfish/v1/Managers"
    },
  - Tasks: {
        @odata.id: "/redfish/v1/TaskService"
    },
  - SessionService: {
        @odata.id: "/redfish/v1/SessionService"
    },
  - AccountService: {
        @odata.id: "/redfish/v1/AccountService"
```

Navigating through the Mockups…

- Select the ….[/redfish/v1/Storage/Services](#) link to see the “Collection” of Storage Services

- Click the “[…/StorageServices/Simple](#)” link to see the details of the Simple mockup or …

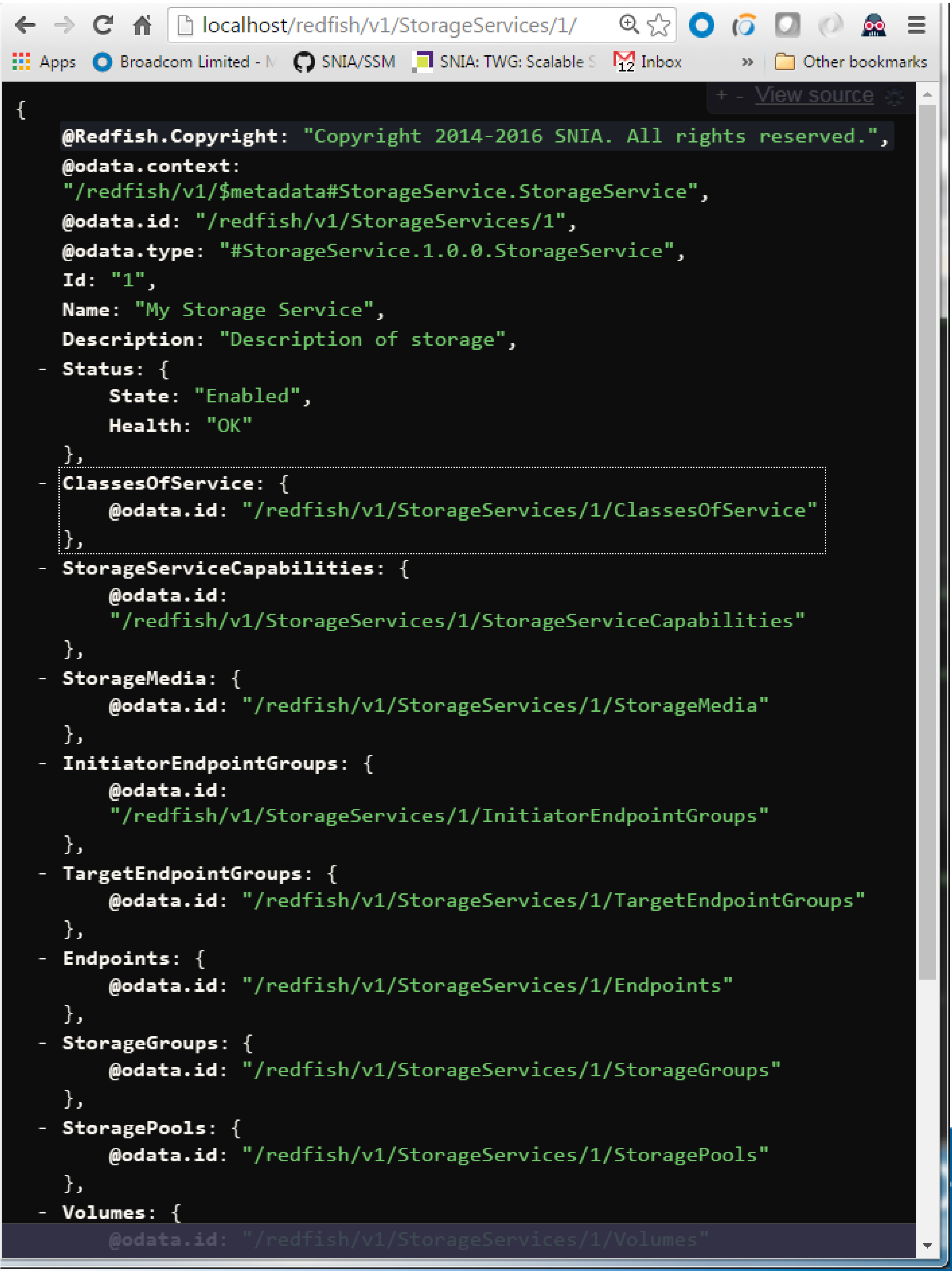
  “[…/StorageServices/1](#)” to see the details of the complex storage service mockup



```
{
    @Redfish.Copyright: "Copyright 2015-2016 SNIA. All rights
    reserved.",
    @odata.context:
    "/redfish/v1/$metadata#StorageService.StorageService",
    @odata.id:
    "/redfish/v1/StorageSystems/Simple/StorageServices",
    @odata.type:
    "#StorageServiceCollection.1.0.0.StorageServiceCollection",
    Name: "Storage Service Collection",
    Members@odata.count: 2,
  - Members: [
      - {
            @odata.id: "/redfish/v1/StorageServices/1"
        },
      - {
            @odata.id: "/redfish/v1/StorageServices/Simple1"
        }
    ]
}
```

What's in a Storage Service?

- Available Classes Of Service
- Volumes
- Pools
- Groups
- Endpoints
- Media (drives)



```
{
    @Redfish.Copyright: "Copyright 2014-2016 SNIA. All rights reserved.",
    @odata.context:
    "/redfish/v1/$metadata#StorageService.StorageService",
    @odata.id: "/redfish/v1/StorageServices/1",
    @odata.type: "#StorageService.1.0.0.StorageService",
    Id: "1",
    Name: "My Storage Service",
    Description: "Description of storage",
  - Status: {
        State: "Enabled",
        Health: "OK"
    },
  - ClassesOfService: {
        @odata.id: "/redfish/v1/StorageServices/1/ClassesOfService"
    },
  - StorageServiceCapabilities: {
        @odata.id:
        "/redfish/v1/StorageServices/1/StorageServiceCapabilities"
    },
  - StorageMedia: {
        @odata.id: "/redfish/v1/StorageServices/1/StorageMedia"
    },
  - InitiatorEndpointGroups: {
        @odata.id:
        "/redfish/v1/StorageServices/1/InitiatorEndpointGroups"
    },
  - TargetEndpointGroups: {
        @odata.id: "/redfish/v1/StorageServices/1/TargetEndpointGroups"
    },
  - Endpoints: {
        @odata.id: "/redfish/v1/StorageServices/1/Endpoints"
    },
  - StorageGroups: {
        @odata.id: "/redfish/v1/StorageServices/1/StorageGroups"
    },
  - StoragePools: {
        @odata.id: "/redfish/v1/StorageServices/1/StoragePools"
    },
  - Volumes: {
        @odata.id: "/redfish/v1/StorageServices/1/Volumes"
```

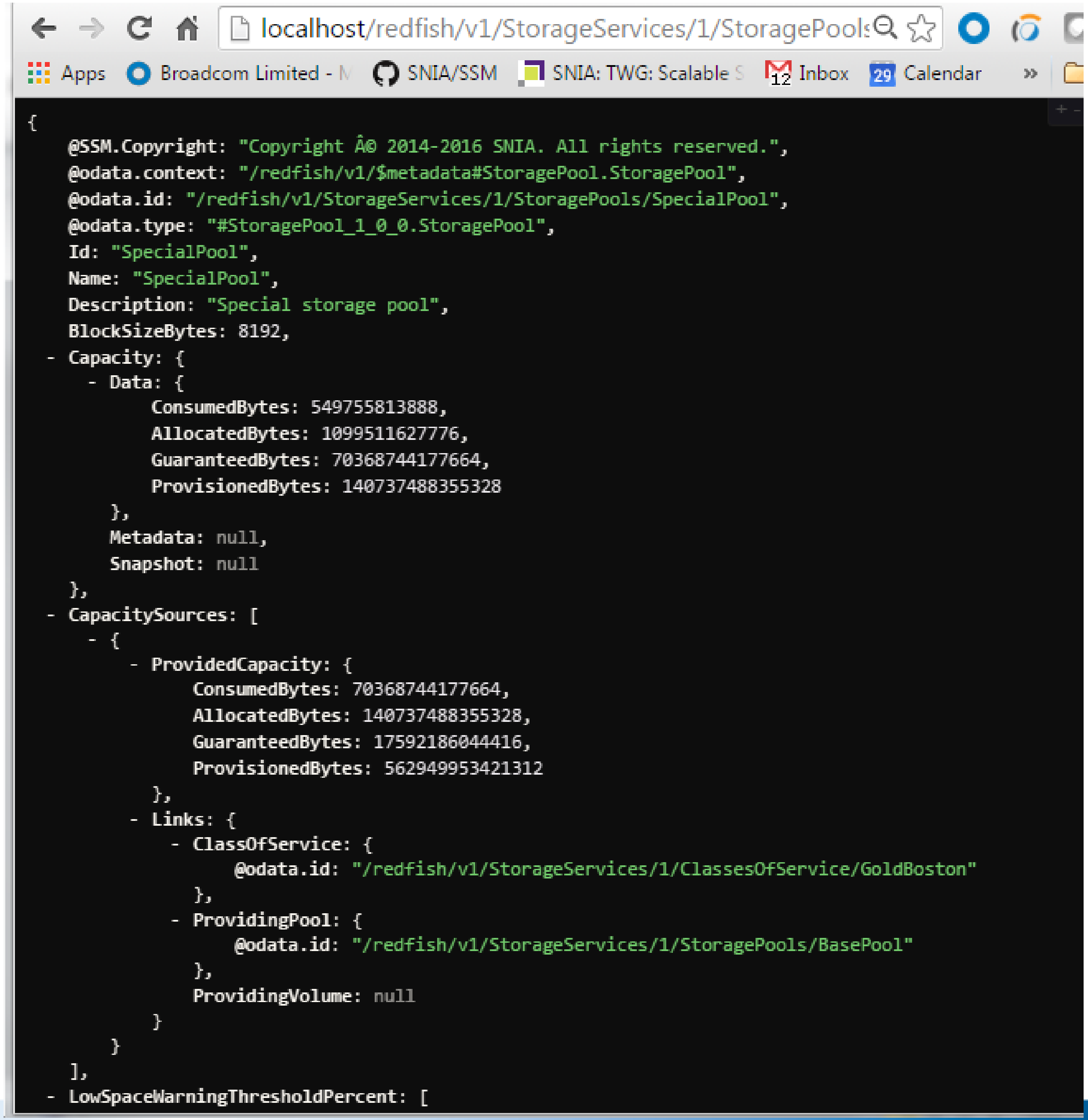
Discovery…

Let’s discover something:

- Do I have space to…?

Check the capacity in a storage pool

- Navigate down into one of the storage pools and check it’s remaining capacity



```
{
    @SSM.Copyright: "Copyright Â© 2014-2016 SNIA. All rights reserved.",
    @odata.context: "/redfish/v1/$metadata#StoragePool.StoragePool",
    @odata.id: "/redfish/v1/StorageServices/1/StoragePools/SpecialPool",
    @odata.type: "#StoragePool_1_0_0.StoragePool",
    Id: "SpecialPool",
    Name: "SpecialPool",
    Description: "Special storage pool",
    BlockSizeBytes: 8192,
  - Capacity: {
      - Data: {
            ConsumedBytes: 549755813888,
            AllocatedBytes: 1099511627776,
            GuaranteedBytes: 70368744177664,
            ProvisionedBytes: 140737488355328
        },
        Metadata: null,
        Snapshot: null
    },
  - CapacitySources: [
      - {
          - ProvidedCapacity: {
                ConsumedBytes: 70368744177664,
                AllocatedBytes: 140737488355328,
                GuaranteedBytes: 17592186044416,
                ProvisionedBytes: 562949953421312
            },
          - Links: {
              - ClassOfService: {
                    @odata.id: "/redfish/v1/StorageServices/1/ClassesOfService/GoldBoston"
                },
              - ProvidingPool: {
                    @odata.id: "/redfish/v1/StorageServices/1/StoragePools/BasePool"
                },
                ProvidingVolume: null
            }
        }
    ],
  - LowSpaceWarningThresholdPercent: [
```

Progress towards a Swordfish v1.0 Release

- v0.5 Work in Progress released March 2016
  - Initial WIP release
- v0.6 Work in Progress released May 2016
  - **Completed Block and start documentation:** Added active management and full provisioning including remote replication
  - Extension of Redfish simple storage
- v0.8 Work in Progress (July 2016)
  - **Seamless alignment with Redfish**: Capacity and Health Metrics, Add vendor extension model
  - File Systems, Object Drive
  - First draft of Specification and User’s Guide
- v1.0 Specification (September 2016)
  - **Final Specification sent to SNIA Technical Council**

Who is Developing Swordfish?

- SNIA Scalable Storage Management Technical Work Group (SSM TWG)
  - SSM is the group, Swordfish is the Spec
  - Provisional TWG formed in October 2015 to investigate / scope work
  - Scalable Storage Management (SSM) TWG chartered in December 2015
- Companies Engaged in Technical Development:
  - ***Broadcom***, Brocade, Compellent / ***Dell***, ***EMC***, Fujitsu, ***HPE***, Huawei, IBM, ***Inova***, ***Intel***, ***Microsoft***, NEC, ***NetApp***, Nimble Storage, Pure Storage, RedHat, SK Hynix, Tintri, Toshiba, VMTurbo, ***VMware*****,** WD

How to Participate

- Download the latest “Work in Progress” from the SNIA site:
  - http://www.snia.org/tech_activities/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

Q&A AND DISCUSSION