Open. Together.
Modeling Immersion Cooling
Compatible with OCP Profile

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OCP Advanced Cooling Solutions (ACS)

- A sub-project of OCP Rack & Power
- Immersion Standards and best practices
- Version 1.0 Feb 20, 2019 Final community approval
  - Immersion technology definitions
  - Quality and safety requirements
  - Management and monitoring

(https://www.opencompute.org/wiki/Rack_%26_Power/Advanced_Cooling_Solutions)
Who Are We?

- A leading player of rack-level integrator
- Delivered 27000+ racks in 2018
- ORv2, OCS, Open19, EIA 19”
- A leading player of OCP certified products
- 20 out of 30 OCP Accepted server/storage products are designed and/or made by Wiwynn.
Where Are We?

• Wiwynn’s whitepaper submission on immersion standards was approved
• Wiwynn is prototyping the use of Redfish to manage its immersive cooling tank
Building a Tank

Key features

- High-density - 100 nodes per Tank
- Low PUE
- Two-Phase Immersion Cooling
- 48V DC power distribution
Management Software for the Tank

Cooling system control
Power management
Node management
 Interfaces

Goal:
• Compatible with OCP Profile
• Be friendly to existing DCIM

Valves and pumps

Redfish-based API  Web-based GUI
Challenges

• Additional relationship between nodes
• Additional actions
• Different orientation

A simple object hierarchy

```
/redfish/v1
Service Root
```
```
/redfish/v1/Chassis
Collection of Chassis
/Chassis/<id>
ChassisType="Blade"
```
```
/redfish/v1/Systems
Collection of Systems
/Systems/<id>
Computer System
```

Power
Thermal
Additional Relationship between Nodes

- Topology of power distribution, e.g.,
- Power Bus Bar
- Nodes that share presence state, e.g.,
- Cartridges
The Implemented Hierarchy

/redfish/v1

Service Root

Chassis
- ChassisType="Rack"
- ChassisType="Enclosure"
- ChassisType="Blade"

Systems
- Computer System

Chassis Type
- Rack
- Enclosure
- Blade

Power
- Tank
- Power Bus Bar
- Cartridge
- Node

Thermal
Additional Actions

Dynamic power capping according to air pressure
  • Enable power capping when air pressure hits threshold

Lid opening
  • Throttle or shutdown ComputerSystems till the liquid temperature below boiling point

Cartridge drawn out
  • By crawling the object hierarchy, identify the ComputerSystems that will be impacted
  • Send graceful shutdown requests to them
The Orientation

Transform (x, z) to (x, y) to be friendly to existing DCIM
Rotate 90 degree to map power bus to virtual chassis
Screenshot and Short Demo Video
Compatibility with Existing DCIM

Wiwynn Cluster Manager
Intel® RSD PODM
Zabbix (under testing)
Call to Action

• Work with the immersion cooling group on the OCP Profile
• Wiwynn will keep following Immersion Standards and best practices.
• Wiwynn is willing to contribute its draft to the profile.
• Work with us to massively deploy immersion cooling to real world datacenters