A Modern Interface for Managing Compute, Storage and Network

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Disclaimer

- The information in this presentation represents a snapshot of work in progress within the DMTF.
- This information is subject to change. The Standard Specifications remain the normative reference for all information.
- For additional information, see the Distributed Management Task Force (DMTF) Web site.

www.dmtf.org

What is 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)

DMTF Board Member Companies

Leadership Level Companies

Advanced Micro Devices | China Academy of Telecommunication Research, MIIT
China Electronics Standardization Institute | Cisco | Daten Tecnologia Ltda
Ericsson AB | Getac Technology Corp. | Huawei | Inspur | Mellanox Technologies
NetIQ Corporation | Positivo Informática SA | Supermicro | WS

DMTF Alliance Partners

Standard Organizations (14)

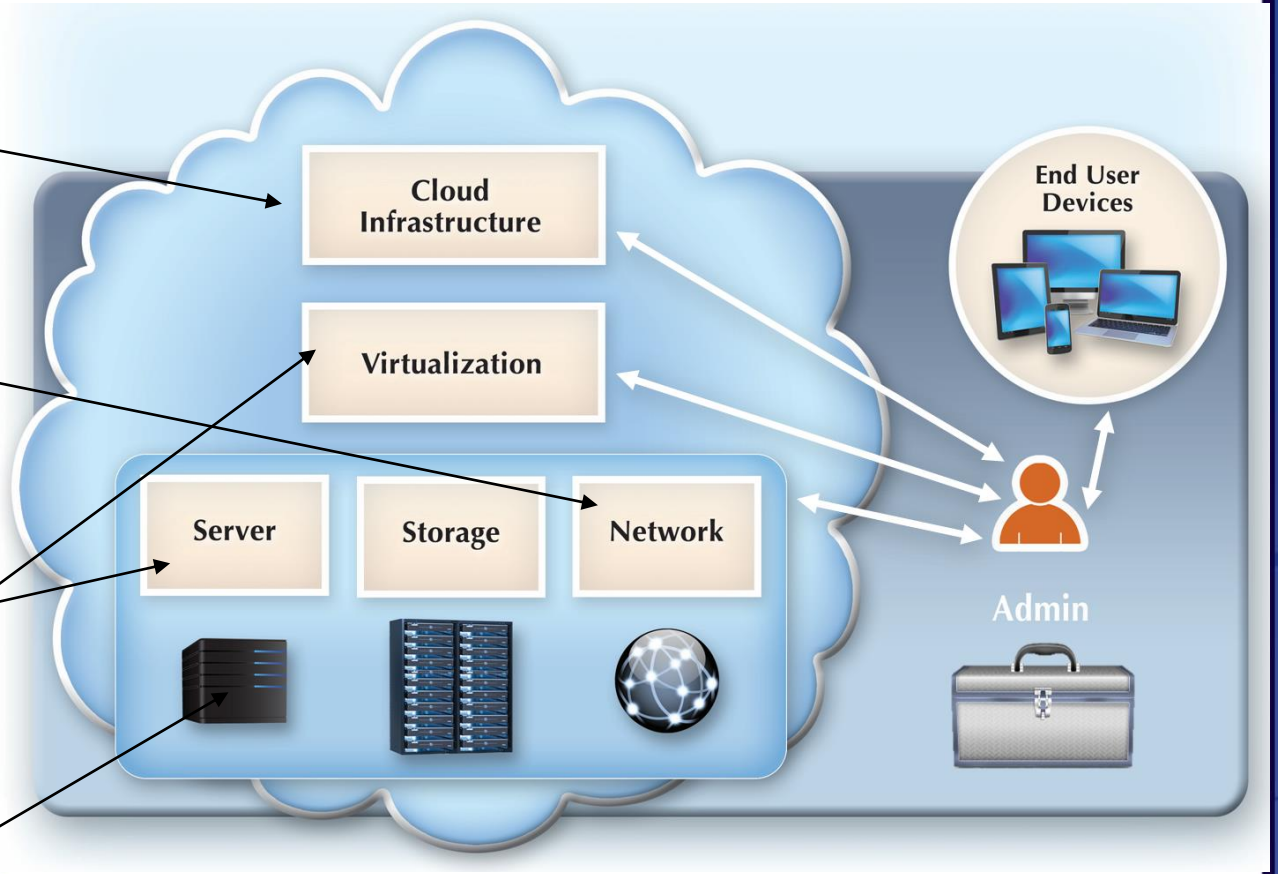
- China Cloud Computing Promotion and Policy Forum (3CPP)
- China Communications Standards Association (CCSA)
- China Electronics Standardization Institute (CESI)
- Cloud Standards Customer Council (OMG-CSCC)
- ETSI-Network Function Virtualization (ETSI-NFV)
- The Green Grid (TGG)
- Open Compute Project (OCP)
- Open Data Center Alliance (ODCA)
- Open Grid Forum (OGF)
- The Open Group (TOG)
- OpenStack Foundation
- Storage Networking Industry Association (SNIA)
- TeleManagement Forum (TMF)
- Unified Extensible Firmware Interface Forum (UEFI)

Academic Alliance Partners

- With individual students and faculty interested in DMTF technologies and standards
- From over 80 universities and research institutions

DMTF Management Domains

- Infrastructure Management
- Services Management
- Platform Management
- On-platform Manageability



Platform Management

The DMTF has mature manageability interface standards based on the Common Information Model (CIM)

Virtualization
- Elements from virtualization (VMM, VMs)

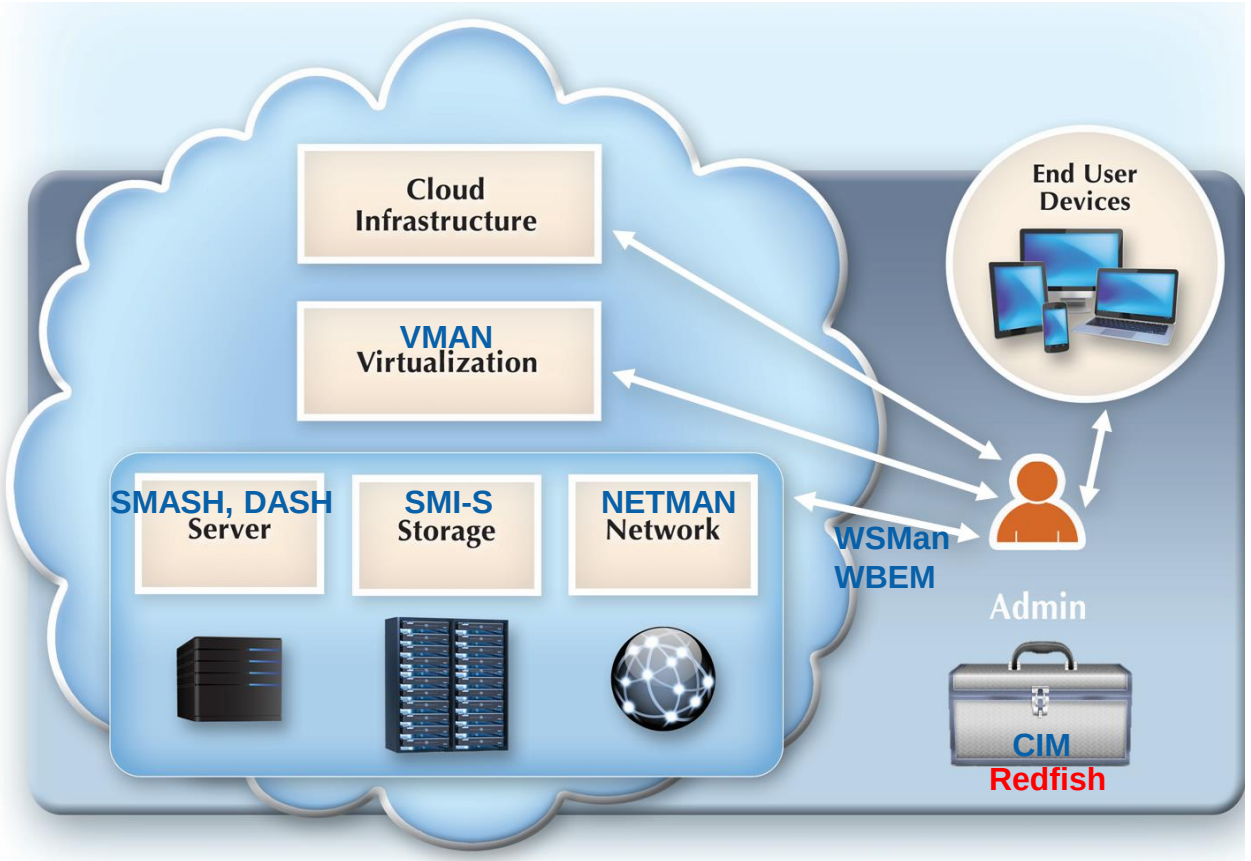
Compute
- Server, desktop and mobile platforms

Storage
- Networked storage

SNIA

Network
- Network services

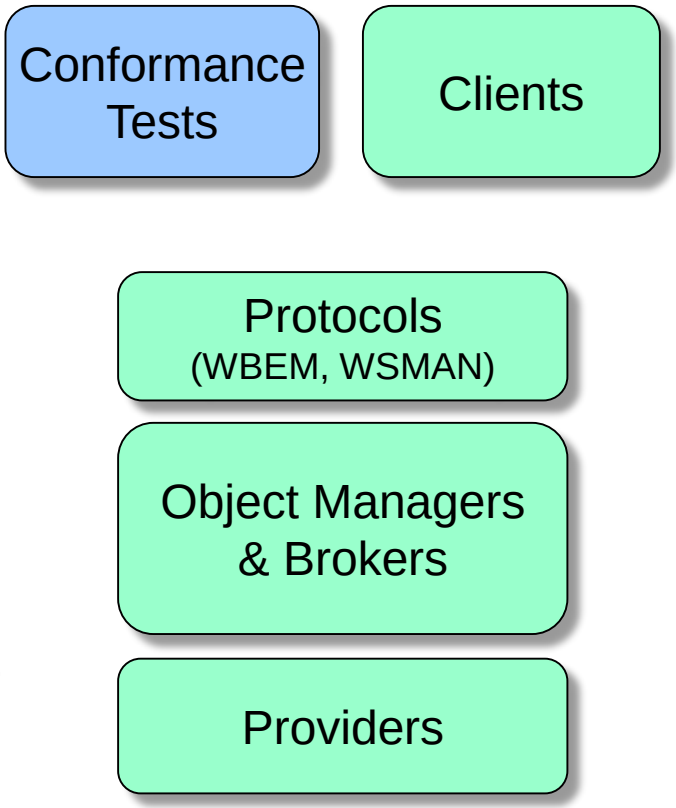
Platform Management



CIM Tools

Industry and academia have created open source tools and implementations

- Conformance Tests (DMTF)
  - Server Conformance Tool
  - Desktop Conformance Tool
- Client
  - CIMNavigator
  - Small Footprint CIM Client (sfcc)
  - wbemcli
- Implementations
  - Open Pegasus
  - Standards Based Linux Instrumentation (SBLIM)
  - OpenLMI (Linux)
  - Small Footprint CIM Broker (sfcb)
  - OpenWBEM, PyWBEM
  - Open Mgmt Interface (OMI, NanoWBEM)
  - Openwsman



Research with CIM

- Researcher saw CIM as a malleable technology, usable in existing research or as an area of research, itself
- Since 2007, the DMTF has been encouraging research in manageability with academic workshops
  - "Toward Configurable Performance Monitoring Introduction to Mathematical Support for Metric Representation and Instrumentation of the CIM Metric Model"
  - "Managing polling adaptability in a CIM/WBEM infrastructure"
  - "Time Probabilistic Constraints over the DMTF CIM"
  - "CIM-Based Resource Information Management for Integrated Access Control Manager"
  - "Managing OVF applications under SLA constrains on Contrail Virtual Execution Platform"
- Reflecting the convergence of manageability, this year the DMTF sponsors the CNSM mini-conference

Redfish: Why a New Interface?

- Market shifting to scale-out solutions
  - Sea of simple servers; reliability via software
- Customers exhausting basic IPMI functionality
  - Security and encryption support no longer meet requirements
  - Implementation are limited to “common denominator”
  - New system architectures cannot be modeled in within IPMI specification
  - Fragmentation of IPMI as proprietary extensions proliferated
- Customers asking for a modern interface
  - Demand for standards-based, multi-vendor deployments
  - CIM was not an option – tool chain is too complex
  - Expect APIs to use Cloud / Web protocols, structures and security model

Criterion for a Modern Manageability Interface

- Leverage existing Internet standards and tool chains
- Able to manage scale-out solutions
- Usable by professions and amateurs
- Deployable on existing management controllers
- Meets OCP Remote Machine Management requirements

Client Python code

```
rawData = urllib.urlopen('https://<ip_addr>/redfish/v1/Systems/1')
jsonData = json.loads(rawData)
print( jsonData['SerialNumber'] )
```

Output

```
1A87CA442K
```

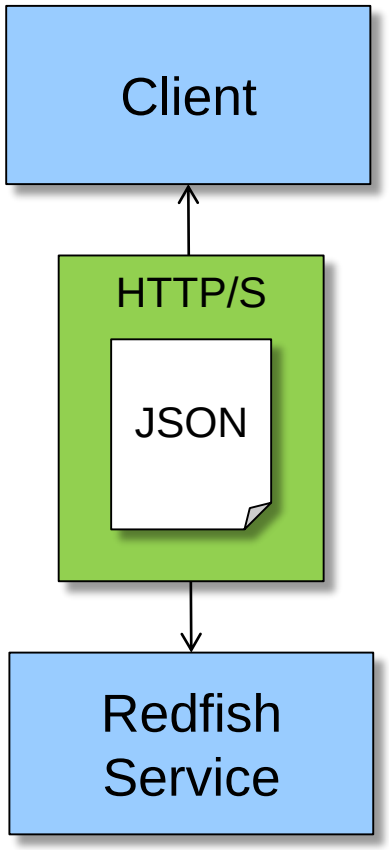
Timeline of Redfish™ Specification

- The DMTF Redfish technology
  - Aug 2015: Redfish Specification with base models (v1.0)
  - May 2016: Models for BIOS, disk drives, memory, storage, volume (2016r1)
  - Aug 2016: Models for endpoint, fabric, switch, PCIe device, zone, software inventory (2016r2)
  - Released multiple work-in-progress for public feedback
- Alignment with other standard organizations
  - Aug 2016: SNIA releases model for network storage services (Swordfish)
  - DMTF created work registers[1] with UEFI Forum and OCP
- Open Compute Project (OCP)
  - OCP's HW Management Specification references IPMI
  - DMTF posted a *proposed* OCP Redfish Profile

[1]dmtf.org/about/registers

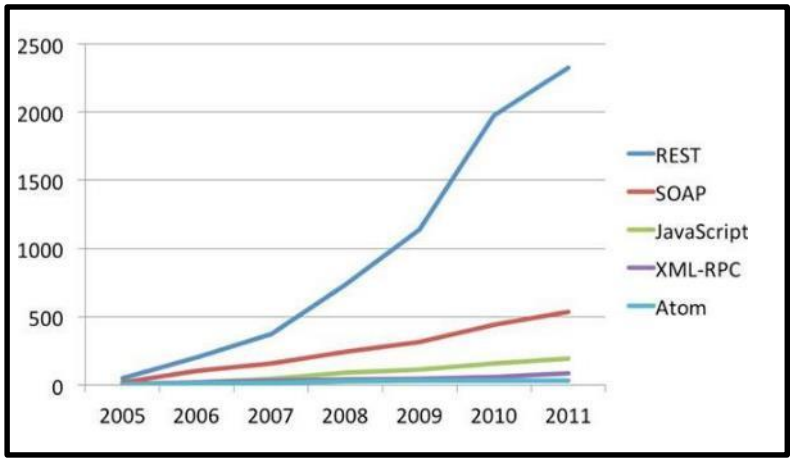
DMTF Redfish Technology

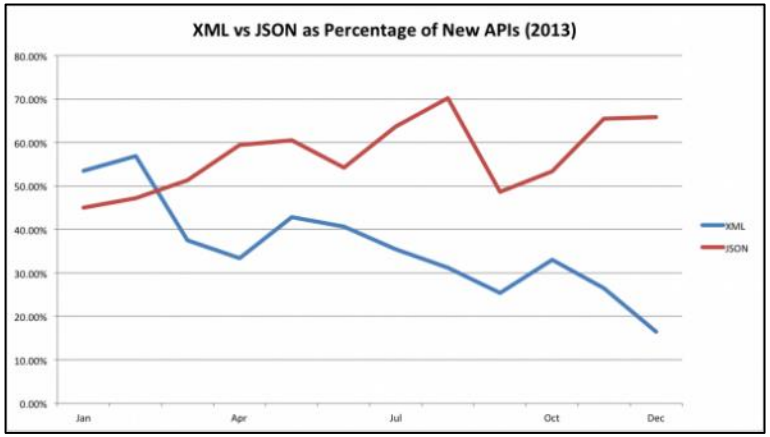
- Redfish Interface (RESTful)
  - Request/response via HTTP/HTTPS protocol
  - Content is formatted in JSON
  - Schemas available to describe JSON structures (introspection)
- Redfish Models
  - Models for managing compute, storage and network platforms and services



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
- IT can use their existing DEV/OPS skill set and tool chain to perform system management tasks

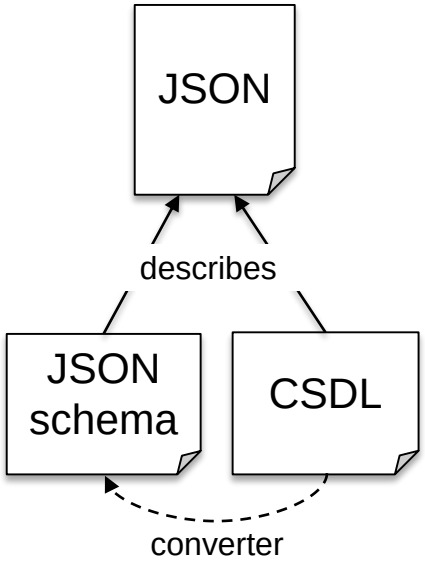




http://www.infoq.com/articles/rest-soap
http://www.programmableweb.com/news/jsons-eight-year-convergence-xml/2013/12/26

JSON Schema

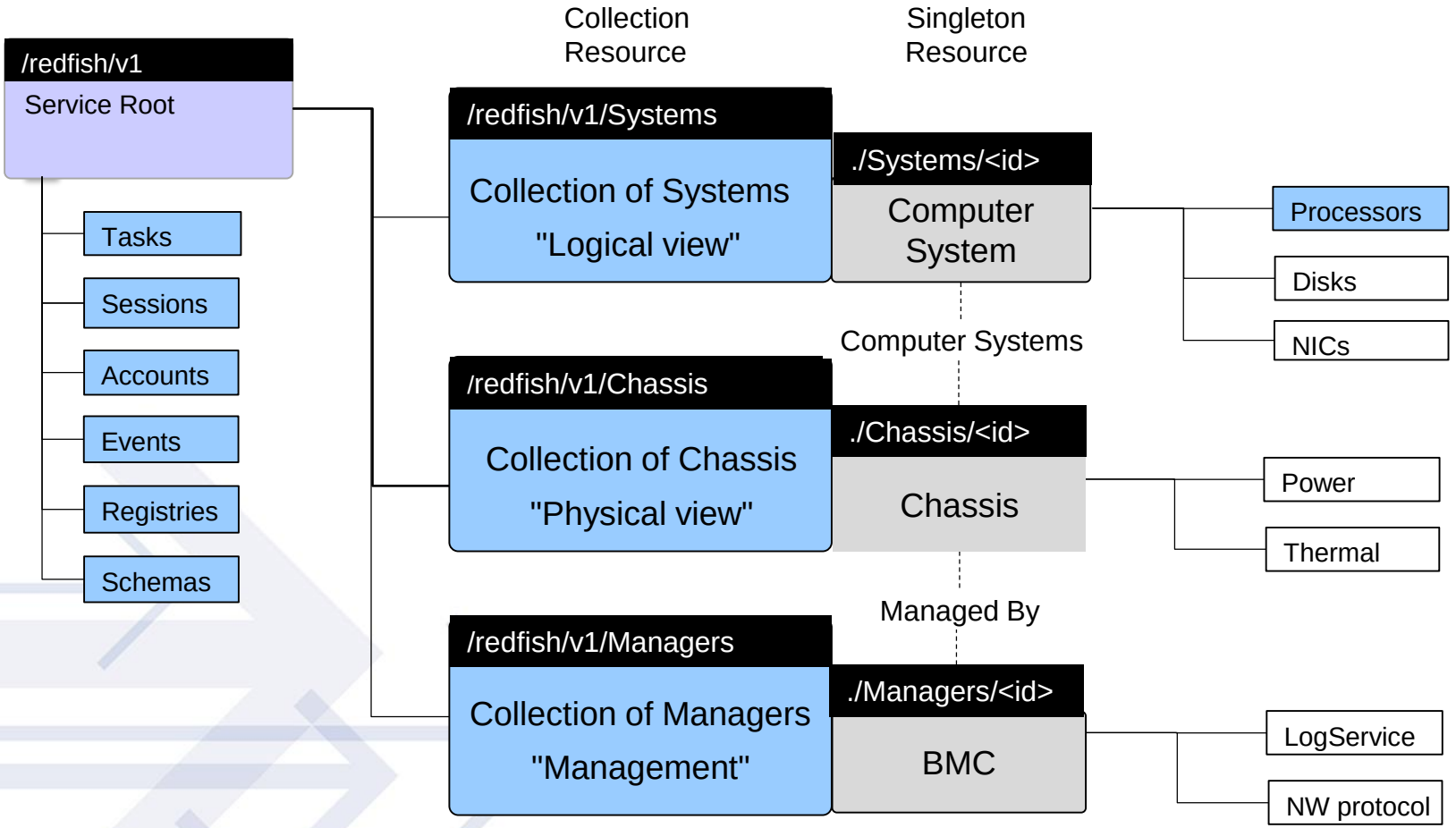
- Schemas describe the structure of JSON content
- The data schema is expressed in json-schema and OData[1] CSDL[2]
- The DMTF creates CSDL files and converts to JSON-schema



	JSON-schema	CSDL
Standard	De facto	OData v4
File format	JSON	XML
Tool-chain	Large	Growing

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

Redfish Resource Map



GET http://<ip-addr>/redfish/v1/Systems/{id}/Processors/{id}

Use the Redfish Resource Explorer (redfish.dmtf.org) to explore the resource map

Initial Redfish Capabilities (v1.0)

Discovery

- Chassis
- Computer systems
- Managers

Server Information

- Server identification and asset info
- Host Network MAC addresses
- Local storage
- Power supply and fans
- State and Status

BMC Infrastructure

- View / configure BMC network settings
- Manage local BMC user accounts

Common Manageability

- Change boot order / device
- Reboot / power cycle server
- Power usage and thresholds
- Temperature
- Config serial console access via SSH

Access and Notification

- Subscribe/publish event model
- Access logs

Security

- HTTPS session

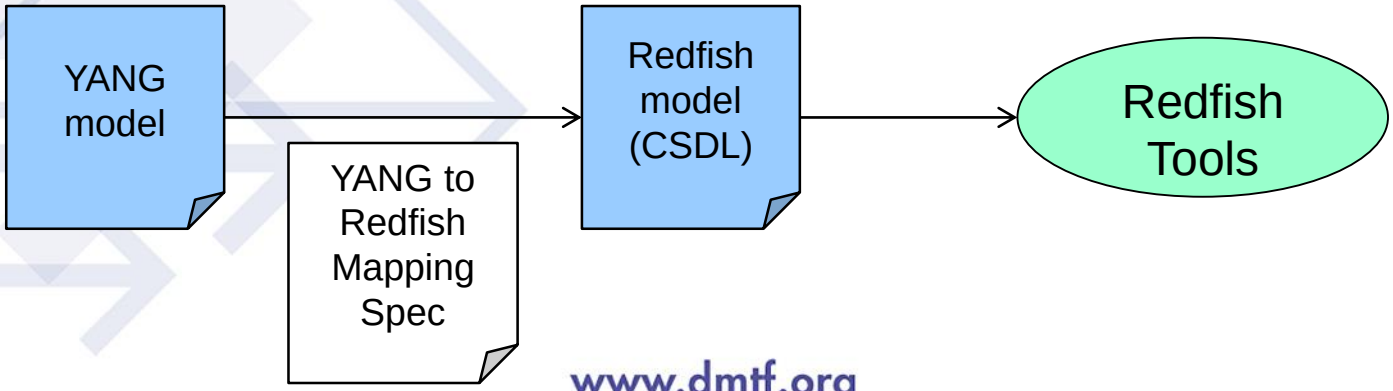
Redfish Task Forces

Task forces created when there is sufficient need or interest

Task Forces	Product	Comment
Host Interface	Interface for in-band entity to access the Redfish service	WIP released
Firmware Update	Resource models for performing firmware updates	WIP released
Storage	Resource models for managing local storage devices	Model released
Advanced Comm Device	Resource models for managing network ports	
Privilege Mapping	Model extensions for expressing user privilege	
Composability	Resource models for composing resource	
Network Infrastructure	Resource models for managing an Ethernet Switch model, derived from YANG models	WIP released
Tools	Open source for using and developing Redfish models	Released 10 tools

Network Infrastructure task force: YANG to Redfish

- Enable converged infrastructure management
  - One interface (one tool chain) to manage compute, storage and network
  - Switches have platform components in common with servers and storage
  - Network Functions Virtualization (NFV) will need common manageability for compute and networking
- DMTF wants to leverage the networking industry's expertise
  - YANG is the basis for general network industry manageability
  - Large body of existing YANG work
  - Model driven approach to network management

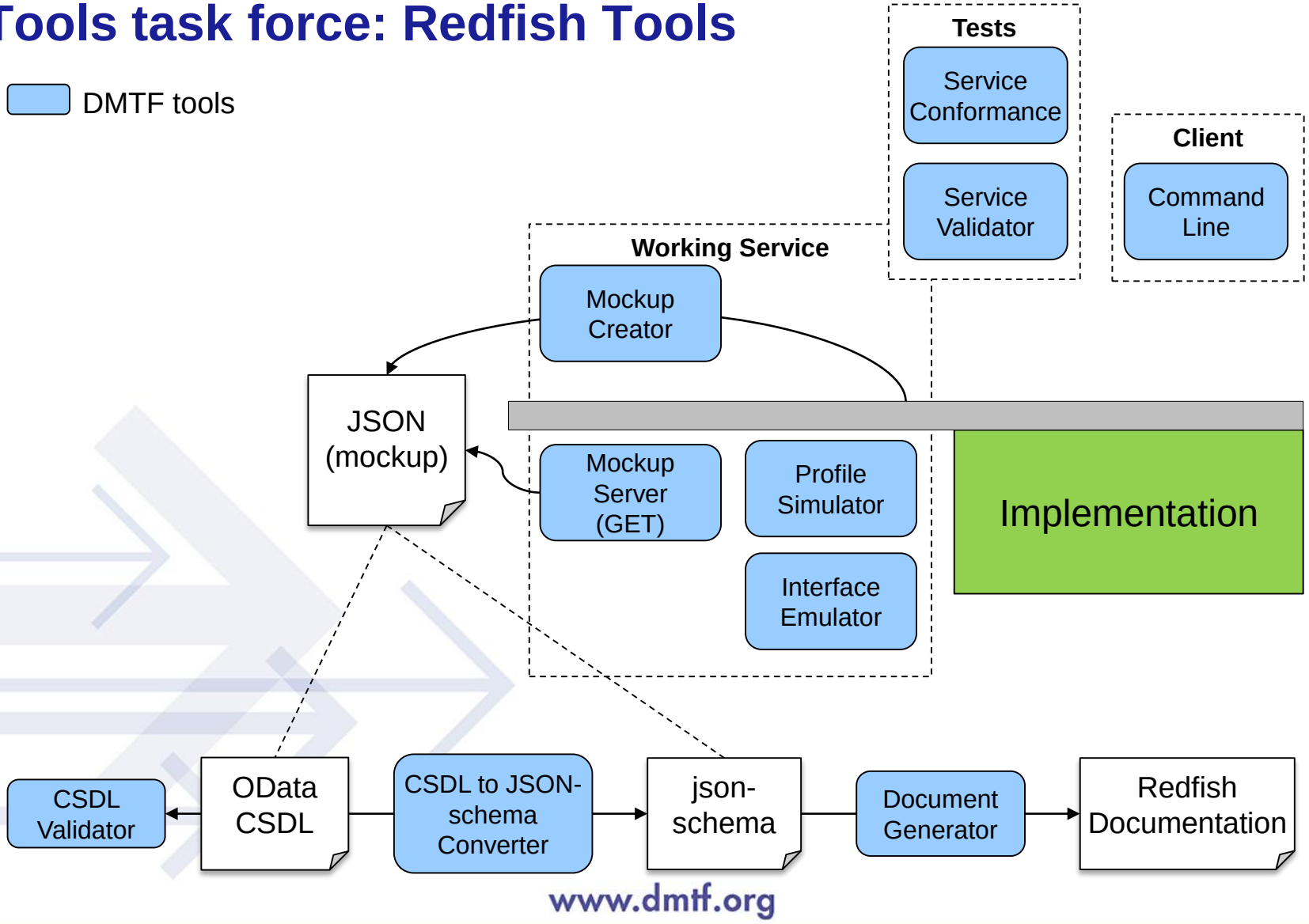


Tools task force: Redfish Tools Description

Tools TF releases open source tools to enable Redfish

	Tool	Description
Extend	CSDL Validator	Validates the CSDL conforms to Redfish requirements
	CSDL-to-JSON schema convertor	Generates json-schema files from CSDL
	Document Generator	Generates documentation from json-schema
Working Svc	Mockup Server	Exposes a mockup as a static HTTP service (GETs only)
	Mockup Creator	Creates a mockup from a Redfish service
	Profile Simulator	Dynamic simulator of the proposed Redfish profile for OCP
	Interface Emulator	Dynamic simulator which can rapid
Test	Service Validator	Validates a Redfish service is conformant
	Service Conformance Tool	Verifies the conformance of a Redfish service to assertions extracted from the Redfish Specification
Client	Command Line (redfishtool)	A command line tool for interacting with a Redfish service (similar to ipmitool)

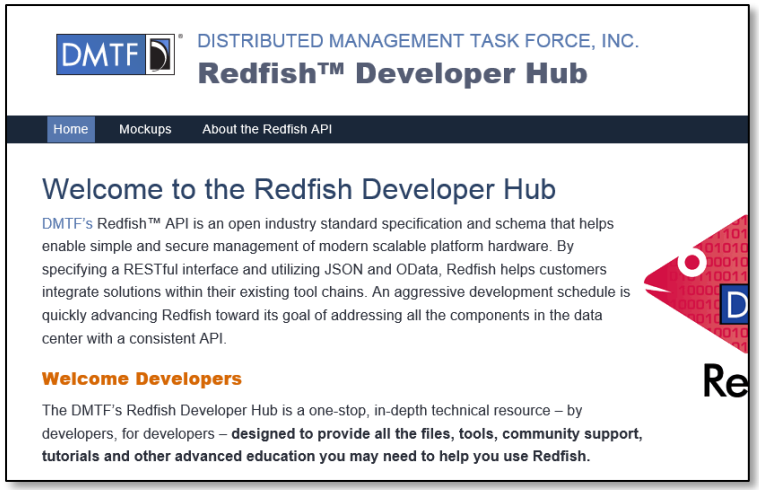
Tools task force: Redfish Tools

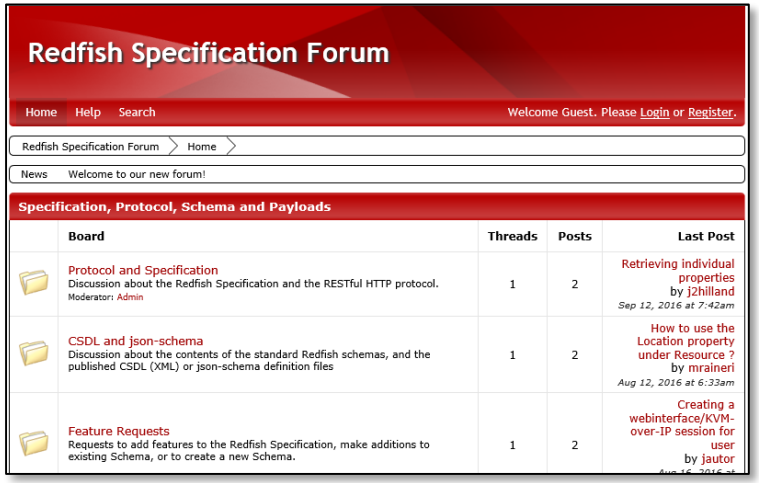


www.dmtf.org

Redfish Developer Hub[1]

- Resources
  - Schema Index
  - Specifications
  - GitHub for Redfish Tools
- Mockups
  - Simple Rack-mounted Server
  - Bladed System
  - Proposed OCP Redfish Profile
- Education/Community
  - Redfish User Forum[2]
  - Whitepapers, Webinars, Presentations





[1]redfish.dmtf.org/redfish
[2]redfishforum.com

Summary

- The DMTF has made rapid progress on a modern interface for data center management
  - Rapid advances in the interface
  - Expediting the tool-chain for extensions and usage
- The industry (standards orgs, companies) have reacted favorably
  - Alliance partnerships with SNIA, UEFI, OCP
- Academic research is underway
  - DMTF is engaged with the Cloud and Autonomic Computing Center at Texas Tech University

If you are interested…

- Access resources posted by the DMTF
  - Apply to new management domains
  - Use and contribute to the Redfish tools on GitHub
- Provide feedback
  - Via the Redfish user forum
  - Via the DMTF submission portal (errata and ideas)
- Become an Academic Alliance Partner
  - Participate and contribute to Redfish advances

Thank you