
OPEN
Compute Project
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# Hardware Management for CG-OpenRack-19

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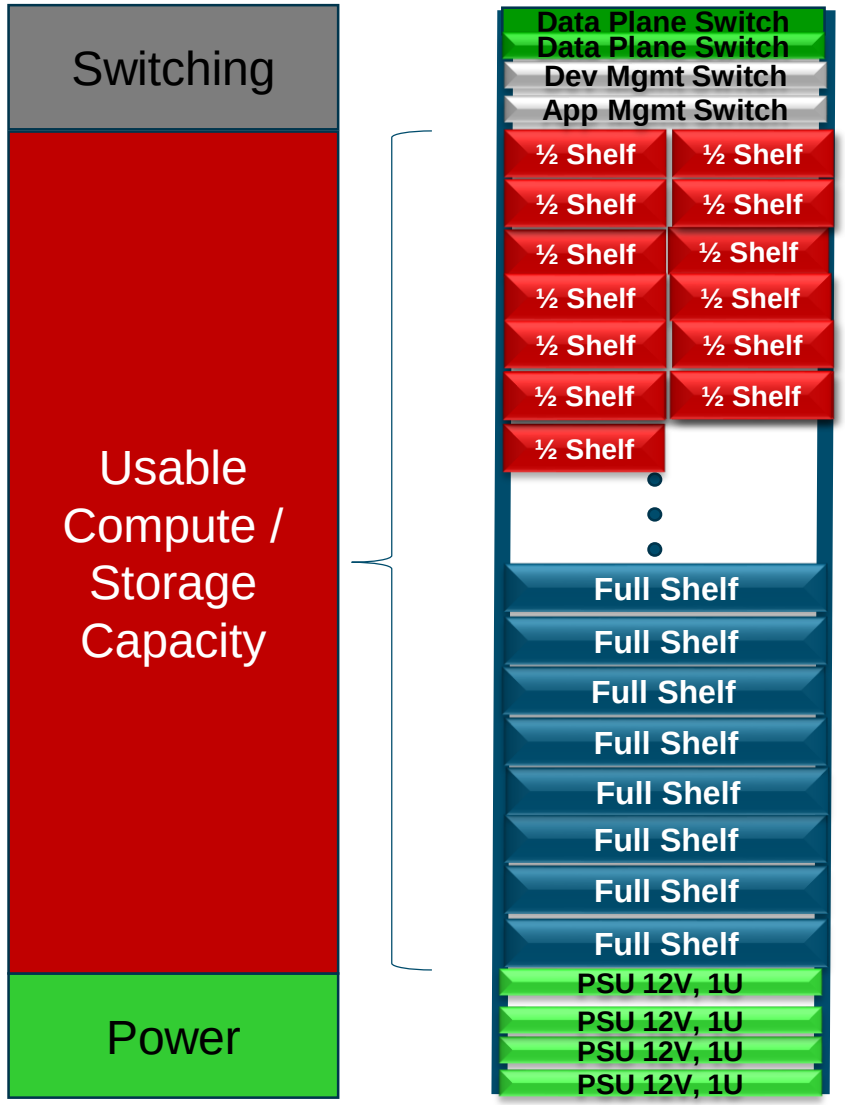
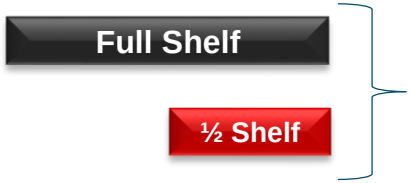
# Agenda

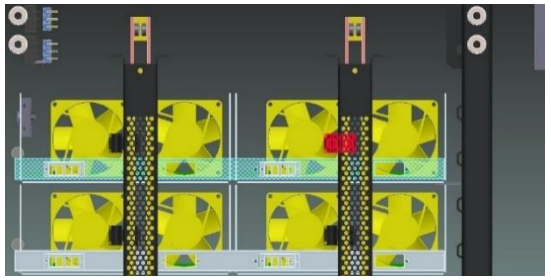
- **Hardware Architecture Overview**
- **Hardware Management Overview**
- **Rack Level Hardware Management**
- **Next Steps**

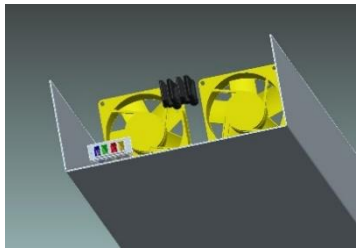
# CG-OpenRack-19 High Level Architecture



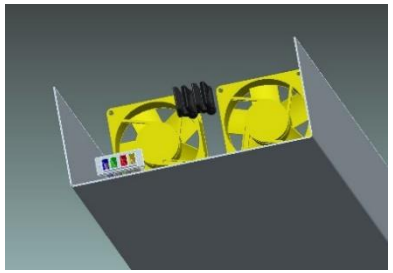

Standard 19” Rack





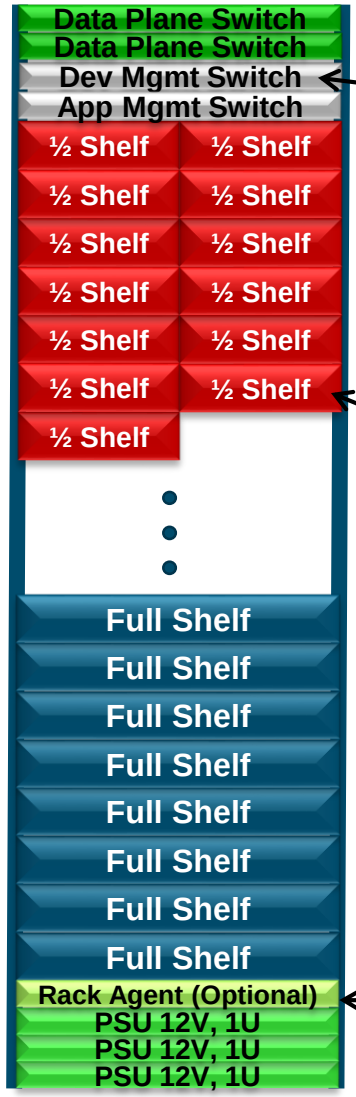
**Vertical 12VDC bus bar in frame mates with power connector located on sled**



**4 x optical fiber ports via blind mate rear connector to sled**

# CG-OpenRack-19 Hardware Management Overview

- **Create Cohesion Across CG-OpenRack-19 Implementations**
- **Leverage OCP hardware management premise**
  - Leverage existing HW management standards: IPMI 2.0, DCMI 1.5 and Redfish
  - Each node is independently managed by BMC
    - Includes cooling of shelf containing the node
- **Add Options as Necessary for Simple, Efficient Rack Management**
  - Device Management switch can be used to run Rack Management applications
    - Example, Location Aware Discovery
  - Rack Agent Module provides access to PSU & PDU, and additional physical security features, i.e. door locks
- **Options for Rack Management**
  - Provide basic rack level management using Redfish API based on open sourced Intel® RSD framework
  - Intel® RSD Architecture Compliant




- Connects to dedicated BMC port on each node, Rack Agent & Management port of other switches
- One uplink out of rack provides OOB management access to all devices in rack
- Open Linux environment enables Rack Level Management applications

- Shelf HW Management provided by Server BMC
- FRU Inventory
- Sensor Data
- Power on/off/reset
- Power consumption
- Boot order control
- Remote Console (SOL, KVM)
- Virtual media
- Front Panel Indicators
- Interfaces: IPMI 2.0, DCMI 1.5, Redfish

- Rack Agent provides Ethernet access to PSU & PDU
- Abstracts PSU & PDU management standard interface (IPMI, Redfish, SSH CLI)
- PSU & PDU Inventory
- Rack level power

# Intel® Rack Scale Design Reference Software

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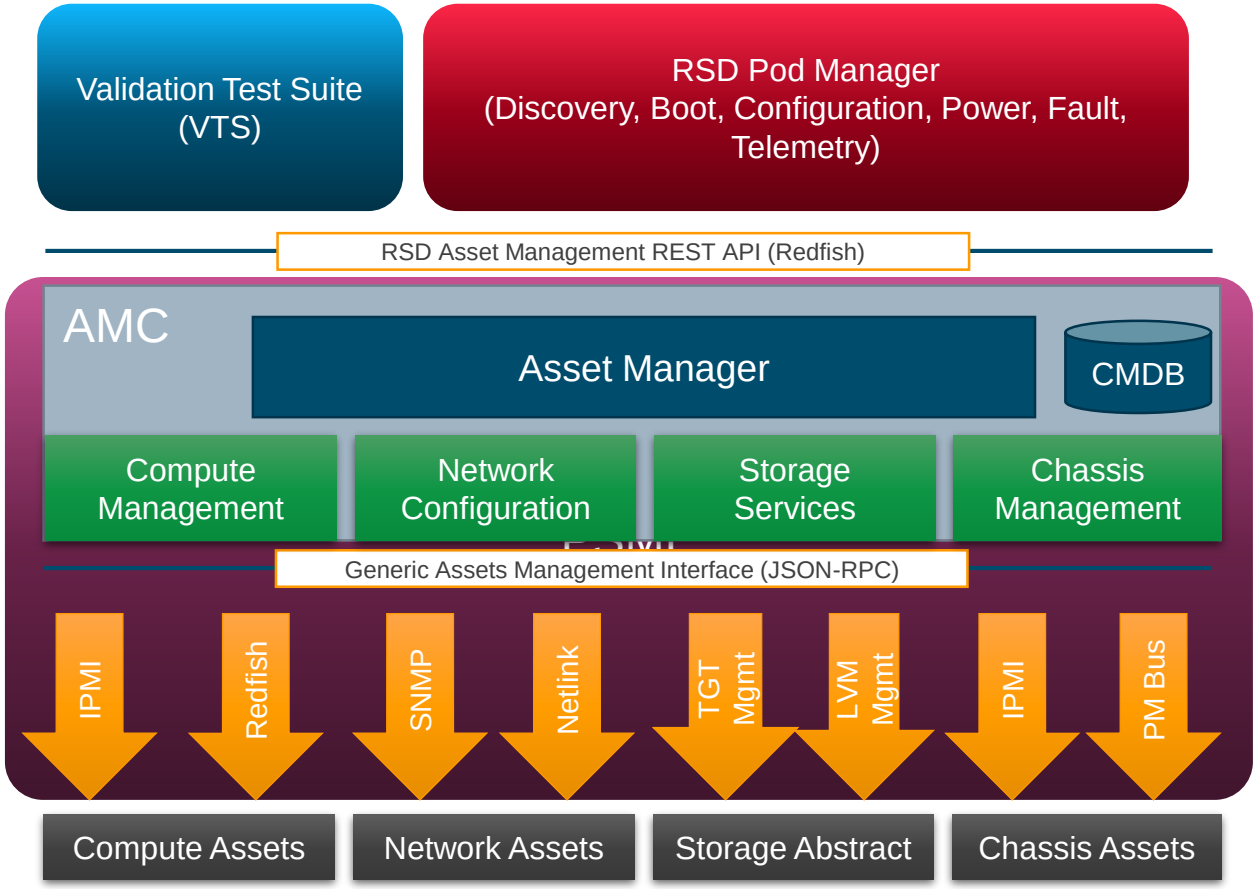
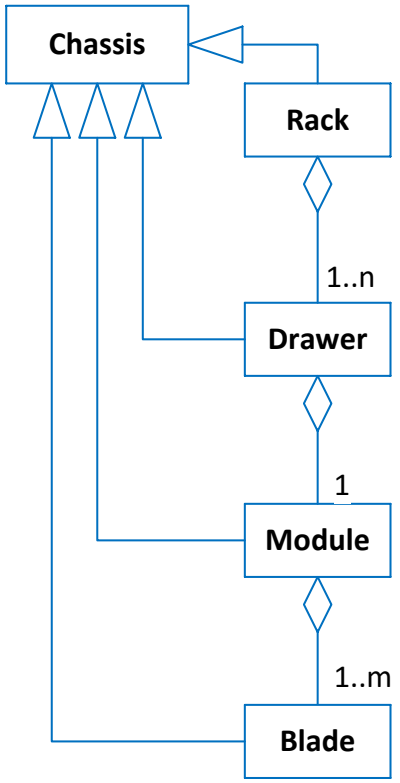
- **Intel® RSD is a logical architecture that disaggregates compute, storage, and network resources**
  - Introduces the ability to pool these resources for more efficient utilization of assets
  - provides the ability to dynamically compose resources based on workload-specific demands from a set of compute, fabric, storage, and management modules that work together to build a wide range of virtual systems
- **The design uses four basic pillars:**
  - POD Manager for multi-rack management
  - Pooled system of compute, network, and storage resources are composed based on workload requirements
  - Pod-wide storage built on Ethernet-connected storage
  - A configurable network fabric of hardware, interconnect with cables and backplane, and management software
- **Intel RSD based on open industry standard Redfish***
- **Intel has open sourced reference implementation of following components on:**
  - Pod Manager
  - Pooled System Management Engine (PSME)
  - Rack Management Module (RMM)
  - Validation Test Suite (VTS)

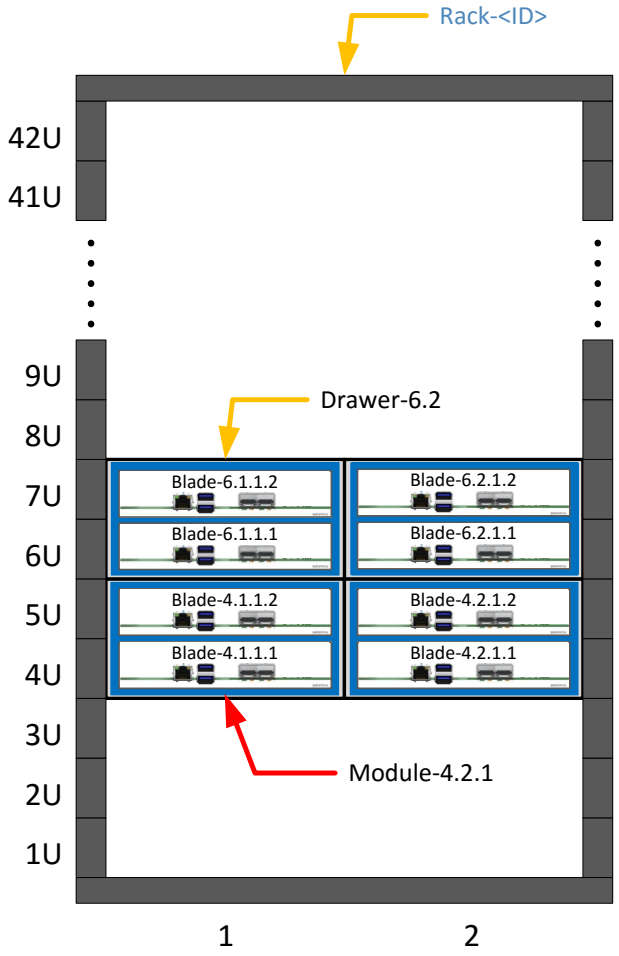



Source code: https://github.com/01org/intelRSD

# CG-Open Rack 19 Component Numbering

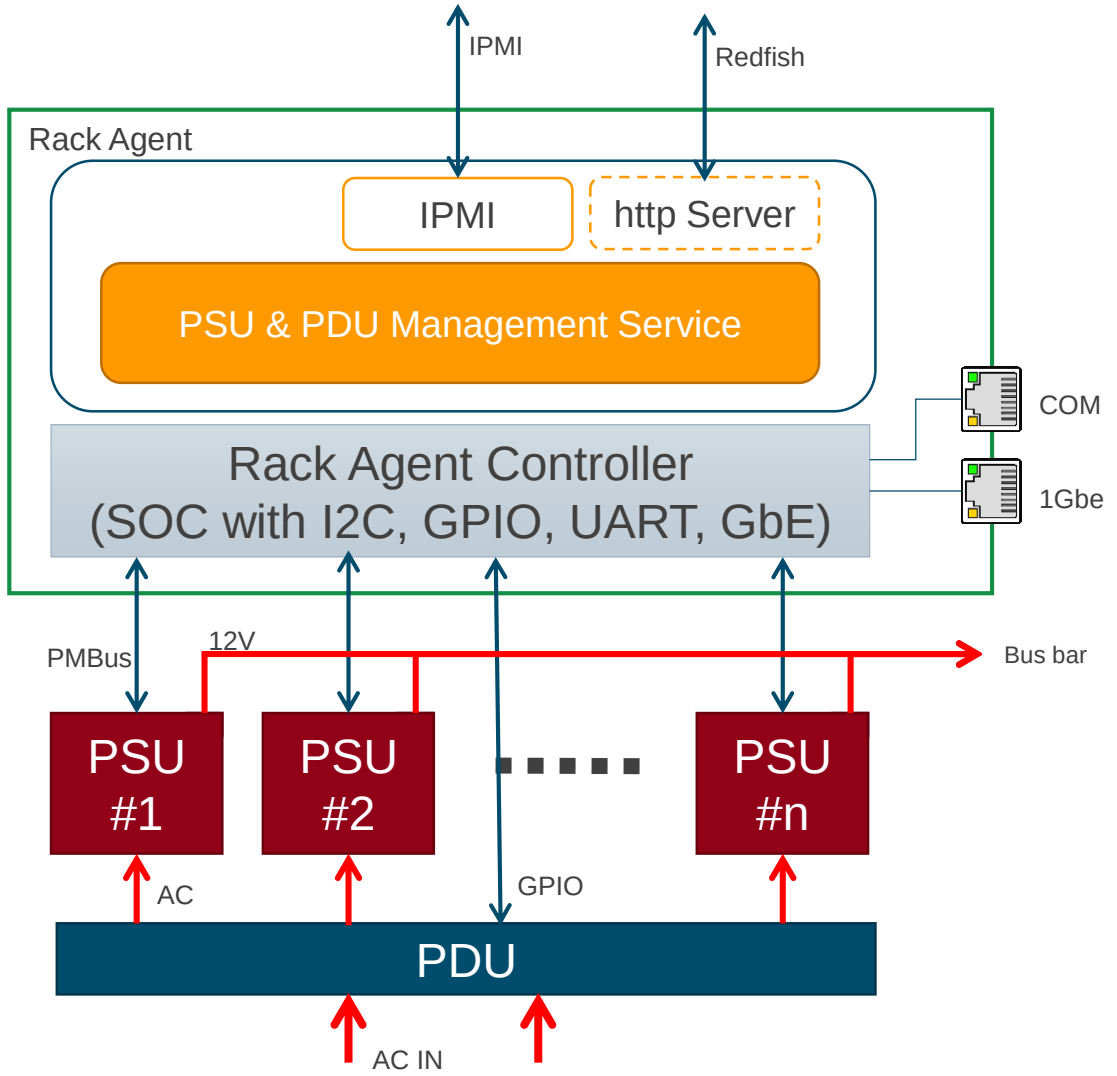
- **A key attribute of Intel® RSD management is location-aware discovery**
  - A mechanism for numbering each component is required
- **Each Rack has a unique ID**
  - Configured by operator
- **RSD defines a 3 level hierarchy for modeling computer systems**
  - Drawer – maps to a shelf
  - Module – logical entity
  - Blade – maps to server motherboard
- **Numbering scheme for blades:**
  - <Drawer Row>.<Drawer Column>.1.<Blade Id>



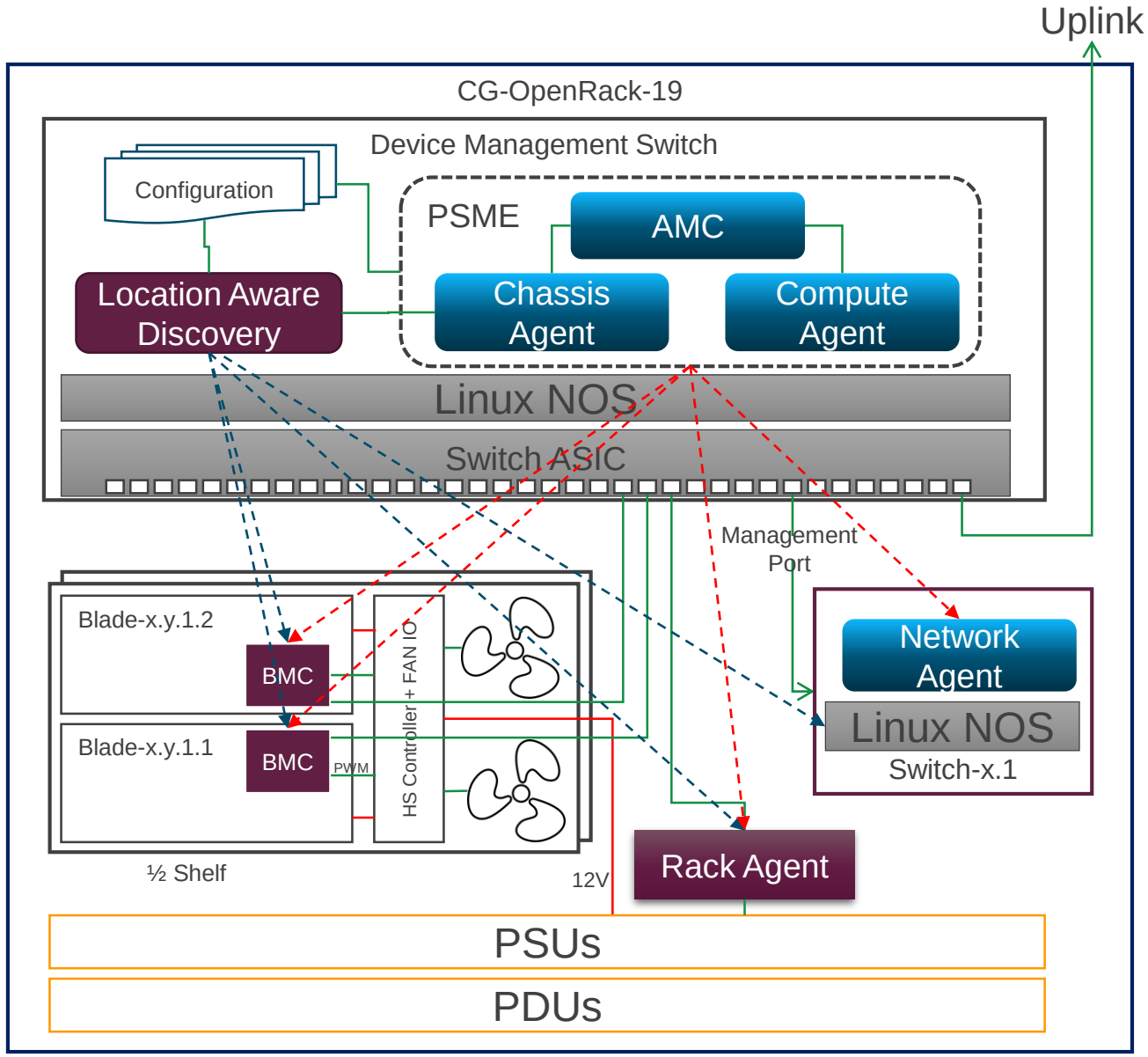
# Rack Agent Architecture

- **Rack Agent module consists of a Controller module following I/O:**
  - I2C interface to interface to PMBus
  - Ethernet Interfaces for uplink to device management switch
  - Serial console for debugging & initial setup
  - GPIO signals to monitor PSUs and Circuit Breakers on PDU
  - Other sensors required to monitor health of the module
  - OpenBMC is a good fit
- **PSU/PDU Management**
  - Presence & Inventory info of PDU & PSU
  - PSU Input and Output Voltage/Current
  - PDU Circuit Breakers
  - Temperature
  - Fan speed & status



# RSD Implementation on CG-OpenRack-19

- **Extended RSD PSME reference code to run on Device Management switch**
  - Extended Chassis and Compute GAMI IPMI interfaces to interact with BMC
  - Extended Network Agents to run on Cumulus Linux on Data switches
- **Added Location Aware Discovery application to discover and determine blade locations**
  - Monitors switch ports to determine presence/absence of devices in the rack
  - Uses Port-to-Device Mapping configuration file to map learned MAC addresses to Blade & Switch location
    - MAC -> Port -> Location
  - To overcome limited visibility of blade inventory through IPMI, uses device profile files for each Product Id
    - Profile describes device tree of server
- **PSME Interfaces to Location Aware Discovery application through API**
  - Retrieves BMC parameters
  - PSME will use contents of BOM file to fill in information not accessible via IPMI
  - Listens for device state changes



# Supported Redfish Capabilities with Intel® RSD

- **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
- **Common Manageability**
  - Change boot order / device
  - Reboot / power cycle server
  - Power usage and thresholds
  - Temperature
- **BMC Infrastructure**
  - View / configure BMC network settings
- **Access and Notification**
  - Subscribe/publish event model

# CG-OpenRack-19 Hardware Management Next Steps

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- **To provide cohesion across CG-OpenRack-19 implementations**
- **We are considering contributing the location aware discovery application and Intel® RSD enhancements**
  - It enables basic hardware management of rack using Redfish
- **Please join us on in the Radisys booth to see DCEngine and see a demonstration of this work.**

**DCEngine**
Intel® Rack Scale Design

***DCEngine*** *is a commercially available product family compliant with this specification.*

Collaborate Create Share

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# Thank You