HP Apollo 8000 System

Monitoring and Controls

Christopher Holmes
HP System Manager developer
Nicolas Dubé
Chief Strategist for HPC
HP Apollo 8000 System

Leading performance density
HP Apollo f8000 Rack

Dry disconnect server trays
HP ProLiant XL730f 2x2P Servers
HP ProLiant XL740f 2P+ 2 Accelerators
HP ProLiant XL750f 2P+2 GPUs

Efficient liquid cooling without the risk
HP Apollo 8000 iCDU Rack

HP InfiniBand Switch for Apollo 8000 System

HP Apollo 8000 Cooling Circuit
Apollo 8000 System Technologies

Advancing the science of supercomputing

**Intelligent Cooling Distribution Unit**
- 320 KW power capacity
- Integrated controls with active-active failover

**Dry-disconnect servers**
- 100% water cooled components
- Designed for serviceability

**Management infrastructure**
- HP iLO4, IPMI 2.0 and DCMI 1.0
- Rack-level Advanced Power Manager

**Power infrastructure**
- Up to 80kW per rack
- Four 30A 3-phase 380-480VAC

**Warm water**
- Closed secondary loop in CDU
- Isolated and open facility loop

**Open door view of 4 f8000, redundant iCDU racks and underfloor plumbing kit**

Raised Floor
HP System Manager v1.0 Objectives

• Provide insight into the Apollo 8000 water-cooled infrastructure

• Provide solution-level and component-level views

• Display sensor history for trending and analysis

• Send email when alerts are detected
HP System Manager network topology

Lab Network

- Switch
- System Manager
- HP APM
- ICUD
- Server Rack
- Server Rack
- Server Rack
- Server Rack
- ICUD
HP System Manager

Launch the Main Display

All racks are displayed and colored based on alert summary

All current alerts are displayed

Click on the components to See more detail

Rack firmware table below
HP System Manager

IT Rack schematic display

Icons representing sensors change color when values go out of range or an alert is triggered
HP System Manager

CDU Rack schematic display

Icons representing sensors change color when values go out of range or an alert is triggered

CDU Status and alarm table displayed below
Plots spanning the past 24 hours for pre-selected metrics are available.
HP System Manager

- Every bit of metric data is preserved in the HP Insight CMU database
- Any and all data can be extracted to CSV files

```
[root@uefi02 tools]# pwd
/opt/cmu/apollo/tools
[root@uefi02 tools]# ls
get_metric_data  make_plot_data
[root@uefi02 tools]# ./get_metric_data -h
usage: get_metric_data [-m "m1,m2,..."] [-n "n1,n2,..."] [-H <# of hours>] [-b <date time>] [-e <date time>] [-f <filename>]
   get_metric_data -h
   -h : this help
   -m : comma-separated list of metrics
   -n : comma-separated list of nodes
   -H : provide data starting from this many hours ago
   -b : provide starting date and time of data capture; syntax 'yyyy-MM-dd HH:mm:ss'
   -e : provide ending date and time of data capture; syntax 'yyyy-MM-dd HH:mm:ss'
   -f : store data in this file

By default, this script dumps all metrics from all nodes from yesterday to a prenamed file in
/opt/cmu/apollo/reports
[root@uefi02 tools]#  
```
HP System Manager

To view/analyze sensor history, use HP Insight CMU
HP System Manager

Each circle displays the given metric from all components so that the values can be compared to each other.

This display makes it easy to identify outliers (etc. hottest/coolest/fastest/slowest component)
HP System Manager

HP Insight CMU Time View displays the same metric “circles” with history, so that patterns in the data can be seen.

You can click on the component slices to change their color so you can correlate the component across the circles.
Backup slides
HP System Manager
HP System Manager Pre-Configuration Requirements

- Each HP APM configured with known IP address and username/password
- HP APM in CDU rack is configured with CDU IP address
- HP APM has secure XML enabled (‘enable xml secure’)

- System Manager server configured with appropriate IP addresses
  - One internal IP address on “infrastructure” network connected to APMs
  - One external IP address connected to lab network
Gathering the data from APM

[root@uefi02 apm]# pwd
/opt/cmu/apollo/apm
[root@uefi02 apm]# ls xml
get_all_compute_power.xml    get_fw_version.xml    get_rectifier_data.xml
get_cdu_info.xml             get_power_load.xml    get_thermal_status.xml
get_cdus.xml                 get_power_meter_data.xml get_warnings.xml
get_event_log.xml            get_rack_info.xml
get_fault_log.xml            get_rack_topology.xml
[root@uefi02 apm]#
[root@uefi02 apm]#
[root@uefi02 apm]# cat xml/get_thermal_status.xml
<SLAPMCL VERSION="2.0">
<LOGIN USER_LOGIN="XXUSERXX" PASSWORD="XXPASSXX">
<GET_thermal_STATUS/>
</LOGIN>
</SLAPMCL>
[root@uefi02 apm]#
[root@uefi02 apm]#
[root@uefi02 apm]# curl -k -X POST -H content-type:application/xml -d@/tmp/xmlfile https://192.168.3.1
Gathering data from the APM

```xml
<SLAPMC Version="1.00" />
<RESPONSE STATUS="0000" MESSAGE="No Error." />
<GET_THERMAL_STATUS>
    <GET_THERMAL_STATUS_UPPER>
        <SENSORS>
            <SENSOR NAME="Leak Detector" INDEX="1" STATUS="no leaks" />
            <SENSOR NAME="Leak Detector" INDEX="2" STATUS="no leaks" />
            <SENSOR NAME="Leak Detector" INDEX="3" STATUS="no leaks" />
            <SENSOR NAME="Door Sensor" INDEX="1" STATUS="closed ( front )" />
            <SENSOR NAME="Door Sensor" INDEX="2" STATUS="closed ( rear )" />
            <SENSOR NAME="Valve Sensor" INDEX="1" STATUS="not present" />
            <SENSOR NAME="Valve Sensor" INDEX="2" STATUS="not present" />
            <SENSOR NAME="Water Temp (RTD)" INDEX="1" STATUS="29.7425 degC ( supply )" />
            <SENSOR NAME="Water Temp (RTD)" INDEX="2" STATUS="30.4925 degC ( intermediate )" />
            <SENSOR NAME="Water Temp (RTD)" INDEX="3" STATUS="31.5863 degC ( return -bot )" />
            <SENSOR NAME="Flow" INDEX="1" STATUS="1.92560 PSI (689.00 mV reading)" />
            <SENSOR NAME="Temp-Humid -board" INDEX="1" STATUS="32.03 degC, 22.46 %RH" />
            <SENSOR NAME="Dew Point Temp." INDEX="1" STATUS="7.93 degC" />
            <SENSOR NAME="Air Temp." INDEX="1" STATUS="30.7500 degC (Dev 0:0 )" />
            <SENSOR NAME="Air Temp." INDEX="7" STATUS="33.2500 degC (Dev 2:0 )" />
            <SENSOR NAME="DC/DC Power Supply" INDEX="1" STATUS="654.00 mV (PS 0 - present - OK)" />
            <SENSOR NAME="DC/DC Power Supply" INDEX="2" STATUS="655.00 mV (PS 1 - present - OK)" />
        </SENSORS>
    </GET_THERMAL_STATUS_UPPER>
</GET_THERMAL_STATUS>
```