Redfish APIs on Next Generation Cray Hardware
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Modernizing Cray Systems Management
Use of Redfish APIs on Next Generation Cray Hardware

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Please hold questions for the end of the presentation!

Modernizing Cray Systems Management

- **This presentation will cover the following**
  - Motivation to change Cray system management
  - Quick intro to DMTF and Redfish
  - Endpoint discovery
  - Redfish control
  - Redfish telemetry
  - Redfish and network boot
  - Cray and 3rd party tool integration

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Motivation to Change Cray System Management

- **Requirements and expectations have evolved**
  - Proprietary management systems seen as limiting going forward
  - Customers are asking for open interfaces
  - Common interfaces for custom and COTS (commercial off-the-shelf) hardware

- **Industry standards are now more capable**
  - Redfish is replacing IPMI as the low level interface
  - New RESTful API enable discoverable capabilities
  - Open and documented APIs
  - JSON data formats human and machine friendly

Introduction to DMTF and Redfish

- **Distributed Management Task Force (DMTF)**
  - The DMTF creates open manageability standards spanning diverse emerging and traditional IT infrastructures including cloud, virtualization, network, servers and storage.

- **Redfish:**
  - DMTF's Redfish® is a standard API designed to deliver simple and secure management for converged, hybrid IT and the Software Defined Data Center (SDDC).
  - Now also ISO/IEC 30115:2018

Endpoint Discovery

- **Controller IP addressing**
  - Support customer assigned addresses
  - Supports IPv4/IPv6
  - 'explicit' endpoint discovery
  - Expected to integrate with customer networks

- **Name Resolution**
  - Redfish is HTTPS, requires X.509 Certificates
  - Clients *MUST* validate server (BMC) certificate FQDN
  - Prevent sending HTTP Basic credentials imposter

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Endpoint Discovery (continued)

- **COTS rackmount equipment**
  - Barcode scan of MAC addresses
  - Query MAC addresses from Ethernet Switch ports
  - SSDP, only answers "I'm somewhere over here"
    - COTS BMC is not location aware

- **Custom compute equipment**
  - Embedded Ethernet switches, can't map 1:1 BMC to switch ports
  - SSDP, answers "I am exactly here..."
    - BMC is location aware

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Redfish Control
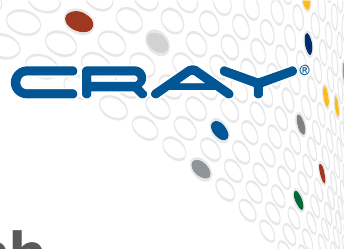
- **Commercial off-the-shelf (COTS) support Redfish**
  - COTS systems "#ComputerSystem.Reset"
    - Both support:
      - On, ForceOff, GracefulRestart, Nmi, PushPowerButton
    - The "COTS-A" system adds:
      - GracefulShutdown, ForceRestart, ForceOn

- **Cray custom (optimized) systems supporting Red**
  - Same Redfish APIs implemented in the Cray firmware
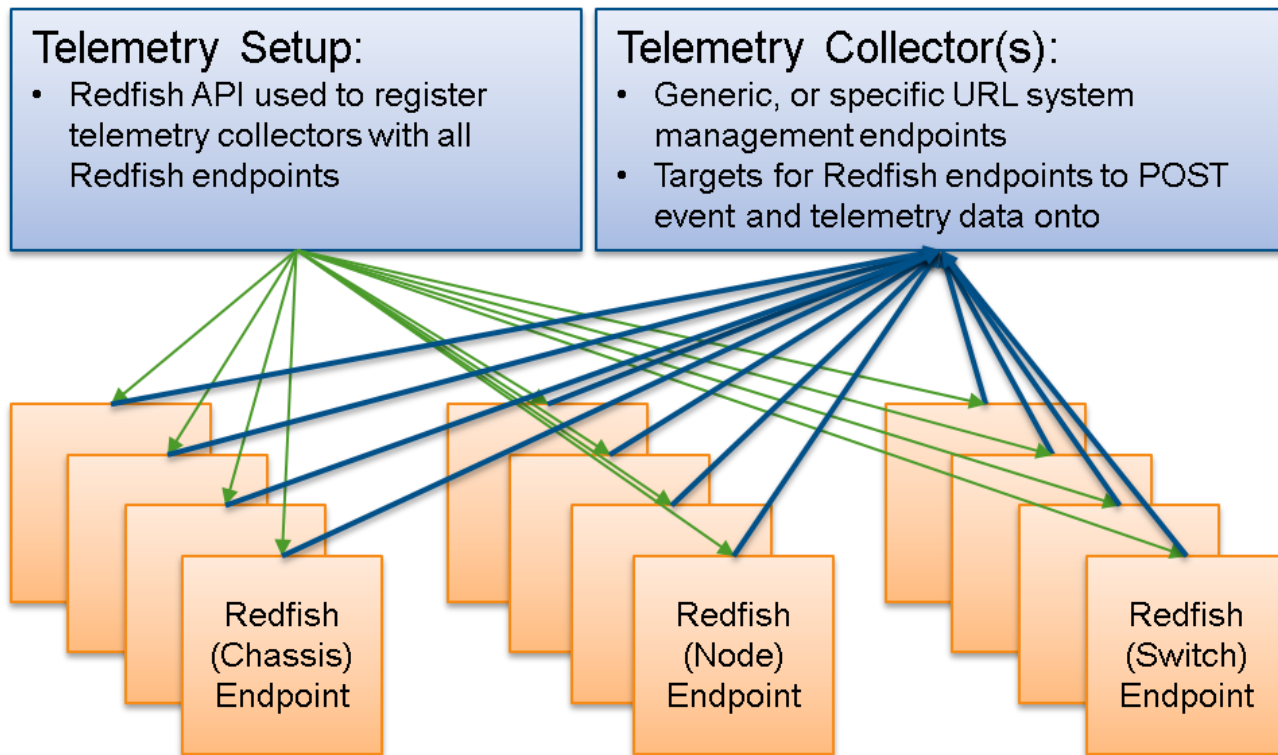 - Common higher level management tools

Redfish Control: Chassis Enclosure

```
sms:~user> curl -u root:XXXXXXXX https://cmm7/redfish/v1/Chassis/Enclosure
{ …
  "Actions": {
     "#Chassis.Reset": {
        "ResetType@Redfish.AllowableValues":  [ "On", "Off", "ForceOff" ],
        "target": "/redfish/v1/Chassis/Enclosure/Actions/Chassis.Reset"
     }
  },
  "ChassisType": "Enclosure", "Id": "Enclosure",
  "Links": {
    "Contains": [
      {"@odata.id": "/redfish/v1/Chassis/B0"}, {"@odata.id": "/redfish/v1/Chassis/M2"},
      {"@odata.id": "/redfish/v1/Chassis/B1"}, {"@odata.id": "/redfish/v1/Chassis/M1"},
      {"@odata.id": "/redfish/v1/Chassis/M0"}, {"@odata.id": "/redfish/v1/Chassis/B2"},
          ...
    ], "ManagedBy": [{ "@odata.id": "/redfish/v1/Managers/BMC" }]
  }, "Manufacturer": "Cray Inc", "Name": "Enclosure",
  "PowerState": "Off", "Status": { "State": "Enabled" }
}
```

Redfish Telemetry

Telemetry Setup:
- Redfish API used to register telemetry collectors with all Redfish endpoints

Telemetry Collector(s):
- Generic, or specific URL system management endpoints
- Targets for Redfish endpoints to POST event and telemetry data onto

Redfish (Chassis) Endpoint

Redfish (Node) Endpoint

Redfish (Switch) Endpoint

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Redfish Telemetry: EventService Subscribe

```
sms~user> curl -u root:XXXXXXXX -X \
        POST https://COTS-B/redfish/v1/EventService/Subscriptions/
{
  "Destination": "http://SMS-Telemetry/TelemetryEndpoint",
  "Context": "power",
  "EventTypes": [
    "Alert",
    "Status Change",
    "Value"
  ],
  "Protocol": "Redfish"
}
```

Redfish and Network Boot

- **Cray custom compute equipment**
  - Contains node management Ethernet
  - UEFI IPv4/IPv6 Network Boot
    - Supports commonly used network bootstrap programs PXE and iPXE

- **Flexibility to boot over HSN or NMN**
  - High speed network (HSN)
  - Node management network (NMN)

- **Redfish controls to select boot device/network**

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Cray and 3rd Party Tool Integration

- **Cray tools will simplify administration tasks**
  - Orchestrate parallel Redfish operations for scaling
  - Manage telemetry collection

- **Flexible environment supporting**
  - Cray tools
  - 3rd party tools
  - Open source tools (DMTF, and other)
  - Customer developed tools

Cray and 3rd Party Tool Integration

- **Redfish Tools Released on GitHub**
  - "DMTF invites review and open source contributions from the industry in the collaborative community environment of its public GitHub repo".
  - https://www.dmtf.org/content/new-redfish-tools-released-github

- **https://github.com/DMTF/Redfishtool**
  - Handy CLI (developed by the DMTF) Requires Python 3
  - Helps check compliance with the standard

Wrap Up

- **Cray is making fundamental changes in systems management**
  - Moving to Redfish as the hardware interface
  - Open well documented REST APIs
  - Support for open interfaces and tools
- **We are working on this now, and interested in your feedback!**

Q&A

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