Introduction and Overview of Redfish

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The Distributed Management Task Force

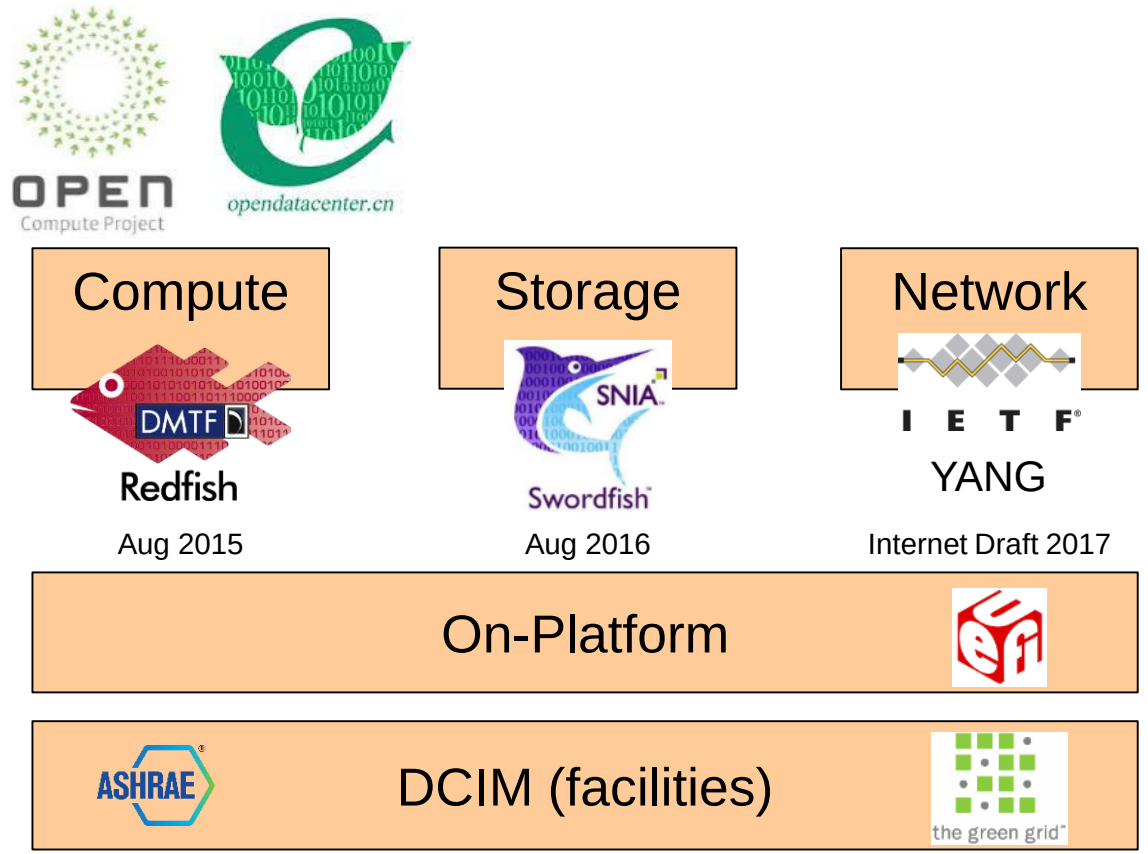
- An Industry Standards Organization
  - Developing manageability standards for 24 years (est. 1992)
  - Membership includes 65 companies and industry organizations
  - With active chapters in China and Japan
- Allied with
  - 14 standard development organizations (alliance partners)
  - 80+ universities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

Agenda

- Redfish - a modern manageability interface for the data center
  - Why a new interface?
  - Redfish capabilities
  - Elements of the Redfish standard
  - A JSON Response
- Redfish manageability models
  - Server/Compute model
  - Storage model
  - Network Device model
- Redfish tools
  - The conformance tool chain and OCP

"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

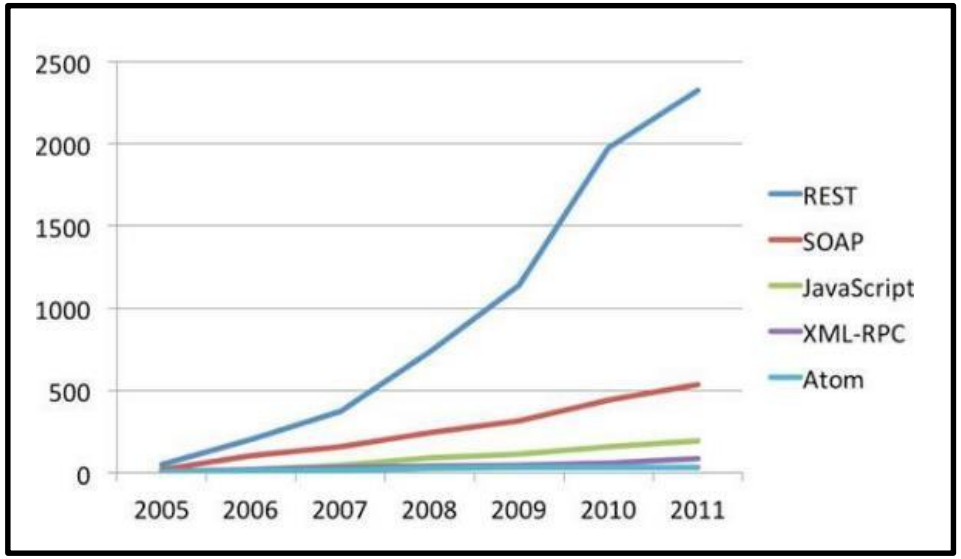
```
rawData = urllib.urlopen('https://<ip_addr>/redfish/v1/Systems/CS_1'
jsonData = json.loads(rawData)
print( jsonData['SerialNumber'] )
```

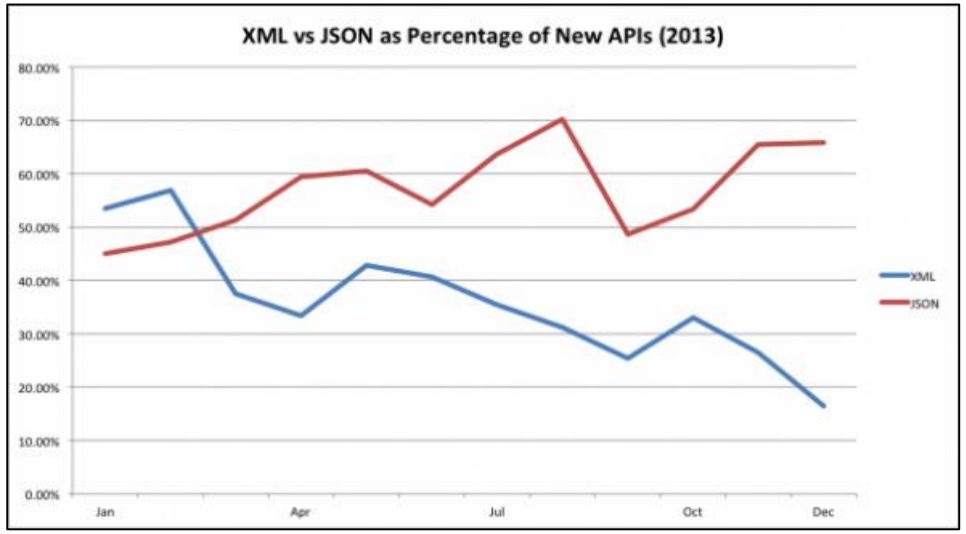
Output

```
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

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

Composition
- Specific composition
- Enumerated composition

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

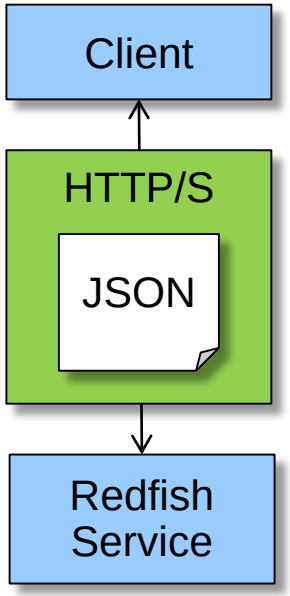
Discovery
- Physical hierarchy (rack/chassis/server/node)
- Compute service (servers)
- Management hierarchy (rack mgr, tray mgr, BMC)

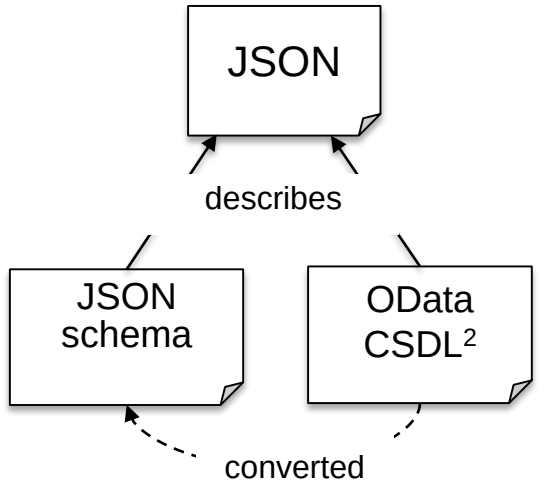
Security
- Use HTTPS
- Map roles to privileges

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

The Redfish Standard

- Redfish is composed of
  - An Interface definition
  - Various Model schema
- Redfish Interface (RESTful)
  - HTTP/HTTPS - protocol
  - JSON – format of content
- Redfish Models and Schema
  - Schema format for JSON responses
  - DMTF publishes the models for platforms and compute/servers
    - Other standard bodies can publish their own





[1]OData is an OASIS Standard
[2]CSDL = Common Schema Definition Language

JSON response

HTTP GET /redfish/v1/Systems/CS_1

Note

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

Simple properties

Complex properties

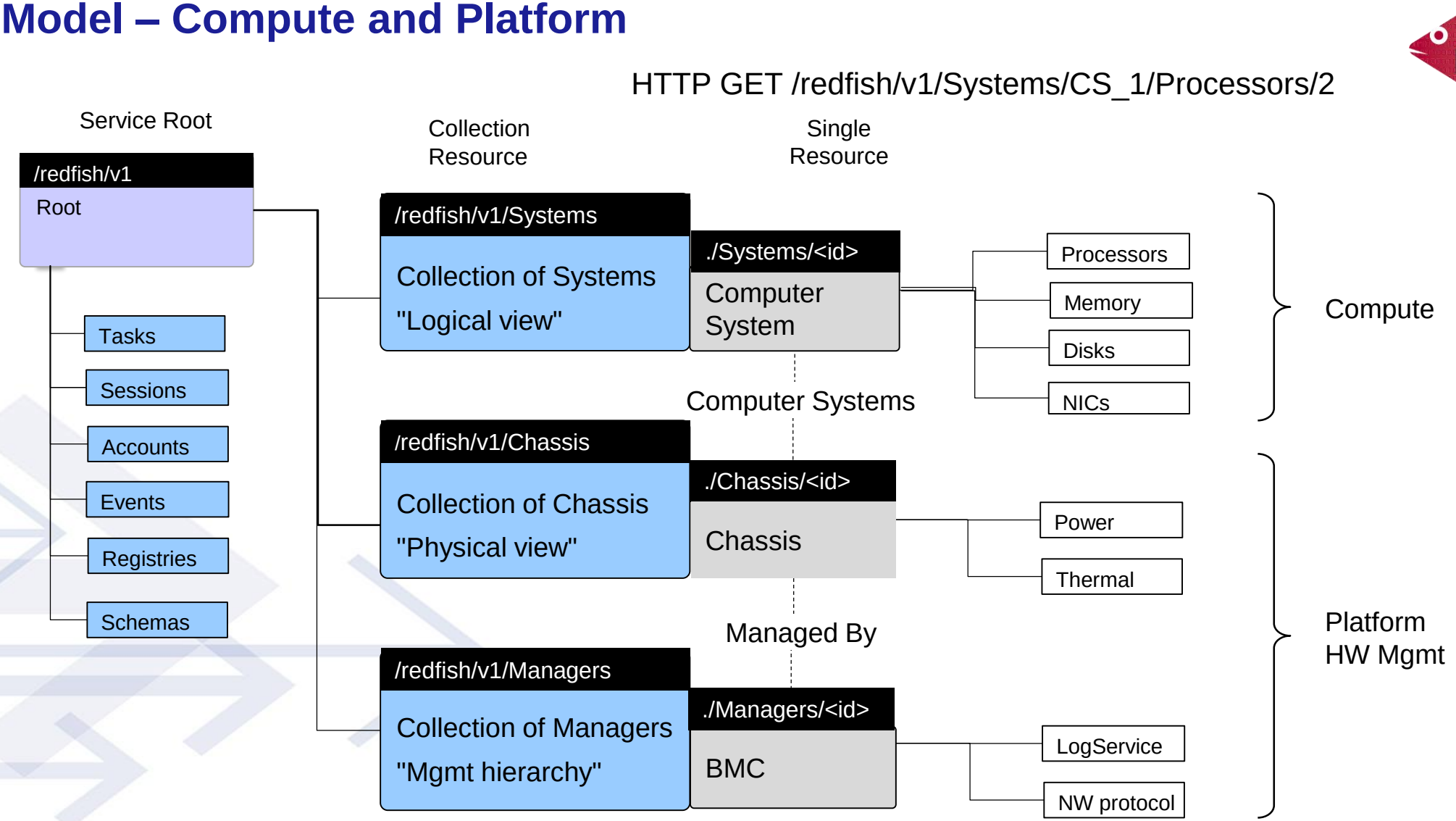
Subordinate resources

Associated resources

Actions

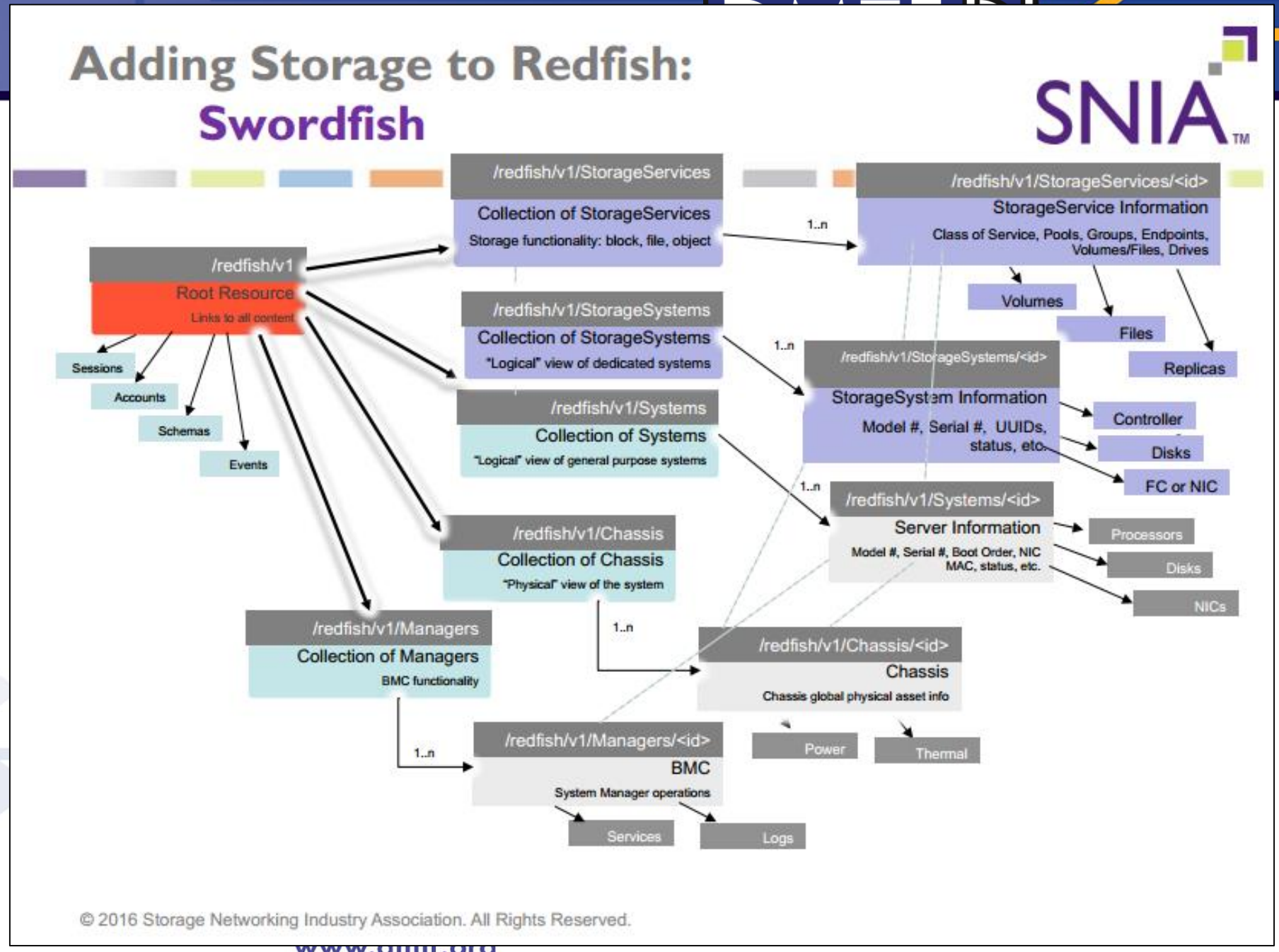

```
{
   "@odata.context": "/redfish/v1/$metadata#ComputerSystem.ComputerSystem",
   "@odata.id": "/redfish/v1/Systems/CS_1",
   "Id": "CS_1",
   "Name": "My Computer System",
   "SystemType": "Physical",
   "AssetTag": "free form asset tag",
   "Manufacturer": "Manufacturer Name",
   "Model": "Model 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" },
   "PCIeDevices":         [ {"@odata.id": "/redfish/v1/Chassis/CS_1/PCIeDevices/NIC"} ],
   "PCIeFunctions":       [ {"@odata.id": "/redfish/v1/Chassis/CS_1/PCIeDevices/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/PCIe/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

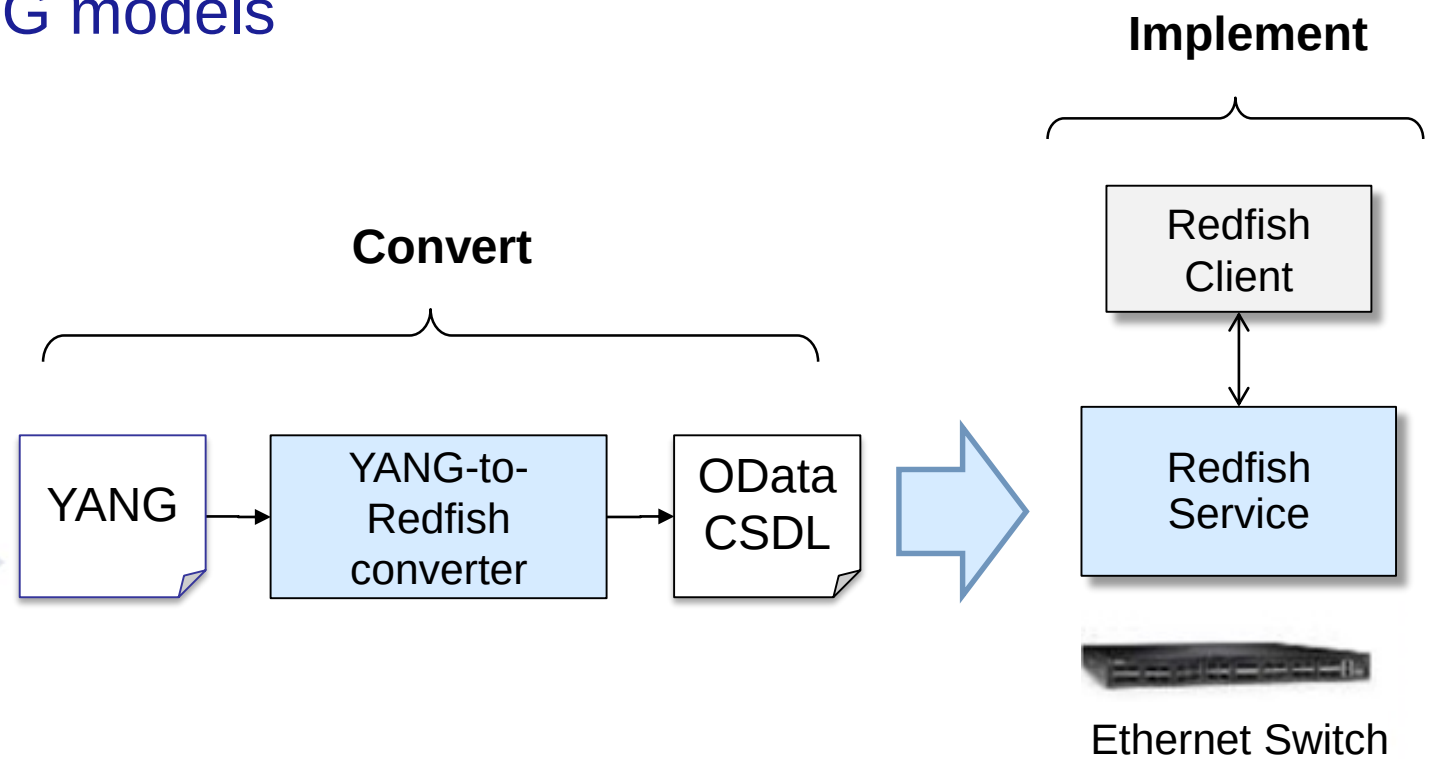


Network Model – Convert from YANG models

- ✓ 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

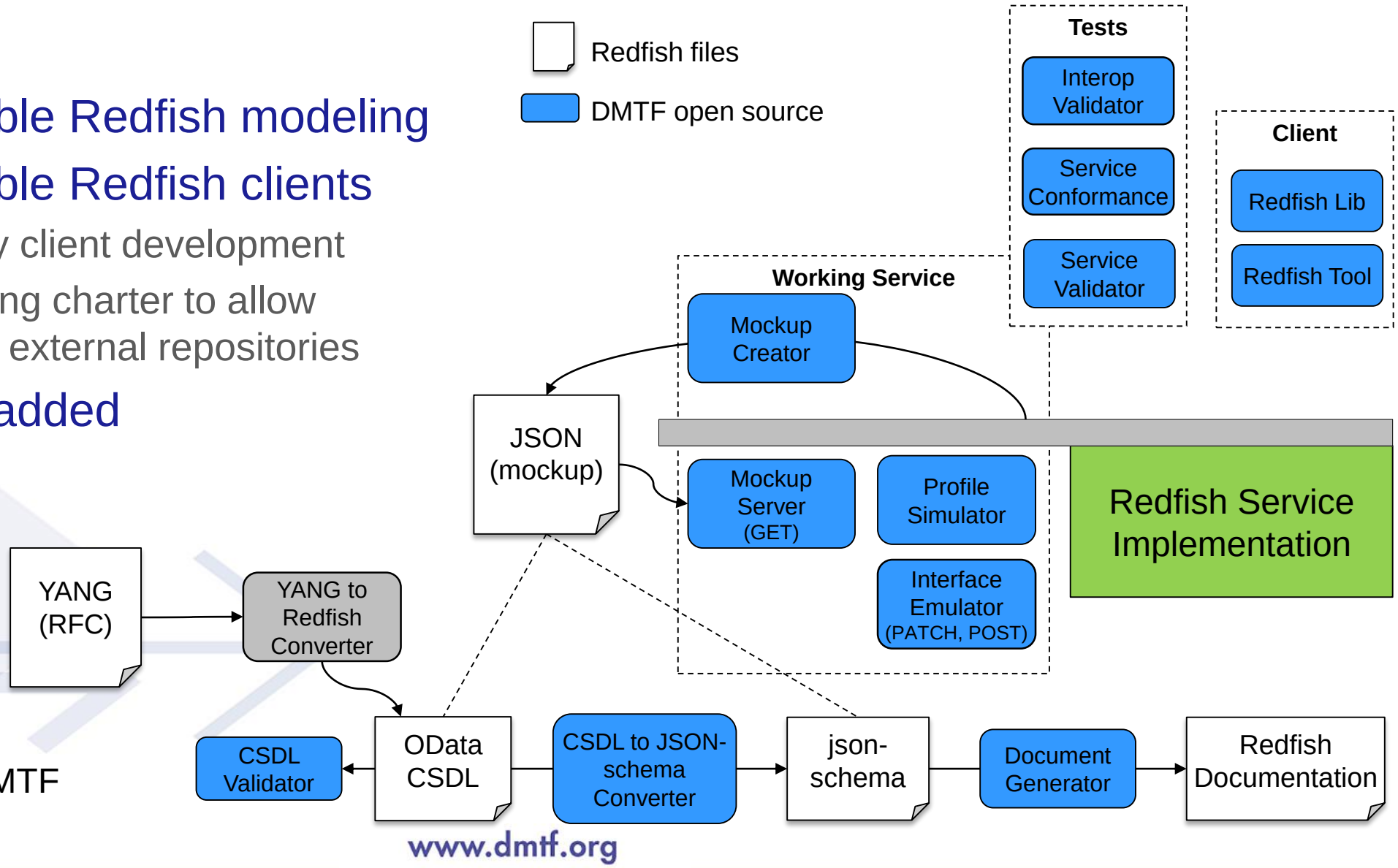
Phase 1 (Ethernet Switch)

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



Redfish Tools

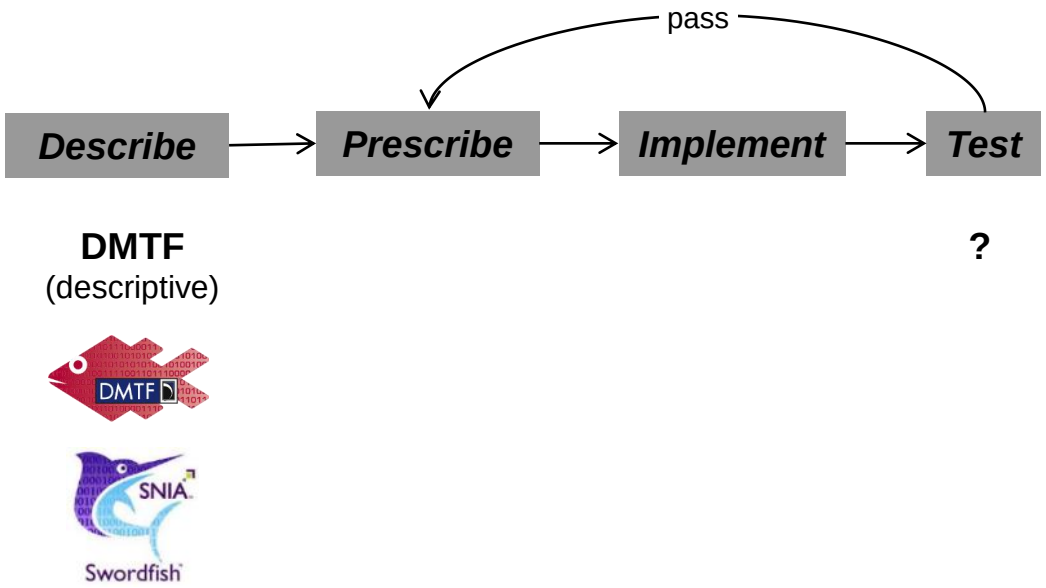
- Tools to enable Redfish modeling
- Tools to enable Redfish clients
  - Ability for early client development
  - DMTF extending charter to allow contribution to external repositories
- Tools being added



http://github.com/DMTF

The Redfish Conformance Tool-chain

- DMTF describes a standard for a manageability interface and models
- OCP could prescribe conformance requirements for the Redfish model elements (resources, properties, actions) in a profile document
- Implementations are tested for conformance to the profile to claim conformance to OCP specifications



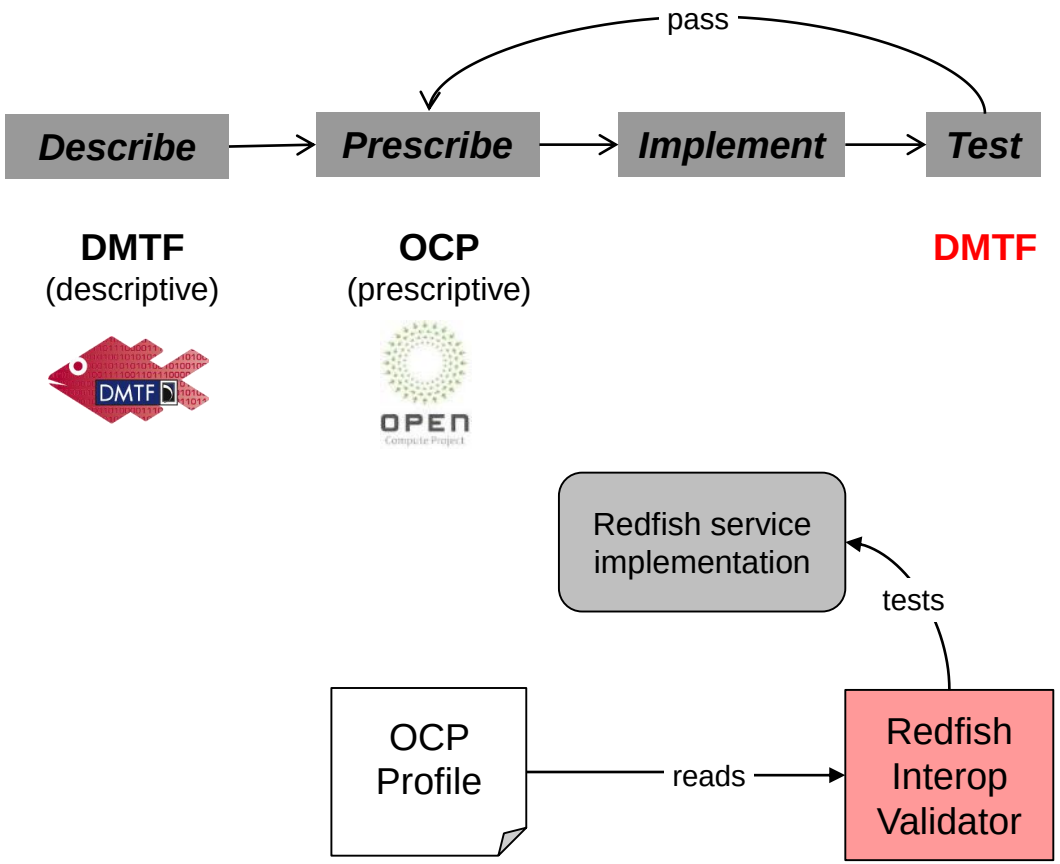
OCP Conformance of Redfish Profile

The DMTF is

- Defining a JSON file format for a prescriptive profile
- Developing a Redfish Interop Validator
  - Reads the profile file
  - Profile drives the testing of a Redfish service implementation
- The Redfish Interop Validator has been open sourced
  - https://github.com/DMTF/Redfish-Interop-Validator

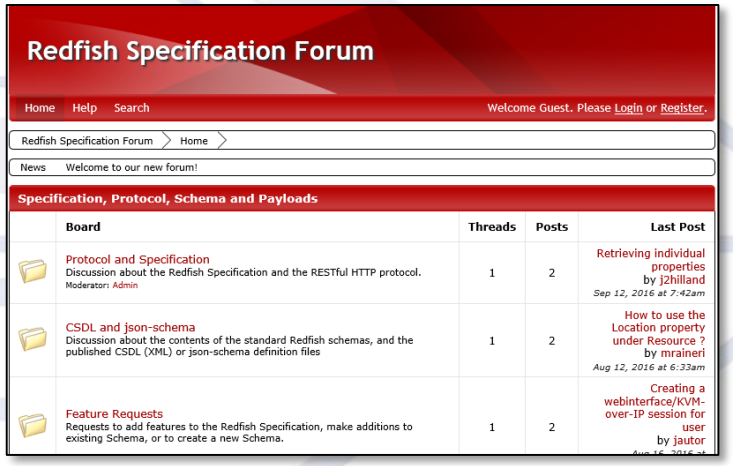
OCP could

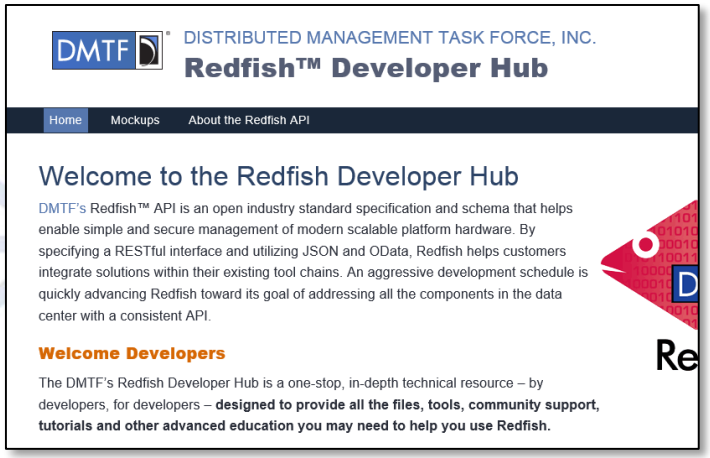
- Create a baseline manageability profile
- Create project specific profiles

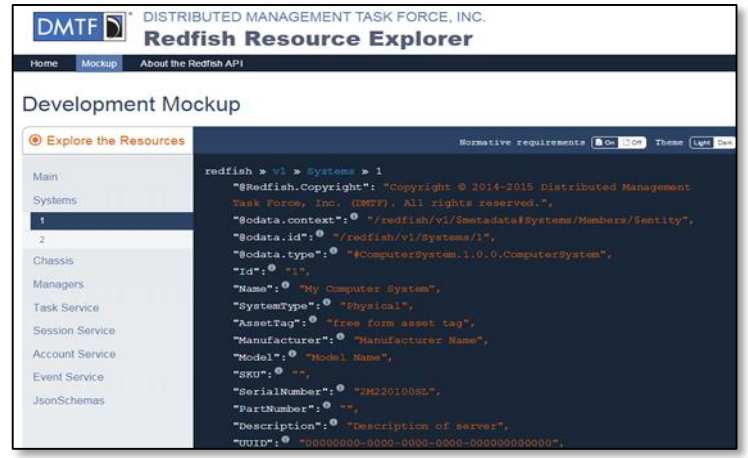


Public Redfish Collateral

- Redfish Github — github.com/DMTF
- Redfish Community Forum — redfishforum.com
- Redfish Developer's Hub — redfish.dmtf.org
- Specs, presentation — dmtf.org/standards/redfish
- Redfish Forum (SPMF) — dmtf.org/standards/spmf







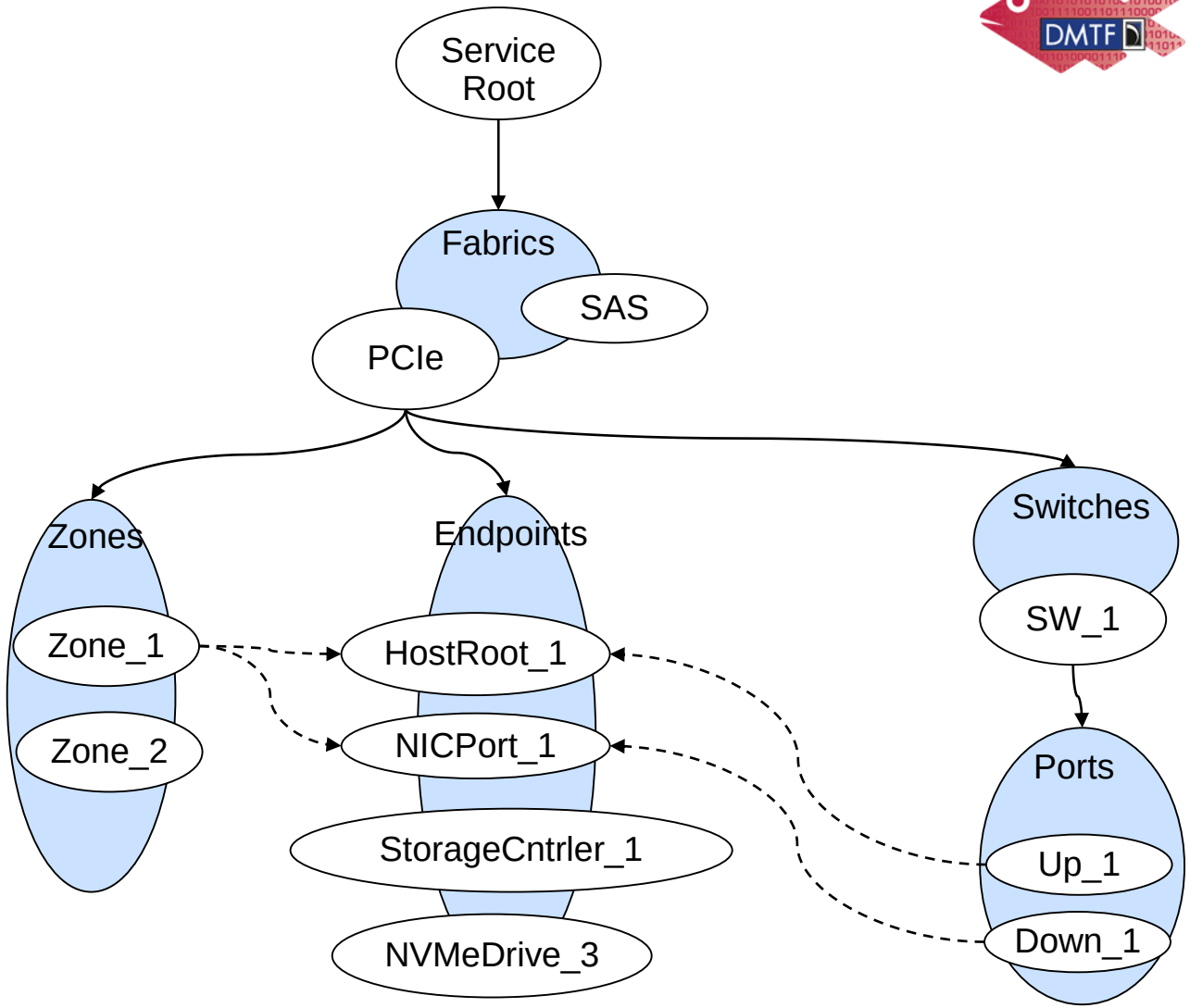
Summary

- 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, CSCC
- Academic research is underway (with academic alliance partner members)
  - Texas Tech University - Cloud and Autonomic Computing Center
  - Barcelona Supercomputing Center

Thank you

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