OPEN.

FOR BUSINESS.

OCP SUMMIT

OCP Profiles for Platform Hardware Management

John Leung
Intel Corporation - Data Center Group - Principal Engineer
OCP Incubation Committee Representative to the HW Management Project

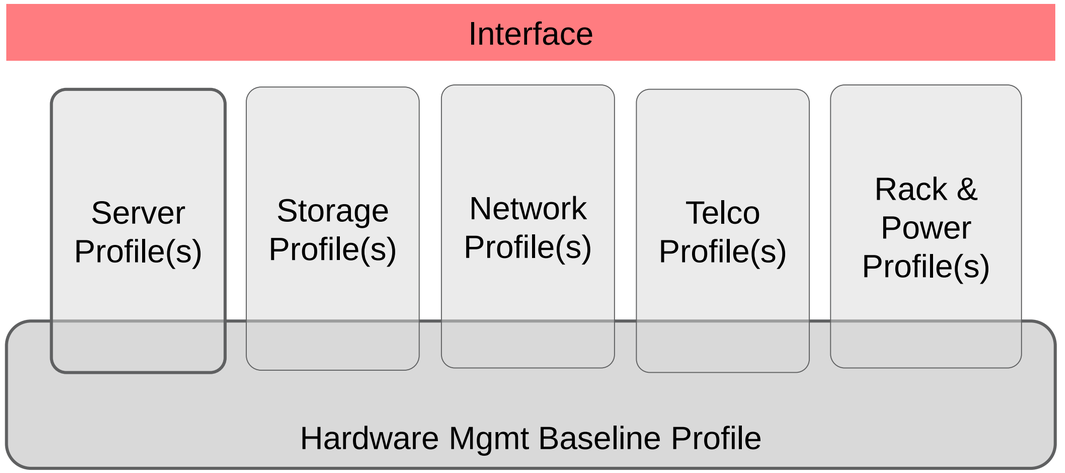
OCP Profiles

- The vision: the OCP Profile specifies conformance requirements for an OCP submission as a checklist item
- Initially, the OCP Profile will contain the requirements for the manageability interface
  - Manageability interface is based on Redfish[1]
  - OCP profile is specified using the Redfish Profile format
  - Conformance is tested with the Redfish open source tools

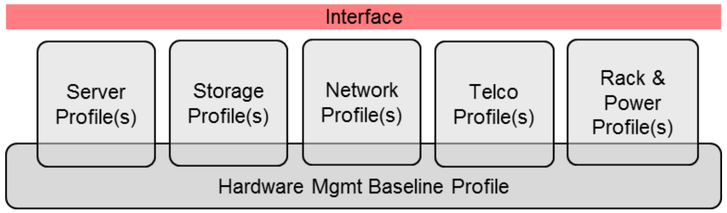
[1]A manageability interface standard from the DMTF (dmtf.org)

Platform Manageability based on Redfish

- The OCP Hardware Management Project
  - Has approved the "OCP Baseline Hardware Management Profile"
  - Specifies the manageability common across OCP platforms
- Other OCP projects
  - Create platform level profiles by extending the "Baseline Hardware Management Profile"
  - To include platform specific requirements
- Start with the OCP Server platform



OCP Profile Status



- Server Project
  - Reviewing the "OCP Server Hardware Management Profile" v0.2.0
- Storage Project
  - There is interest in creating an "OCP Storage Hardware Management Profile"
- Rack and Power Project
  - Active work - "The majority of the descriptive work that we need for Rack & Power management has been already been done for the DCIM domain." - Mike

From Rack and Power Workshop: July 2018

Name	Status	Contributor
Rack and Power Redfish Profile	In Development	Shared

	Activity	Target Completion Date
1	Generate initial list of elements for the rack and power schema/mock-up	Done
2	Generate mock-up and test with validator to create initial feel of the validation process	Done
3	Consolidate additional elements needed for the schema/mock-up •Upload updated checklist •Solicit inputs from members	Sept 7, 2018
4	Schedule semi-monthly calls	By August Rack&Power Meeting
5	Finalize process for determining the baseline for the Rack&Power profile	Will be done on semi-monthly calls

Redfish Overview

- A modern RESTful interface for manageability
- Uses cloud/web protocols, structures, security models and tool chains
- Schemas are accessible so an interface can be introspected and enabled programmatically
- Models specified for managing datacenter platforms and devices (compute, storage, network, facilities)

HTTP/S

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

Python code

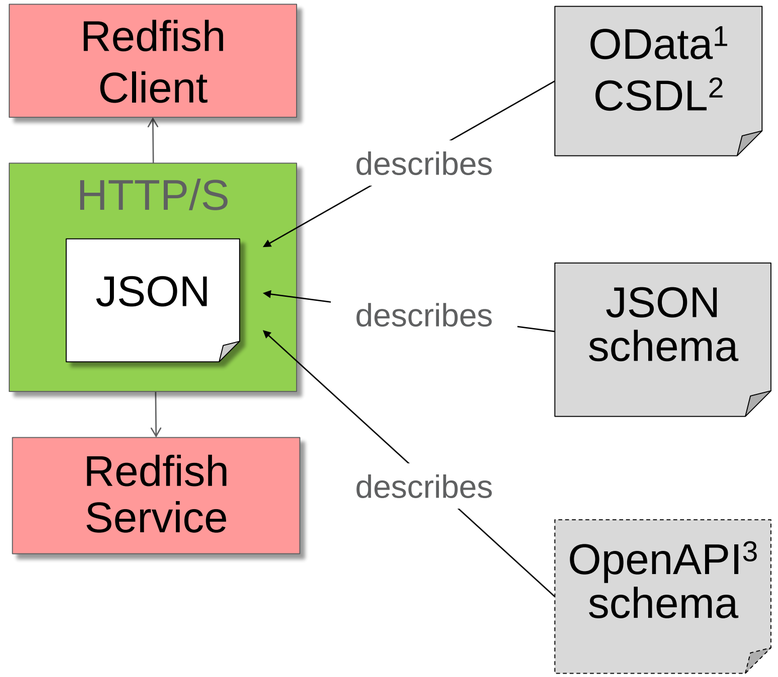
```
rawData = urllib.urlopen('https://<ip_addr>/redfish/v1/Systems/CS_1'
jsonData = json.loads(rawData)
print( jsonData['SerialNumber'] )
```

Output

```
1A87CA442K
```

Redfish interface and schema

- Redfish interface
  - HTTP/HTTPS - GET, POST, PATCH, DELETE
  - JSON – format of content
- Redfish model schema
  - Describes the content of the JSON response
  - DMTF develops the models for platforms and compute/servers
  - Other organization create models for their management domain



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

Redfish JSON response

- Obtained by issuing an HTTP GET
  - URL = /redfish/v1/Systems/<member>
- JSON response contains
  - Simple properties
  - Complex properties
  - References to subordinate resources
  - References to associated resources
  - Actions
  - References to schema
- Redfish is a hypertext model
  - Resources are accessible by traversing references

Simple properties

Complex properties

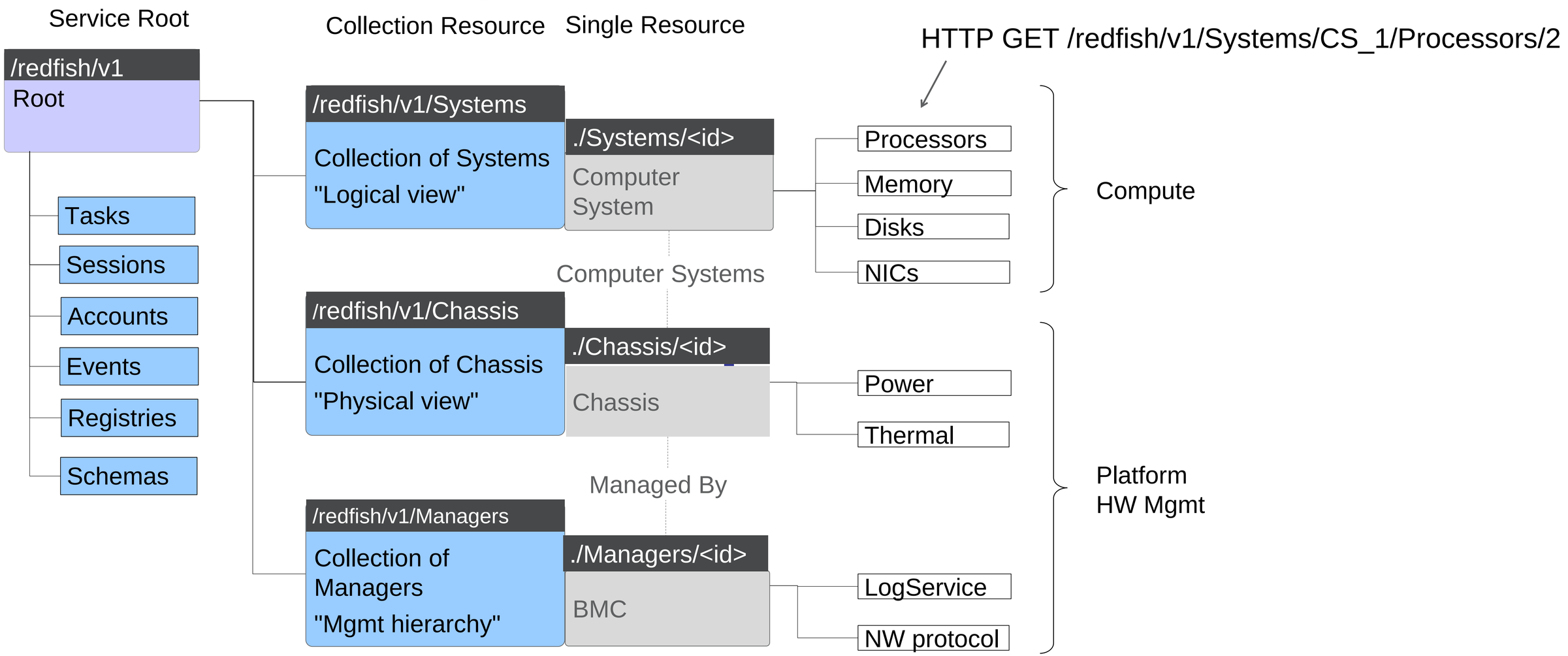
Subordinate resources

Associated resources

Actions

```
{
   "@odata.context": "/redfish/v1/$metadata#ComputerSystem.ComputerSystem",
    "@odata.type": "#ComputerSystem.v1_3_0.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": “78899498CLF-7",
   "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 Compute Model



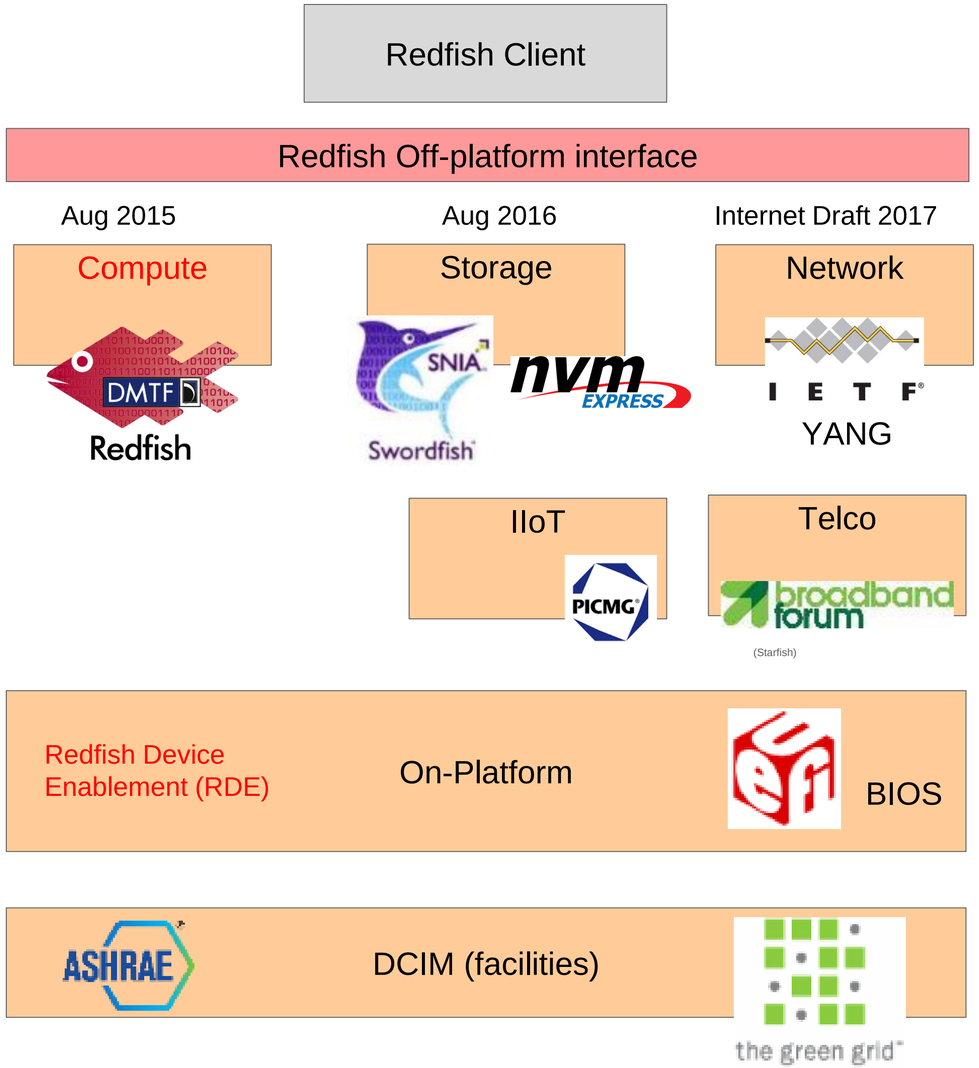
Capabilities of Compute Model

- **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
  - Change boot order and device
  - Configure BIOS settings
  - 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**
  - Compute (servers)
  - Physical hierarchy (rack/chassis/server/node)
  - Management hierarchy (rack mgr, tray mgr, BMC)
- **Security**
  - HTTPS
  - Map roles to privileges
- **Access and Notification**
  - Subscribe to published events
  - Inspect Logs
  - Host interface for in-band access
- **Composition**
  - Specific composition
  - Constrained composition

Red font = notable capabilities

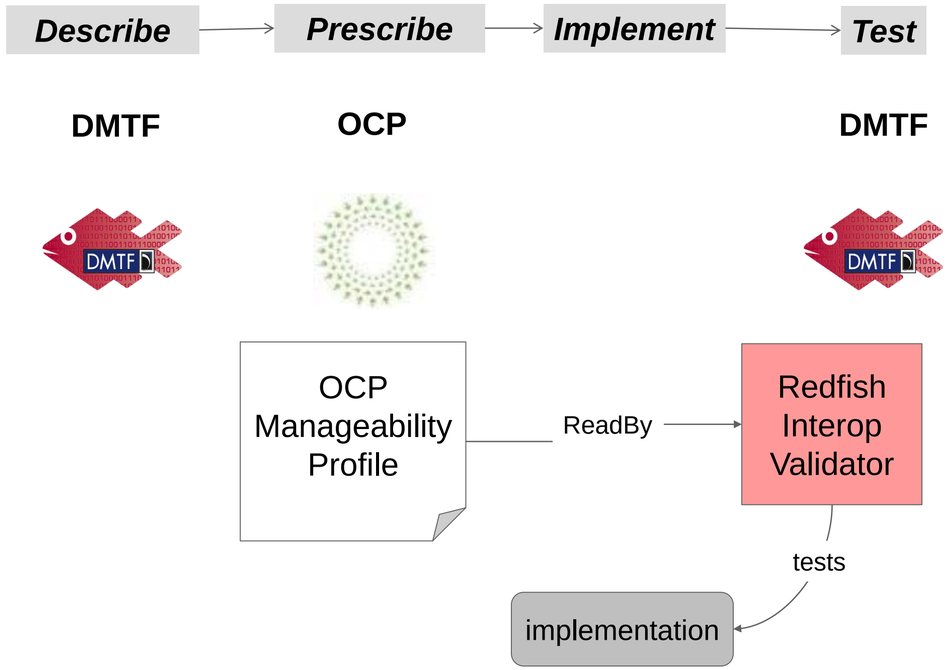
Extending Redfish manageability

- The Redfish Forum enabling other SDOs to create and extend models into new management domains
  - Networked storage, storage services, and non-volatile storage (SNIA, NVMExpress)
  - Ethernet Switch (IETF) - map YANG to Redfish
  - Industrial IoT (PICMG)
  - Customer Premise Equipment (Broadband Forum)
  - BIOS interface (UEFI)
  - DC facitlities infrastructure devices (The Green Grid, ASHRAE)



Conformance Testing with Redfish Tools

- Redfish Interop Validator
  - Runs conformance test against an implementation (pass/fail)
  - The Profile file is read to determine which tests to perform
  - Open source application[1]
- Profile file
  - Specified by OCP projects
  - HW mgmt project - baseline requirements
  - Other projects - requirements beyond the baseline



[1]github.com/DMTF/Redfish-Interop-Validator

OCP Redfish Profile file

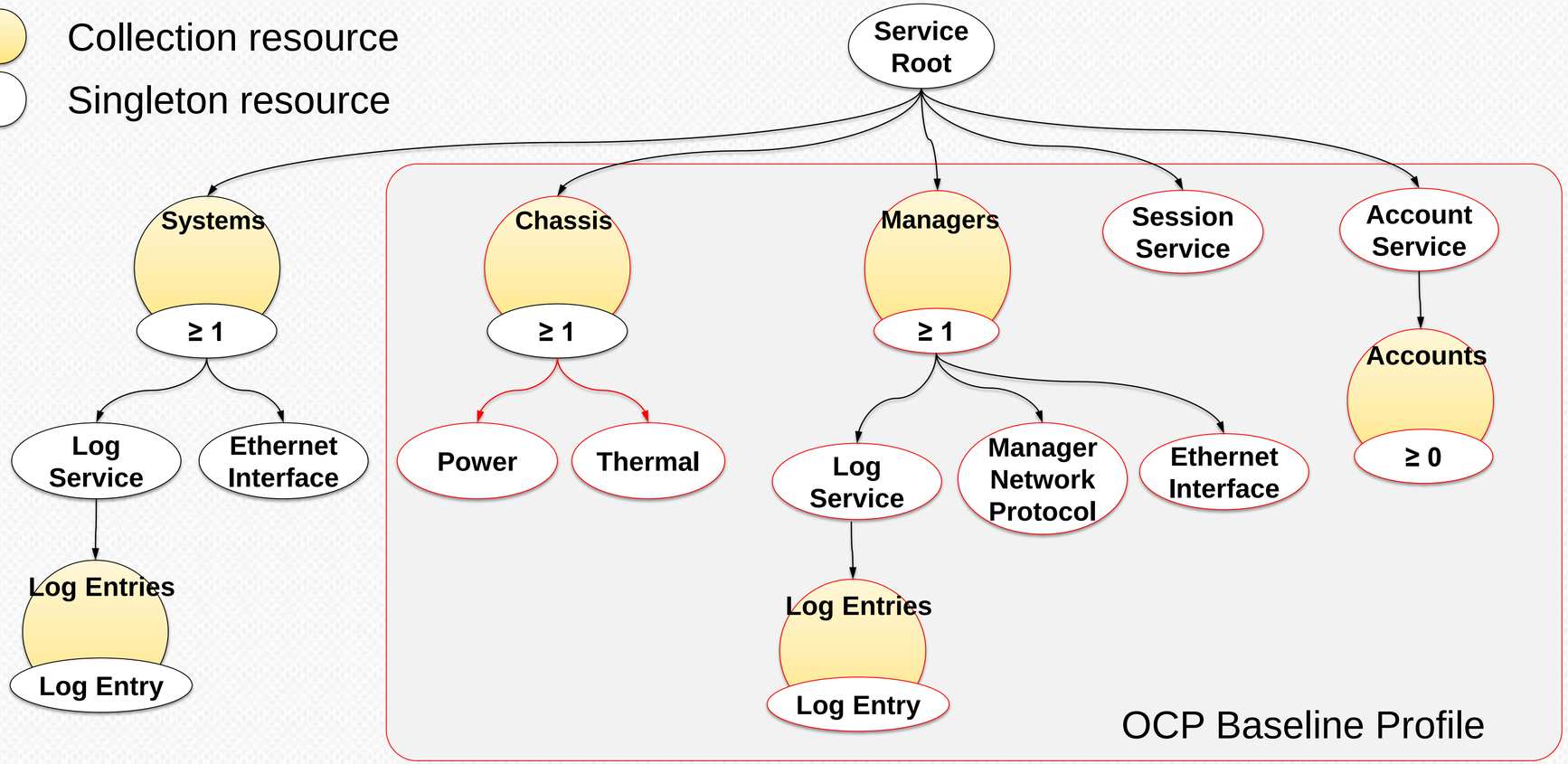
- A JSON formatted file
- File contains requirements for
  - Supported protocols
  - Supported resources
    - Create, delete, etc.
  - Supported properties
    - read-only or read/write, Conditional, MinCount, Value, Action


```
"ComputerSystem": {
    "MinVersion": "1.0.0",
    "PropertyRequirements": {
        "AssetTag": {
            "WriteRequirement": "Mandatory"
        },
        "SystemType": {},
        "SerialNumber": {},
        "Manufacturer": {},
        "Model": {},
        "SKU": {
            "ReadRequirement": "Recommended",
            "ConditionalRequirements": [ {
                "Purpose": "Either PartNumber or SKU (or both)...",
                "CompareProperty": "PartNumber",
                "Comparison": "Absent",
                "ReadRequirement": "Mandatory"
            } ]
        },
        "PartNumber": {
            "ReadRequirement": "Recommended",
            "ConditionalRequirements": [ {
                "Purpose": "Either PartNumber or SKU (or both)...",
                "CompareProperty": "SKU",
                "Comparison": "Absent",
                "ReadRequirement": "Mandatory"
            } ]
        },
        …
    }
```

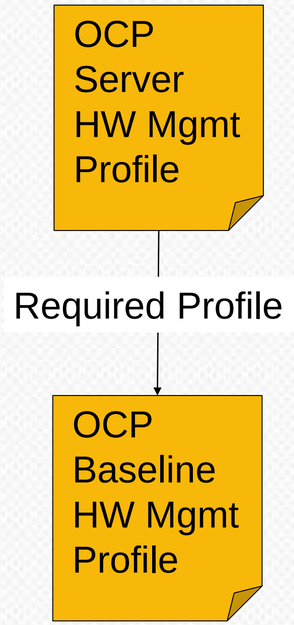
"OCP Baseline Hardware Management Profile"

Collection resource

Singleton resource



The server profile references the baseline profile[1]



[1] http://www.opencompute.org/wiki/Hardware_Management/SpecsAndDesigns#Baseline_and_Server_profile

OCP Profile Specification

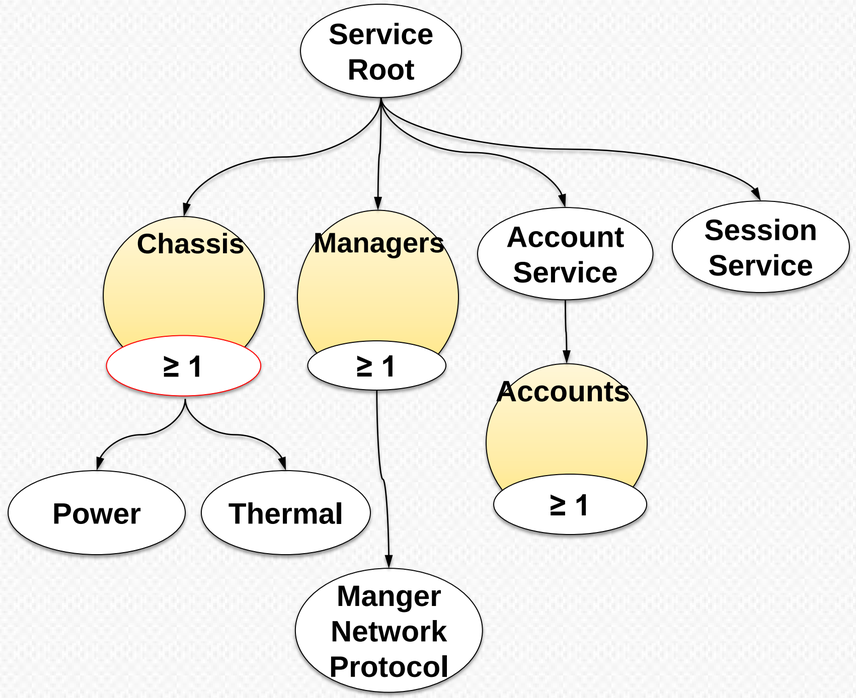
- The specification is a readable version of the profile
- Contains:
  - Sample with requirements bold-faced
  - Requirement Tables

Property	Rqmt	Value
UUID	Mandatory	
RedfishVersion	Mandatory	
AccountService	Mandatory	
SessionService	Mandatory	
Chassis	Mandatory	
Managers	Mandatory	

ServiceRoot

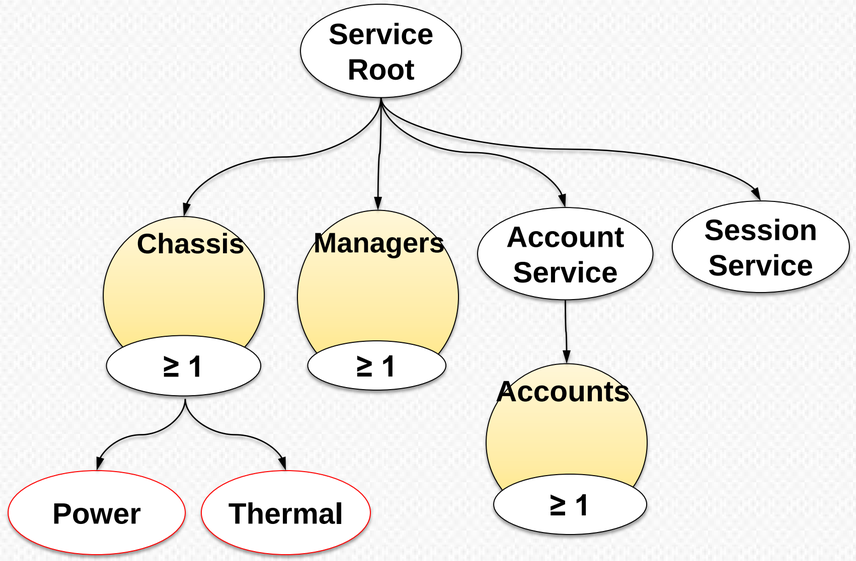
```
{
    "@odata.id": "/redfish/v1/",

    "Id": "RootService",
    "Name": "Root Service",
    "Product": "Contoso WidgetDeluxe 8744",
    "RedfishVersion": "1.0.0",
    "UUID": "92384634-2938-2342-8820-489239905423",
    "Chassis": { … },
    "Managers": { … },
    "SessionService": { … },
    "AccountService": { … },
    "Systems": { … },
    "Fabrics": { … },
    "Tasks": { … },
    "EventService": { … },
    "UpdateService": { … },
    "CompositionService": { … },
    "Registries": { … },
    "JsonSchemas": { … },
    "Links": {
        "Sessions": { … }
    },

    "@odata.context": "/redfish/v1/$metadata#ServiceRoot.ServiceRoot",
    "@odata.type": "#ServiceRoot.v1_3_0.ServiceRoot",
}
```

"OCP Baseline Hardware Management Profile" Chassis Resource



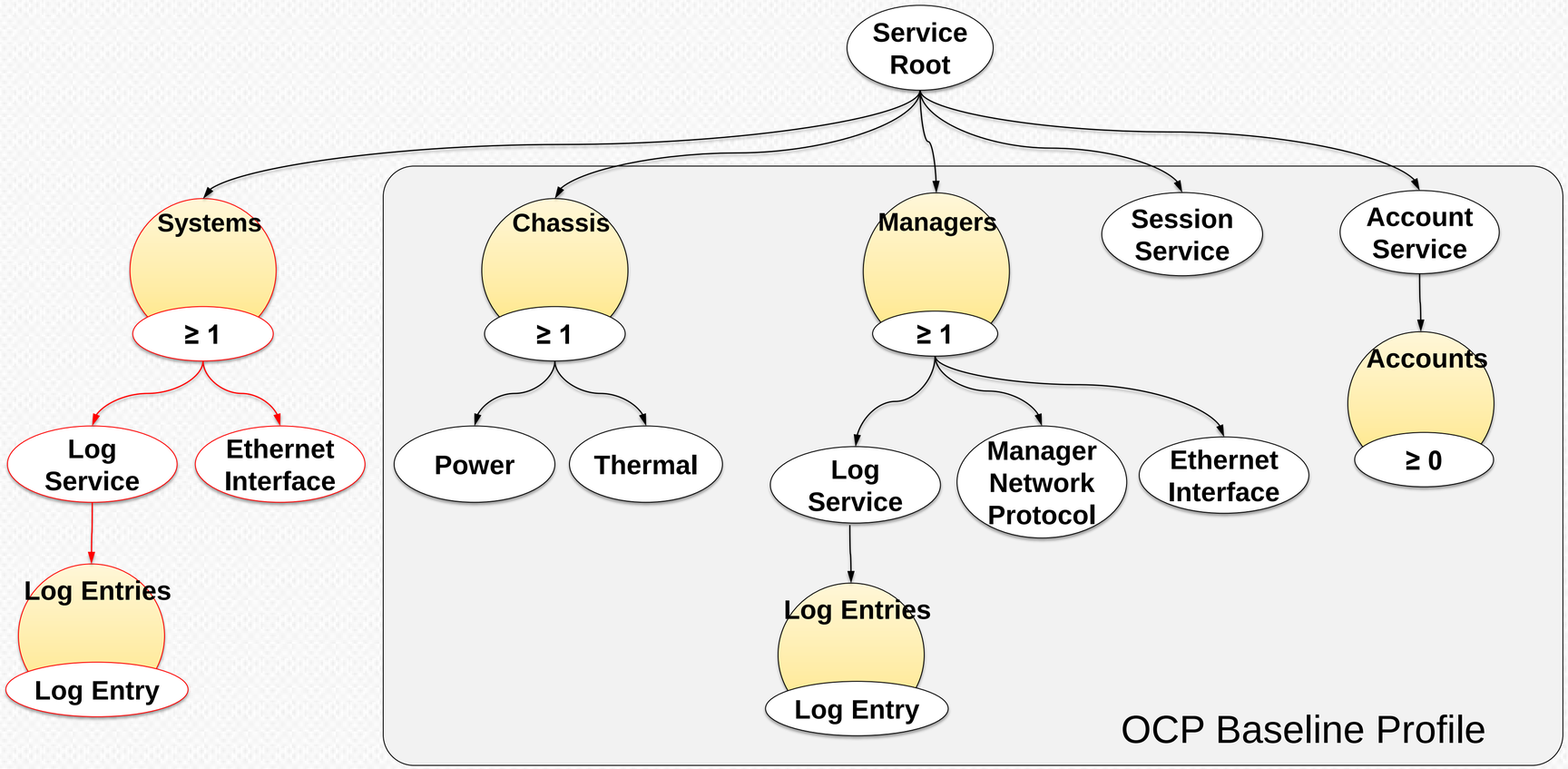

```
{
        "@odata.id": "/redfish/v1/Chassis/1",
        "Id": "1",
        "Name": "Computer System Chassis",
        "ChassisType": "RackMount",
        "Manufacturer": "Manufacturer Name",
        "Model": "Product Model Name",
        "SKU": "",
        "SerialNumber": "2M220100SL",
        "PartNumber": "394048H",
        "AssetTag": "Customer Writable String",
        "IndicatorLED": "Lit",
        "PowerState": "On",
        "Status": {
                "State": "…",
                "Health": "…"
        },
        "Power":  { . . . },
        "Thermal": { . . . },
        "Links": {
                "ComputerSystem":       [ { "…" } ],
                "ManagedBy": [ { "…" } ],
        },
        "@odata.context": "/redfish/v1/$metadata#Chassis.Chassis",
        "@odata.type": "#Chassis.v1_4_0.Chassis",
}
```

"OCP Baseline Hardware Management Profile" Power and Thermal Resource




```
{
    "@odata.id": "/redfish/v1/Chassis/1/Power",
    "Id": "Power",
    "PowerControl": [
        {
            "@odata.id": "/redfish/v1/Chassis/1/Power#/PowerControl/0",
            "MemberId": "0",
            "Name": "System Power Control",
            "PhysicalContext": "Chassis",
            "PowerConsumedWatts": 8000,
            "PowerRequestedWatts": 8500,
            "PowerAvailableWatts": 8500,
            "PowerCapacityWatts": 10000,
            "PowerAllocatedWatts": 8500,
            "PowerMetrics": {
                "IntervalInMin": 30,
                "MinConsumedWatts": 7500,
                "MaxConsumedWatts": 8200,
                "AverageConsumedWatts": 8000
            },
            "PowerLimit": {
                "LimitInWatts": 9000,
                "LimitException": "LogEventOnly",
                "CorrectionInMs": 42
            },
            "RelatedItem": [
                { "@odata.id": "/redfish/v1/Chassis/1" }
            ],
            "Status": { "State": "Enabled" "Health": "OK" } },
            Voltages": [ {  . . . } ],
            "PowerSupplies": [ { . . . } ],
            "Redundancy": [ { . . . } ],
    . . .
}
```

"OCP Server Hardware Management Profile"



[1]http://www.opencompute.org/wiki/Hardware_Management/SpecsAndDesigns#Baseline_and_Server_profile

"OCP Server Management Profile": System Resource

```
{
    "@odata.id": "/redfish/v1/Systems/1",
    "Id": "1",
    "Name": "My Computer System",
    "SystemType": "Physical",
    "AssetTag": "free form asset tag",
    "Manufacturer": "Manufacturer Name",
    "Model": "Model Name",
    "SKU": "",
    "SerialNumber": "2M220100SL",
    "PartNumber": "",
    "Description": "Description of server",
    "UUID": "00000000-0000-0000-0000-000000000000",
    "HostName": "web-srv344",
    "Status": { "State": "Enabled", "Health": "OK", "HealthRollup": "OK" },
    "IndicatorLED": "Off",
    "PowerState": "On",
    "Boot": {
        "BootSourceOverrideEnabled": "Once",
        "BootSourceOverrideMode": "UEFI",
        "BootSourceOverrideTarget": "Pxe",
        "BootSourceOverrideTarget@Redfish.AllowableValues": [ . . . ],
        "UefiTargetBootSourceOverride": "uefi device path"
    },
    "BiosVersion": "P79 v1.00 (09/20/2013)",
    "ProcessorSummary": {
        "Count": 8,
        "Model": "Multi-Core Intel(R) Xeon(R) processor 7xxx Series",
        "Status": { "State": "Enabled", "Health": "OK", "HealthRollup": "OK" },
    },
    "MemorySummary": {
        "TotalSystemMemoryGiB": 16,
        "MemoryMirroring" : "System",
        "Status": { "State": "Enabled", "Health": "OK", "HealthRollup": "OK" },
    },
```

System (continue)

```
    . . .
    "Processors":            { "@odata.id": "/redfish/v1/Systems/1/Processors" },
    "Memory":                { "@odata.id": "/redfish/v1/Systems/1/Memory },
    "EthernetInterfaces": { "@odata.id": "/redfish/v1/Systems/1/EthernetInterfaces" },
    "NetworkInterfaces":  { "@odata.id": "/redfish/v1/Systems/1/NetworkInterface" },
    "SimpleStorage":      { "@odata.id": "/redfish/v1/Systems/1/SimpleStorage" },
    "LogServices":        { "@odata.id": "/redfish/v1/Systems/1/LogServices" },
    "SecureBoot":         { "@odata.id": "/redfish/v1/Systems/1/SecureBoot" },
    "Bios":               { "@odata.id": "/redfish/v1/Systems/1/Bios" },
    "TrustedModules":    [ { . . . } ],
    "PCIeDevices":       [ { "@odata.id": "/redfish/v1/Chassis/1/PCIeDevices/NIC" } ],
   "PCIeFunctions":      [ { . . . } ],
    "Links": {
        "Chassis": [ { "@odata.id": "/redfish/v1/Chassis/1" } ],
        "ManagedBy": [ { "@odata.id": "/redfish/v1/Managers/1" } ],
        "Endpoints": [ { "@odata.id": "/redfish/v1/Fabrics/PCIe/Endpoints/HostRootComplex1" } ],
    },
    "Actions": {
       "#ComputerSystem.Reset": {
          "target": "/redfish/v1/Systems/1/Actions/ComputerSystem.Reset",
           "@Redfish.ActionInfo": "/redfish/v1/Systems/1/ResetActionInfo"
       }
    }
}
```

Next Steps

- Attend the "OpenBMC Status Update" at 14:00
  - Open source implementation with Redfish support
- Participate in OCP project's efforts to create OCP profiles
  - Hardware Mgmt, Server, Rack & Power & Storage
- Test your platforms for conformance with the OCP Server Profile
  1. Setup Python execution environment
  2. Download the Redfish Interop Validator
  3. Execute the Validator with the OCP Server Profile

OCP SUMMIT

OPEN. FOR BUSINESS.