



# Introduction and Overview of Redfish

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# The Distributed Management Task Force

- ❑ An Industry Standards Organization
  - ❑ Developing manageability standards for 24 years (est. 1992)
  - ❑ Membership includes 65 companies and industry organizations
  - ❑ With active chapters in China and Japan
- ❑ Allied with
  - ❑ 14 standard development organizations (alliance partners)
  - ❑ 80+ universities and research organizations (academic alliance partners)
- ❑ Focused on manageability standards
  - ❑ For the management of on-platform, off-platform, network services and infrastructure domains
  - ❑ Standards are recognized nationally (ANSI/US) and internationally (ISO)



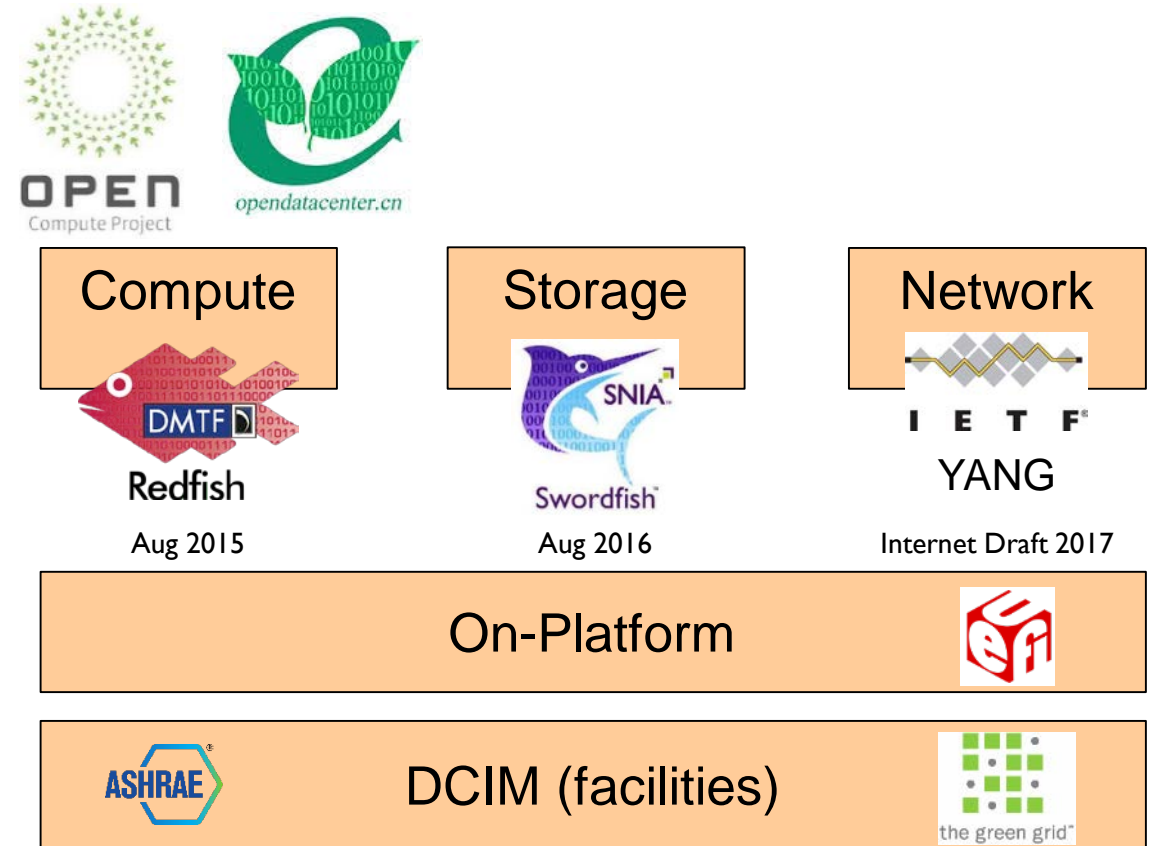
# Agenda

- ❑ Redfish - a modern manageability interface for the data center
- ❑ Why a new interface?
- ❑ Redfish capabilities
- ❑ The Redfish standard
  - ❑ A JSON Response
- ❑ Redfish Models
  - ❑ Compute, platform, storage, network models
  - ❑ PCIe and memory model
- ❑ Redfish tool-chain
- ❑ Public Redfish collateral



# "Redfish – a modern interface for managing the data center"

- ❑ A RESTful interface
  - ❑ To manage compute, storage, network and DCIM
  - ❑ Leverages existing Internet standards and tool chains
  - ❑ Usable by professions and amateurs
- ❑ Resource models for managing
  - ❑ Common platform manageability
  - ❑ (Power, thermal, cooling, inventory, reboot, firmware update, get telemetry, etc.)
  - ❑ Domain specific capabilities



DCIM = Data Center Infrastructure Management



# Redfish: Why a New Interface?



- ❑ Market shifting to scale-out solutions
  - ❑ Datacenters have a sea of simple servers and multi-node servers
  - ❑ Customers exhausting the functionality of current manageability interfaces
- ❑ Customers asked for a modern interface
  - ❑ Single simple interface for managing all datacenter platforms and devices
  - ❑ An interface which uses cloud/web protocols, structures, security models and tool chains
  - ❑ Schemas to allow introspect of interface and programmatic enablement

**HTTP**

```
HTTP GET https://<ip_addr>/redfish/v1/Systems/CS_1
```

**Python  
code**

```
rawData = urllib.urlopen('https://<ip_addr>/redfish/v1/Systems/CS_1')  
jsonData = json.loads(rawData)  
print( jsonData['SerialNumber'] )
```

**Output**

```
1A87CA442K
```

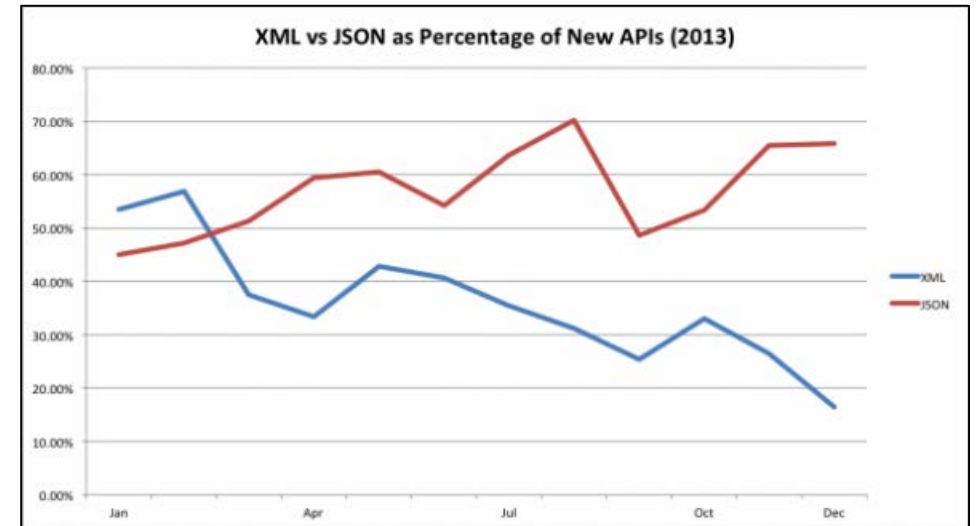
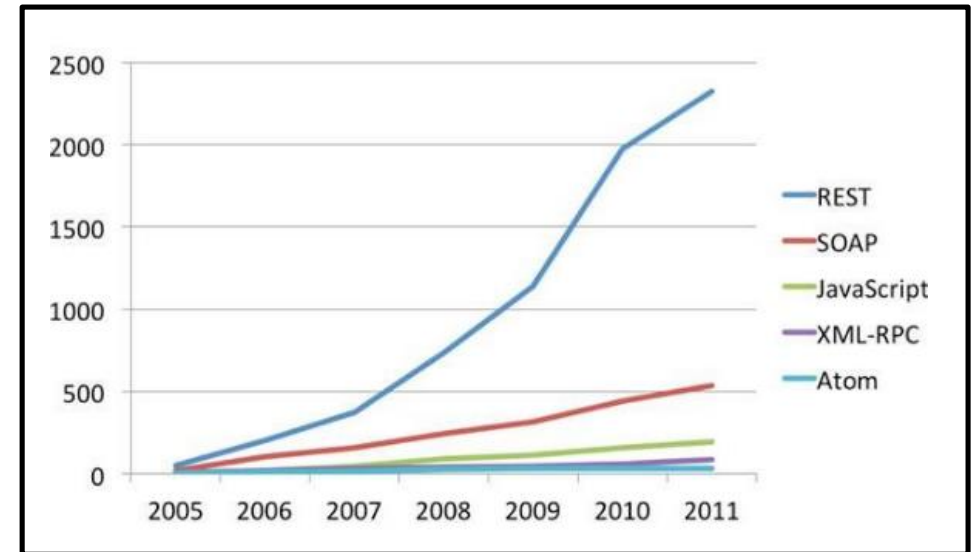


# Why HTTP and JSON?

- HTTP(S): The Web protocol
  - Well-understood by IT admin
  - Known security model
  - Known network configuration
- JSON: A modern data format
  - Human-readable
  - Simpler than XML
  - Modern language support (json-schema)
- For manageability, IT can use their
  - Existing DEV/OPS skill set
  - Tool chain ecosystem

<http://www.infoq.com/articles/rest-soap>

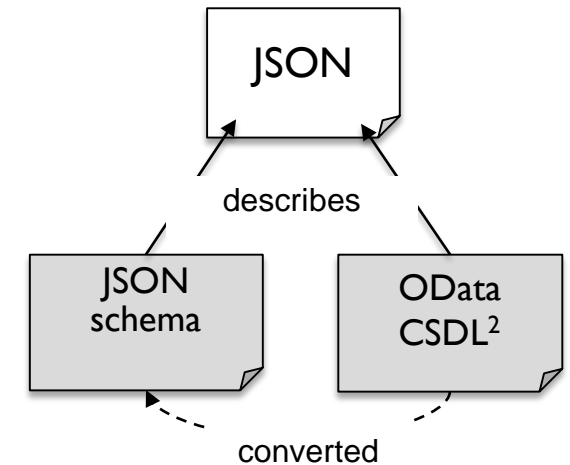
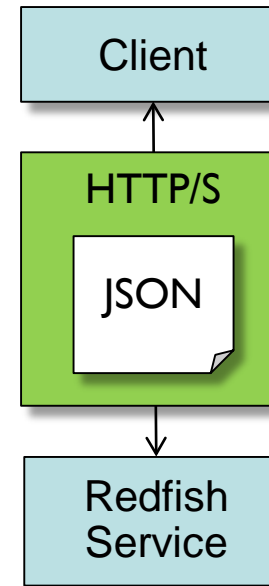
<http://www.programmableweb.com/news/jsons-eight-year-convergence-xml/2013/12/26>



# The Redfish Standard



- ❑ Redfish is composed of
  - ❑ Interface definition
  - ❑ Model schema
- ❑ Redfish Interface (RESTful)
  - ❑ HTTP/HTTPS - protocol
  - ❑ JSON – format of content
- ❑ Redfish Models and Schema
  - ❑ Schema format for JSON
  - ❑ DMTF publishes the models for platforms and compute/servers



<sup>1</sup>OData is an OASIS Standard

<sup>2</sup>CSDL = Common Schema Definition Language



# Redfish Capabilities



## Chassis Information

- Identification and asset information
- State and status
- Temperature sensors and fans
- Power supply, power consumption and thresholds
- Set power thresholds

## Compute Manageability

- Reboot and power cycle server
- Configure BIOS settings
- Change boot order and device
- Update BIOS and firmware
- Memory and NVDIMMs
- Local network interface
- Local storage
- State and status

## Management Infrastructure

- View / configure BMC network settings
- Manage local BMC user accounts
- Configure serial console access (e.g. SSH)

## Discovery

- Physical hierarchy (rack/chassis/server/node)
- Compute service (servers)
- Management hierarchy (rack mgr, tray mgr, BMC)

## Security

- Use HTTPS
- Map roles to privileges

## Access and Notification

- Subscribe to published events
- Inspect Logs
- Access via host interface

## Composition

- Specific composition
- Enumerated composition





# JSON response

HTTP GET /redfish/v1/Systems/CS\_1

- ❑ Redfish is hyper-media
  - ❑ Cannot presume a resource hierarchy

Simple properties

Complex properties

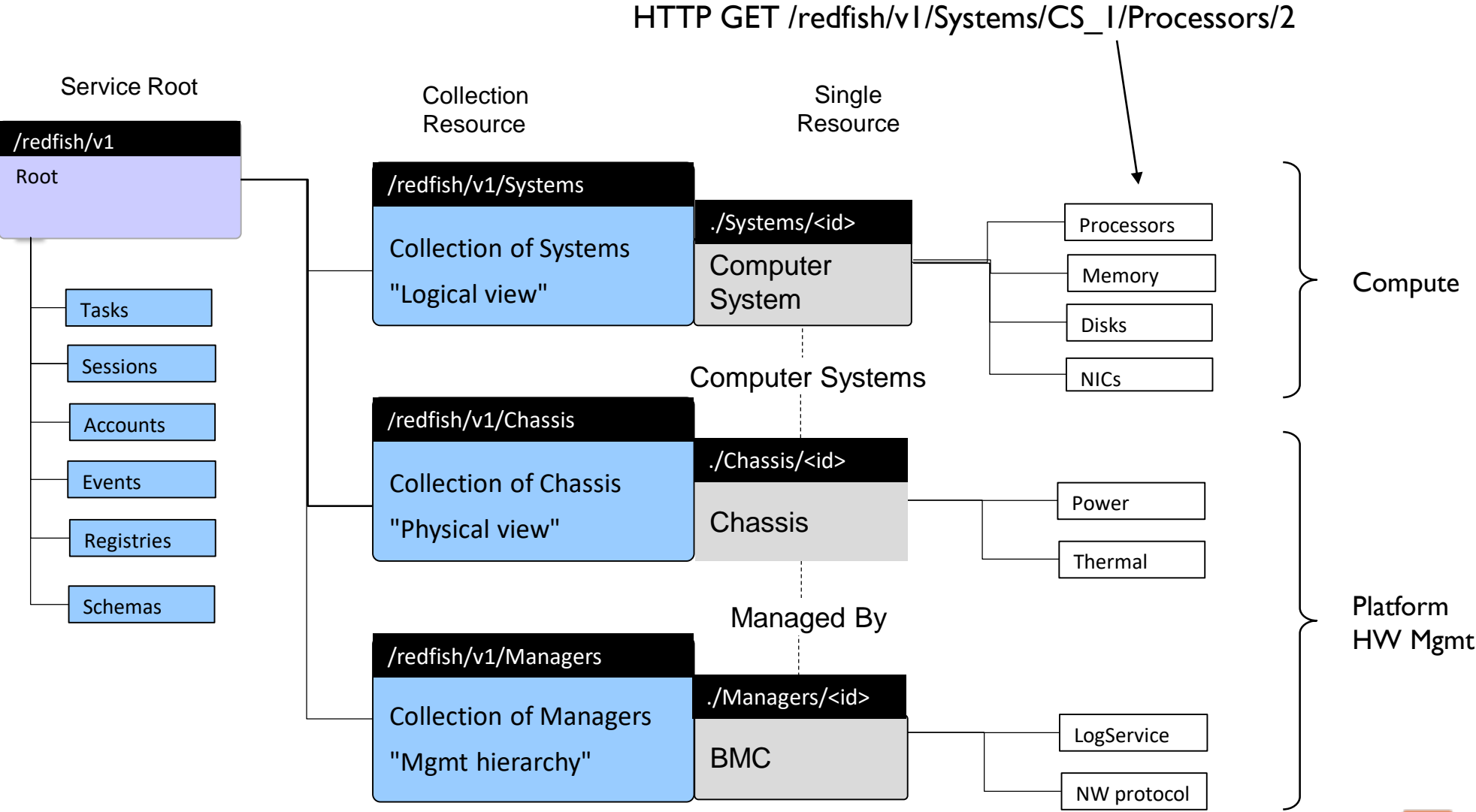
Subordinate resources

Associated resources

Actions

```
{
  "@odata.context": "/redfish/v1/$metadata#ComputerSystem.ComputerSystem",
  "@odata.id": "/redfish/v1/Systems/CS_1",
  "Id": "CS_1",
  "Name": "My Computer System",
  "SystemType": "Physical",
  "AssetTag": "free form asset tag",
  "Manufacturer": "Manufacturer Name",
  "Model": "Model Name",
  "SerialNumber": "2M220100SL",
  "PartNumber": "",
  "Description": "Description of server",
  "UUID": "00000000-0000-0000-0000-000000000000",
  "HostName": "web-srv344",
  "IndicatorLED": "Off",
  "PowerState": "On",
  "BiosVersion": "P79 v1.00 (09/20/2013)",
  "Status": { "State": "Enabled", "Health": "OK", "HealthRollup": "OK" },
  "Boot": { ... },
  "ProcessorSummary": { ... },
  "MemorySummary": { ... },
  "TrustedModules": [ { ... } ],
  "Processors": { "@odata.id": "/redfish/v1/Systems/CS_1/Processors" },
  "Memory": { "@odata.id": "/redfish/v1/Systems/CS_1/Memory" },
  "EthernetInterfaces": { "@odata.id": "/redfish/v1/Systems/CS_1/EthernetInterfaces" },
  "SimpleStorage": { "@odata.id": "/redfish/v1/Systems/CS_1/SimpleStorage" },
  "LogServices": { "@odata.id": "/redfish/v1/Systems/CS_1/LogServices" },
  "SecureBoot": { "@odata.id": "/redfish/v1/Systems/CS_1/SecureBoot" },
  "Bios": { "@odata.id": "/redfish/v1/Systems/CS_1/Bios" },
  "PCleDevices": [ { "@odata.id": "/redfish/v1/Chassis/CS_1/PCleDevices/NIC" } ],
  "PCleFunctions": [ { "@odata.id": "/redfish/v1/Chassis/CS_1/PCleDevices/NIC/Functions/1" } ],
  "Links": {
    "Chassis": [ { "@odata.id": "/redfish/v1/Chassis/Ch_1" } ],
    "ManagedBy": [ { "@odata.id": "/redfish/v1/Managers/Mgr_1" } ],
    "Endpoints": [ { "@odata.id": "/redfish/v1/Fabrics/PCle/Endpoints/HostRootComplex1" } ],
  },
  "Actions": {
    "#ComputerSystem.Reset": {
      "target": "/redfish/v1/Systems/CS_1/Actions/ComputerSystem.Reset",
      "@Redfish.ActionInfo": "/redfish/v1/Systems/CS_1/ResetActionInfo"
    }
  }
}
```

# Redfish Model – Compute and Platform



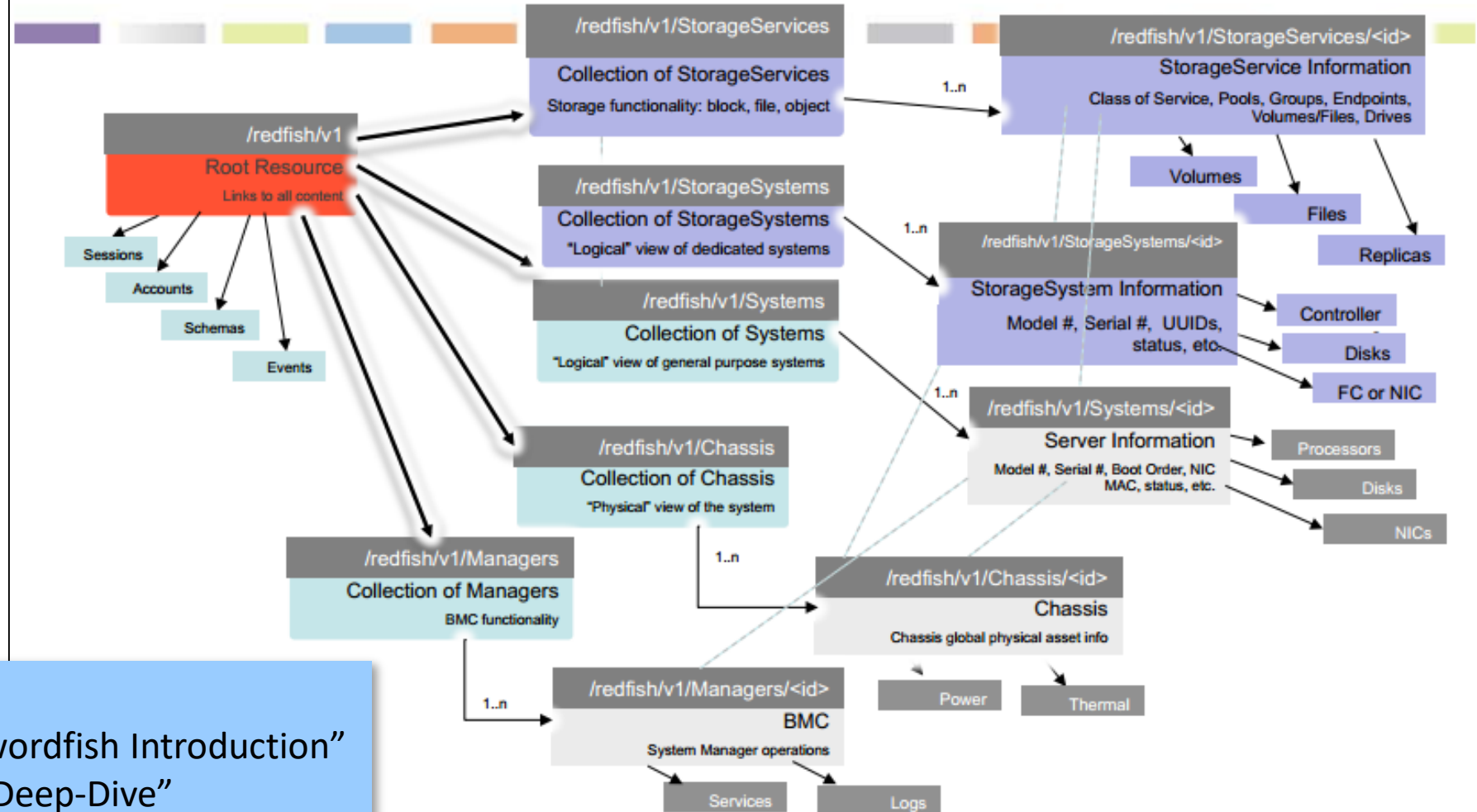
# Storage Model

- ❑ Reuses chassis model
- ❑ Adds StorageServices & StorageSystems

## Other SDC sessions

“Dip your Toe in the Water: A Swordfish Introduction”  
“Deep Sea Fishing: A Swordfish Deep-Dive”

## Adding Storage to Redfish: Swordfish

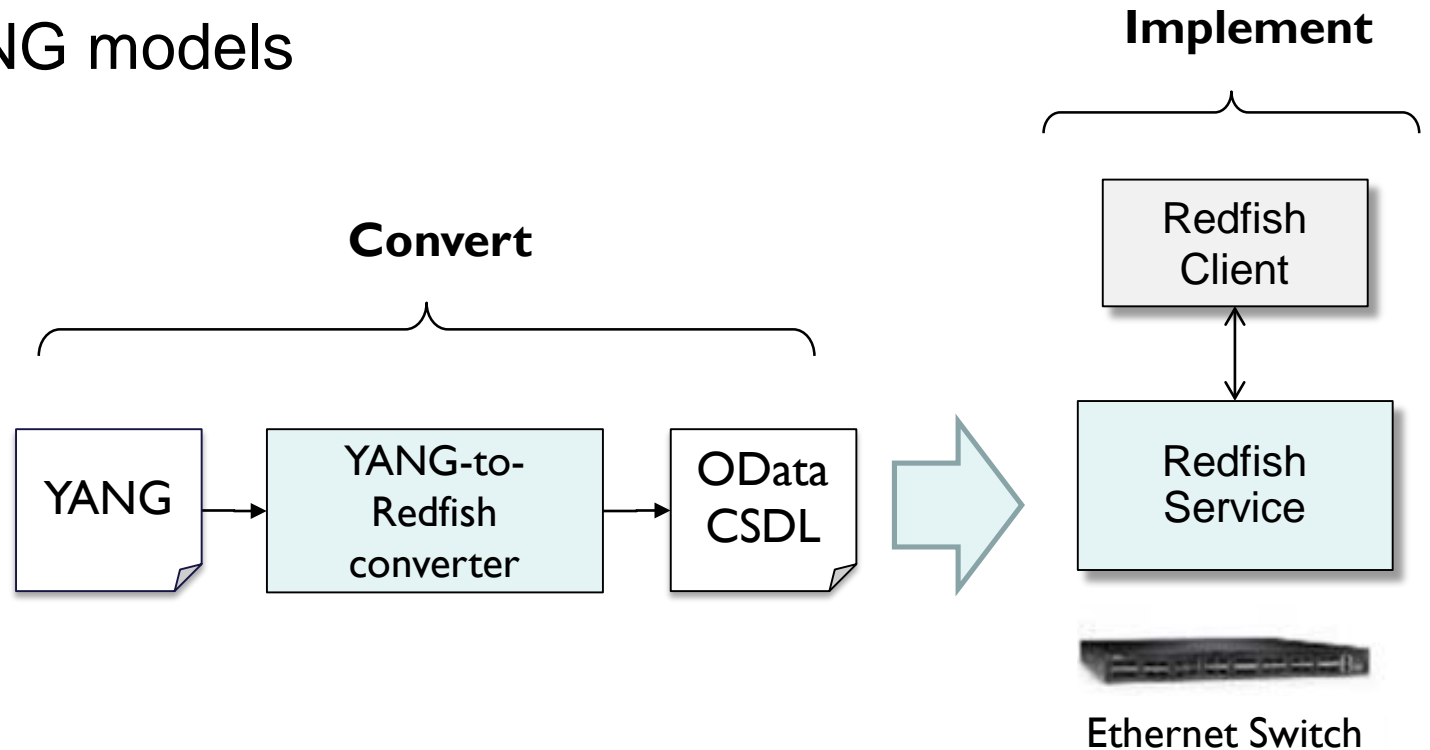


# Network Model – Convert from YANG models

- ✓ Phase 1 - convert a small set of YANG models to Redfish models
  - ▮ Proves out the process, and validates the converter
- ▣ Phase 2 – larger list of YANG models

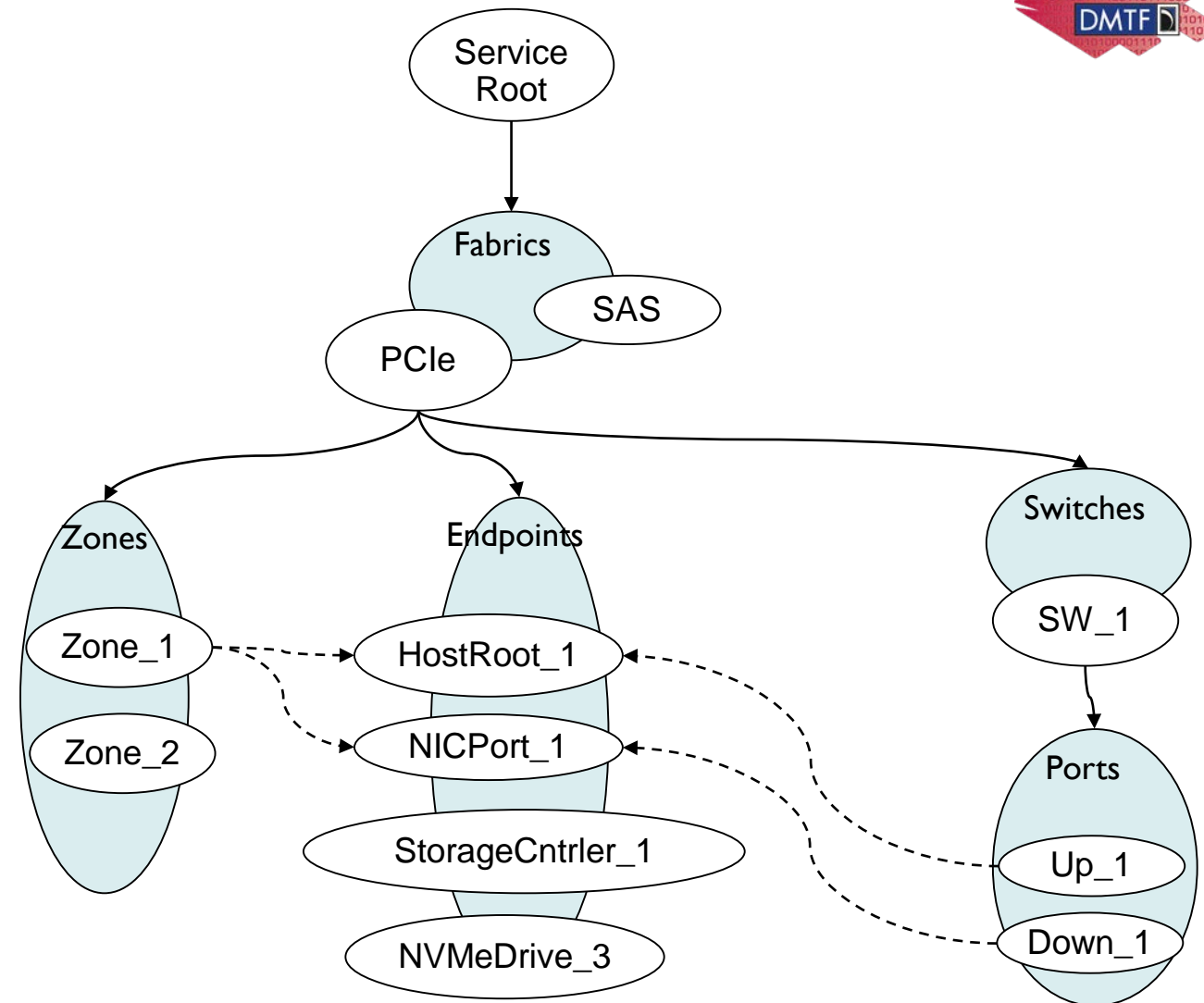
## Ethernet Switch (Phase I)

- RFC6991 (YANG types)
- RFC7223 (Interfaces)
- RFC7224 (IANA Interface types)
- RFC7277 (IPv4 and IPv6)
- RFC7317 (system, system\_state, platform, clock, ntp)



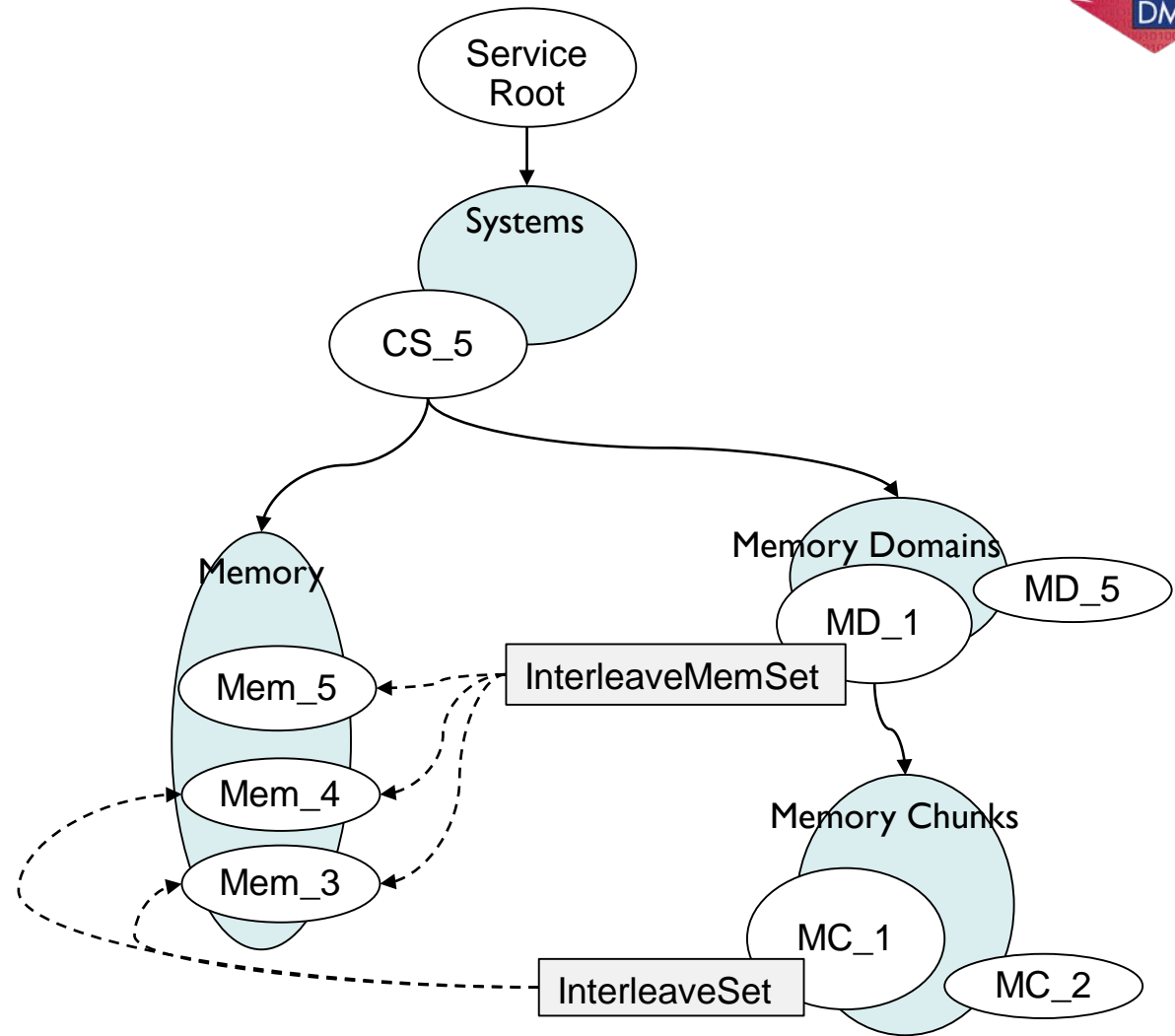
# PCIe Model

- ❑ The Fabric model is use to model PCIe, SAS, and other Fabrics.
- ❑ A fabric includes collections of zones, endpoints and switches
- ❑ A switch include a collection of ports
- ❑ Fabric mockups exist for PCIe, PCIeMesh and ComplexPCIe

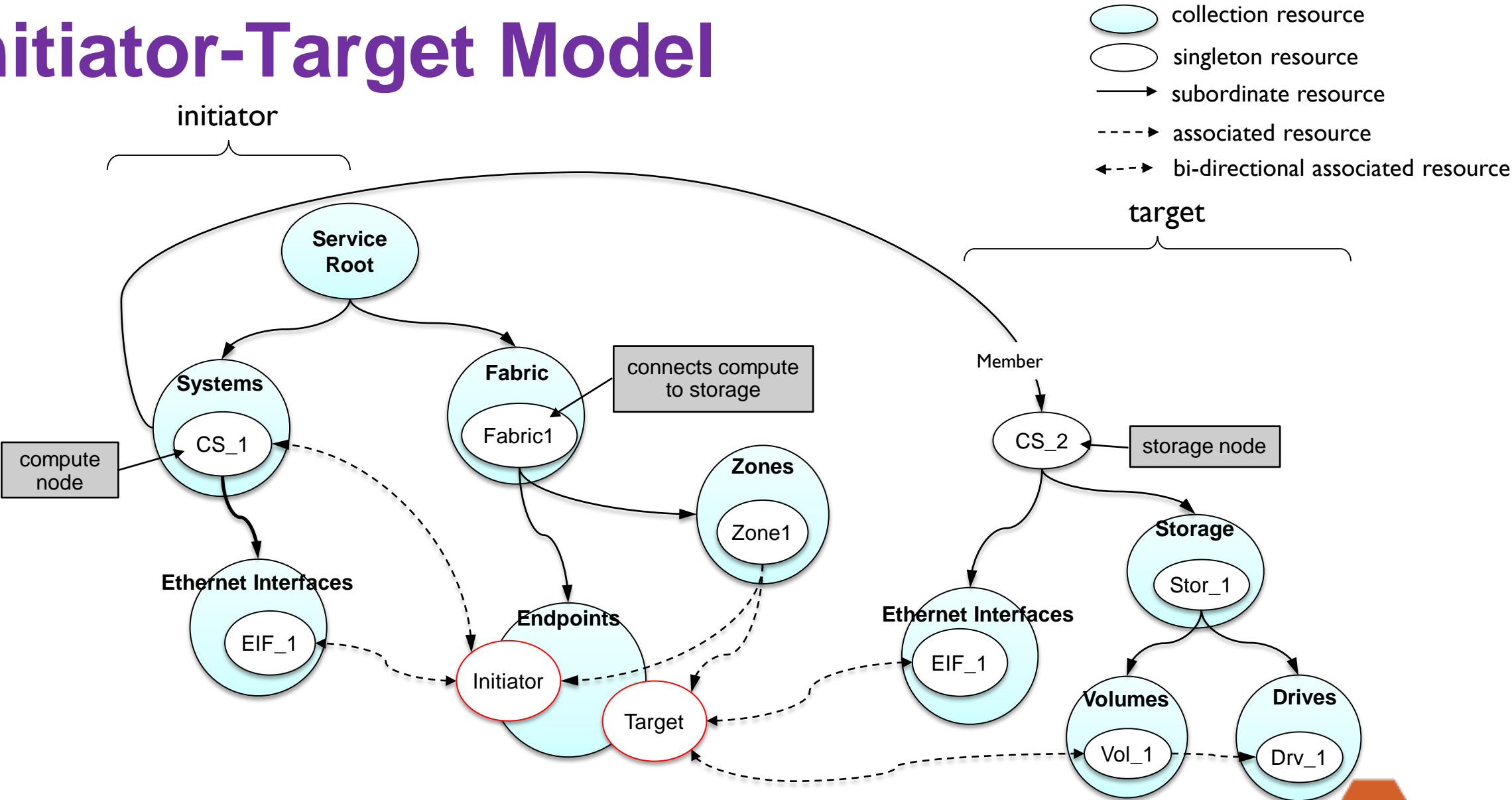


# Memory Model

- ❑ A computer system has physical memory
- ❑ A computer system may have memory domains
  - ❑ Each memory domains can be interleaved memory sets and memory chunks
  - ❑ Each memory chunks may have interleaved sets

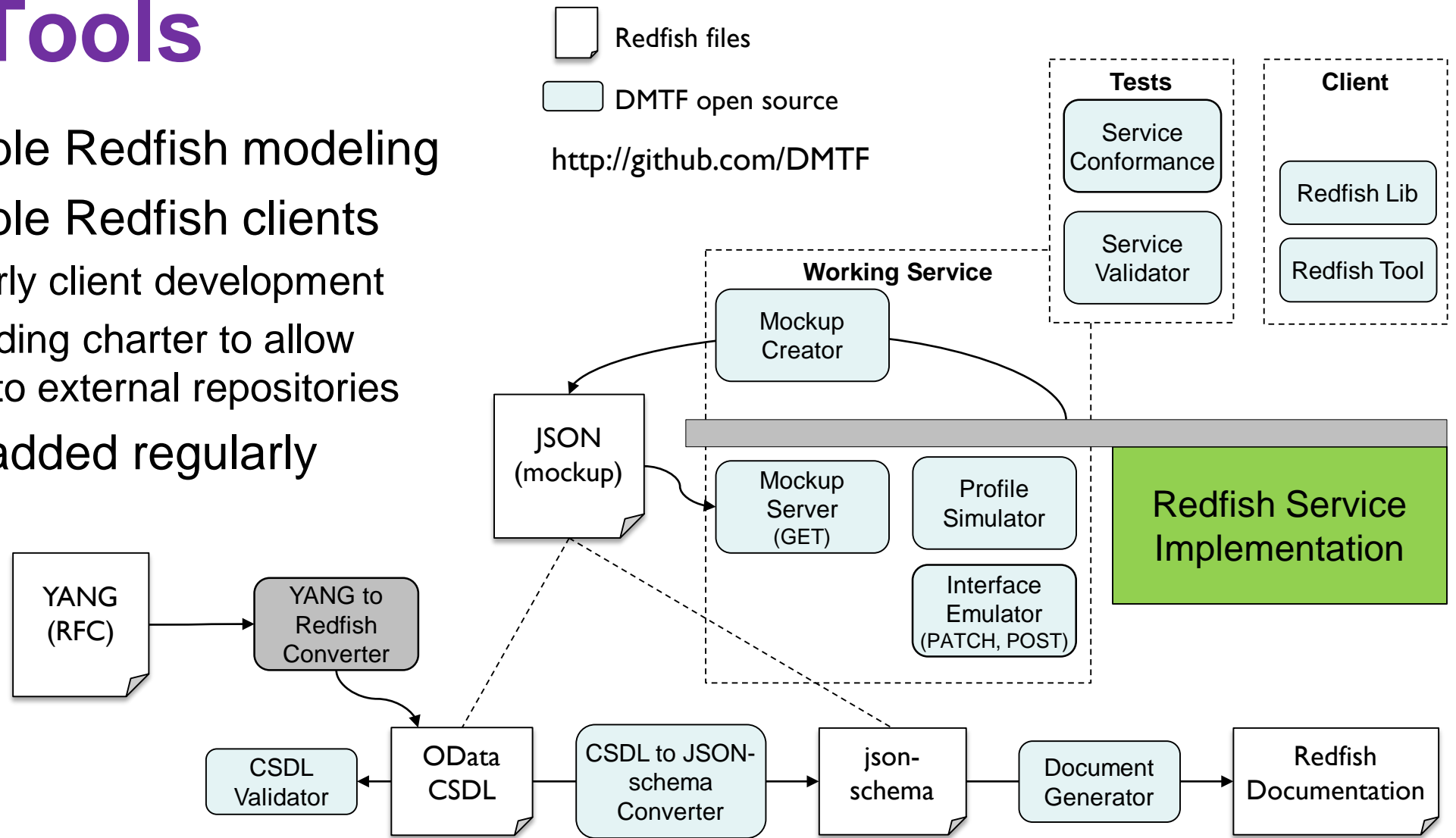


# Initiator-Target Model



# Redfish Tools

- ❑ Tools to enable Redfish modeling
- ❑ Tools to enable Redfish clients
  - ▣ Ability for early client development
  - ▣ DMTF extending charter to allow contribution to external repositories
- ❑ Tools being added regularly





# Public Redfish Collateral

- ❑ Github
- ❑ Community Forum
- ❑ Developer's Hub
- ❑ Specs, presentation
- ❑ Redfish Forum (SPMF)

github.com/DMTF  
redfishforum.com  
redfish.dmtf.org  
dmtof.org/standards/redfish  
dmtof.org/standards/spmf



Redfish Specification Forum				
Home Help Search Welcome Guest. Please <a href="#">Login</a> or <a href="#">Register</a> .				
Redfish Specification Forum > Home				
News Welcome to our new forum!				
Specification, Protocol, Schema and Payloads				
Board	Threads	Posts	Last Post	
<b>Protocol and Specification</b> Discussion about the Redfish Specification and the RESTful HTTP protocol. <small>Moderator: Admin</small>	1	2	Retrieving individual properties by j2hilland Sep 12, 2016 at 7:42am	
<b>CSDL and json-schema</b> Discussion about the contents of the standard Redfish schemas, and the published CSDL (XML) or json-schema definition files	1	2	How to use the Location property under Resource ? by mraimeri Aug 12, 2016 at 6:33am	
<b>Feature Requests</b> Requests to add features to the Redfish Specification, make additions to existing Schema, or to create a new Schema.	1	2	Creating a webinterface/KVM-over-IP session for user by jautor Aug 12, 2016 at 6:33am	

DISTRIBUTED MANAGEMENT TASK FORCE, INC.  
**Redfish™ Developer Hub**

Home Mockups About the Redfish API

### Welcome to the Redfish Developer Hub

DMTF's Redfish™ API is an open industry standard specification and schema that helps enable simple and secure management of modern scalable platform hardware. By specifying a RESTful interface and utilizing JSON and OData, Redfish helps customers integrate solutions within their existing tool chains. An aggressive development schedule is quickly advancing Redfish toward its goal of addressing all the components in the data center with a consistent API.

**Welcome Developers**

The DMTF's Redfish Developer Hub is a one-stop, in-depth technical resource – by developers, for developers – designed to provide all the files, tools, community support, tutorials and other advanced education you may need to help you use Redfish.

DISTRIBUTED MANAGEMENT TASK FORCE, INC.  
**Redfish Resource Explorer**

Home Mockup About the Redfish API

### Development Mockup

Explore the Resources Normative requirements Mockup Theme Login

Main Systems Chassis Managers Task Service Session Service Account Service Event Service JsonSchemas

```
redfish > v1 > Systems > 1
{"@Redfish.Copyright": "Copyright \u00a9 2014-2015 Distributed Management Task Force, Inc. (DMTF). All rights reserved.",
"@odata.context": "/redfish/v1/$metadata#Systems/Members/Entity",
"@odata.id": "/redfish/v1/Systems/1",
"@odata.type": "#ComputerSystem.1.0.0.ComputerSystem",
"Id": "1",
"Name": "My Computer System",
"SystemType": "Physical",
"AssetTag": "Free form asset tag",
"Manufacturer": "Manufacturer Name",
"Model": "Model Name",
"SKU": "",
"SerialNumber": "2M220100BL",
"PartNumber": "",
"Description": "Description of server",
"UUID": "00000000-0000-0000-0000-000000000000"}
```

SDC 17

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17

# Summary

- ❑ Redfish has rapidly established itself as the modern interface for data center management
  - ❑ Rapid advances in the interface with multiple schema releases
  - ❑ Expediting the tool-chain for extensions and usage
- ❑ The industry have reacted favorably (standards orgs, companies)
  - ❑ Alliance partnerships with SNIA, UEFI, OCP, The Green Grid, ASHRAE
- ❑ Academic research is underway (academic alliance partner members)
  - ❑ Texas Tech University - Cloud and Autonomic Computing Center
  - ❑ Barcelona Supercomputing Center



**Thank you**