

OpenHPI for HP ProLiant Rack Mount Server Developers Guide

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Introduction

The OpenHPI Developer's Guide for the HP ProLiant Rack Mount Server describes how to install and configure the iLO2 RIBCL plug-in and provides a product overview, and information on resource mappings and event processing.

Intended Audience

This document is intended for application developers, programmers, and database administrators who are responsible for developing, testing, administering and maintaining OpenHPI enablement on HP ProLiant Rack Mount servers using the iLO2 RIBCL plug-in.

Additional Resources

For more information about iLO, see the *HP Integrated Lights-Out 2 User Guide* located at:
<http://www.hp.com/servers/lights-out>

Typographic Conventions

This document uses the following typographic conventions.

| | |
|---|---|
| <code>Command</code> | A command name or qualified command phrase. |
| <code>ComputerOut</code> | Text displayed by the computer. |
| Ctrl-x | A key sequence. A sequence such as Ctrl-x indicates that you must hold down the key labeled Ctrl while you press another key or button. |
| <code>ENVIRONVAR</code> | The name of an environment variable, for example, <code>PATH</code> . |
| <code>[ERRORNAME]</code> | The name of an error, usually returned in the <code>errno</code> variable. |
| Key | The name of a keyboard key. Return and Enter both refer to the same key. |
| Term | The defined use of an important word or phrase. |
| UserInput | Commands and other text that you type. |
| <code>VARIABLE</code> | The name of a placeholder in a command, function, or other syntax display that you replace with an actual value. |
| <code>\ (continuation character)</code> | A backslash (<code>\</code>) at the end of a line of code (such as a command) indicates that the following line of code is contiguous, and you must not insert a line break. This convention facilitates the typesetting of long lines of code examples on a printed page. If you cut and paste sample code from this publication, ensure that you remove backslash characters at line endings. |
| <code>...</code> | The preceding element can be repeated an arbitrary number of times. |
| <code> </code> | Separates items in a list of choices. |

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Overview

OpenHPI provides an open source implementation of the Service Availability Forum (SAF) Hardware Platform Interface (HPI). HPI provides an interface for managing computer hardware like the HP ProLiant Rack Mount Server. The HP ProLiant Rack Mount Server requires an OpenHPI “plug-in” to support OpenHPI on its hardware. HP has developed the iLO2 RIBCL plug-in to allow access to the HP ProLiant Rack Mount Server. The iLO2 RIBCL plug-in works with iLO2, iLO3 and later versions.

The iLO2 RIBCL plug-in is an interface to HP ProLiant Rack Mount servers, which use Remote Insight Board Command Language (RIBCL) to communicate with the on-board Integrated Lights-Out 2 (iLO2) management processor.



NOTE: The iLO2 RIBCL plug-in is referenced as `ilo2_ribcl` in the OpenHPI tree, and by the name `libilo2_ribcl` in all OpenHPI configuration files.

For more information and documentation on the OpenHPI project, refer to the following web sites:

- <http://www.openhpi.org>
- <http://sourceforge.net/projects/openhpi>
- <http://openhpi.sourceforge.net/manual/book1.html>

Supported Systems

The iLO2 RIBCL plug-in is supported on the following HP ProLiant Rack Mount Servers:

- DL360 G5, G6, G7
- DL365 G1, G5, G6
- DL380 G5, G6, G7
- DL385 G2, G5, G6, G7

Unsupported Systems

The iLO2 RIBCL plug-in is not supported on the DL580 and DL585 HP ProLiant Rack Mount Servers.

OpenHPI Releases

The iLO2 RIBCL plug-in is included in the OpenHPI 2.12 release. For earlier OpenHPI releases, the iLO2 RIBCL plug-in patches can be downloaded.

Future enhancements and defect fixes for this plug-in are posted to the openhpi-devel mailing list located at:

http://sourceforge.net/mailarchive/forum.php?forum_name=openhpi-devel

You can monitor this list or perform a search for the string `ilo2_ribcl` to find relevant content in the mailing list archives.

System Requirements

The iLO2 RIBCL plug-in is installed and enabled automatically when you compile and install OpenHPI. Instructions are provided in the `openhpi/README` file. You may run into errors during the OpenHPI configuration and build process if your build system does not contain the necessary software packages.

The following section describes what you need to successfully build OpenHPI with the iLO2 RIBCL plug-in and contains information on installation and firmware requirements.

Installation Requirements

To successfully install the iLO2 RIBCL plug-in during the OpenHPI build process, you must have the following packages installed on your Management Server (host system):

- `openssl-devel` version 0.9.8a or later
- `libxml2-devel` version 2.6.23 or later

HP recommends that you use the latest version that is available for your distribution.



NOTE: You may disable the automatic build of the iLO2 RIBCL plug-in by passing the configure flag `--disable-ilo2_ribcl` during the configure process. The configuration file `./configure --disable-ilo2_ribcl` builds OpenHPI without the iLO2 RIBCL plug-in. For more information, see the README file that is packaged with the OpenHPI distribution.

Firmware Requirements

Verify that iLO2, iLO3 has the latest firmware on all target HP ProLiant Rack Mount server systems to be managed. The Lights-Out advanced pack licensing level is required to access advanced manageability features such as Power Management.

For detailed instructions on performing the firmware upgrade, see the respective *HP Integrated Lights-Out User Guide* located at:

<http://www.hp.com/servers/lights-out>

Configuring the iLO2 RIBCL Plug-In

The OpenHPI iLO2 RIBCL plug-in is configured in the `/etc/openhpi/openhpi.conf`. OpenHPI configuration file. Using your preferred text editor, edit the file and configure the iLO2 RIBCL plug-in instance.

This section contains information on the following topics:

- Setting the iLO Username and Password
- Modifying the iLO2 RIBCL Plug-In section in the OpenHPI Configuration File

Setting the iLO User Name and Password

You must set up a user account on the iLO management processor for each HP ProLiant Rack Mount server that you want to manage. The iLO is configured at the factory with a default username and password. The default username and password can be found on the iLO2 Network Settings tag attached to the server. HP recommends changing the default username and password after logging in to iLO for the first time.

The login and password in the `/etc/openhpi/openhpi.conf` configuration file must correspond to an iLO local user name and password. In addition, to support any HPI API that involves power control or reset, verify the iLO local user name and password has the *Virtual Power and Reset* privilege.

To setup or change the login and password, refer to the “iLO Setup” and “Configuring iLO2” chapters in the respective *HP Integrated Lights-Out User Guide* located at:

<http://www.hp.com/servers/lights-out>

Modifying the iLO2 RIBCL Plug-In Section in the OpenHPI Configuration File

The iLO2 RIBCL plug-in supports several interfaces for configuration. The following is an example configuration stanza for the iLO2 RIBCL plug-in:

```
handler libilo2_ribcl {
    entity_root = "{RACK_MOUNTED_SERVER,8}"
    ilo_ribcl_hostname = "x.x.x.x" # <iLO IP address>
    ilo_ribcl_portstr = "443" # iLO2 RIBCL SSL server
port number
    ilo_ribcl_username = "username" # <iLO username>
    ilo_ribcl_password = "password" # <iLO password>
}
```


You must update the entries in the `/etc/openhpi/openhpi.conf` configuration file for your particular configuration as follows:

- The value of `ilo_ribcl_hostname` must be set to the TCP/IP address of the iLO on the system you want to manage.
- The value of `ilo_ribcl_portstr` specifies the Web Server SSL Port used by the iLO2 RIBCL plug-in. The default configuration value is 443. Change this value only if you have changed the Web Server SSL Port configuration in iLO2.
- The value of `ilo_ribcl_username` and `ilo_ribcl_password` must correspond to an iLO local username and password.

HP ProLiant Server Resources

This section covers the following topics:

- HP ProLiant Server Model Differences
- RPT Mapping and HP ProLiant Server Entity Types
- System Chassis Resources
- Processor Resources
- Memory Resources
- Power Supply Resources
- Power Module (VRM) Resources
- Fan Resources

All removable resources use the simple hot swap model, and specify `SA_CAPABILITY_FRU` in the `ResourceCapabilities` of their Resource Presence Table entry. The System Chassis is the only resource that is not a field replaceable unit. For details on how hot swap works with HP ProLiant servers, see [“Hot Swap Operations”](#) (page 17).

The `ResourceSeverity` field in the Resource Presence Table entry for all ProLiant resources is set to `SAHPI_CRITICAL`.

RPT Mapping and HP ProLiant Server Entity Types

The following tables outline the RPT mappings, entity type definitions, and entity path examples supported by the iLO2 RIBCL plug-in.

Table 1 RPT Mappings

| Resource | Entity Path | Capabilities |
|--------------------------------|--|---|
| HP ProLiant Rack Mount Chassis | {entity_root} {RACK_MOUNTED_SERVER,#} | SA_CAPABILITY_CONTROL SA_CAPABILITY_INVENTORY_DATA SA_CAPABILITY_POWER SA_CAPABILITY_RDR SA_CAPABILITY_RESET SA_CAPABILITY_RESOURCE SA_CAPABILITY_SENDO |
| Processor | {RACK_MOUNTED_SERVER,#} {PROCESSOR,#} | SA_CAPABILITY_FRU SA_CAPABILITY_INVENTORY_DATA SA_CAPABILITY_RDR SA_CAPABILITY_RESOURCE |
| Memory Device | {RACK_MOUNTED_SERVER,#} {MEMORY_DEVICE,#} | SA_CAPABILITY_FRU SA_CAPABILITY_INVENTORY_DATA SA_CAPABILITY_RDR SA_CAPABILITY_RESOURCE |

Table 1 RPT Mappings *(continued)*

| Resource | Entity Path | Capabilities |
|--------------|---|---|
| Power Supply | {RACK_MOUNTED_SERVER,#} {POWER_SUPPLY,#} | SA_CAPABILITY_FRU SA_CAPABILITY_RESOURCE |
| Power Module | {RACK_MOUNTED_SERVER,#} {POWER_MODULE,#} | SA_CAPABILITY_FRU SA_CAPABILITY_RESOURCE |

Table 2 HP ProLiant Server Entity Type Definitions

| Entity Name | Entity Type |
|------------------------------------|---------------------|
| ProLiant Rack Mount Server Chassis | RACK_MOUNTED_SERVER |
| Processor | PROCESSOR |
| Memory Module | MEMORY_DEVICE |
| Power Supply Module | POWER_SUPPLY |
| Power Module | POWER_MODULE |
| Fan | COOLING_DEVICE |

Table 3 Entity Path Examples

| Resources | Example Entity Path |
|------------------------------------|--|
| ProLiant Rack Mount Server Chassis | {RACK_MOUNTED_SERVER,9} |
| Processor(s) | {RACK_MOUNTED_SERVER,9}{PROCESSOR,1} {RACK_MOUNTED_SERVER,9}{PROCESSOR,2} |
| Memory Module | {RACK_MOUNTED_SERVER,9}{MEMORY_DEVICE,1} {RACK_MOUNTED_SERVER,9}{MEMORY_DEVICE,2} |
| Power Module | {RACK_MOUNTED_SERVER,9}{POWER_MODULE,1} {RACK_MOUNTED_SERVER,9}{POWER_MODULE,2} |
| Fan(s) | {RACK_MOUNTED_SERVER,9}{COOLING_DEVICE,1} {RACK_MOUNTED_SERVER,9}{COOLING_DEVICE,2} |

System Chassis Resources

The entity location for the system chassis is specified in the `openhpi.conf` configuration file as the entity location for the `entity_root`.

The resource tag for the system chassis is constructed by combining the system model number with the system serial number and the entity location of the `entity_root` enclosed within parenthesis. For example, the following syntax specifies a resource tag for the DL360 G5 server with the number 5 as the entity location.

Example Syntax ProLiant DL360 G5 SN:MXQ73703A6 (5)

Processor Resources

The entity location for a processor resource is the slot number for that processor given by the iLO2 RIBCL plug-in.

The resource tag for a processor resource is the label value returned from the RIBCL `GET_HOST_DATA` command. It is displayed as `Proc N`, where *N* is the processor slot number.

Memory Resources

The entity location for a memory DIMM resource is the slot number for that DIMM given by the iLO2 RIBCL plug-in.

The resource tag for a memory DIMM resource is the label value returned from the RIBCL GET_HOST_DATA command. It is displayed as DIMM *NX*, where *N* is the slot number and *X* is a capital letter as shown in the following example syntax.

Example Syntax DIMM 2A

Future supported systems may have a different format for the DIMM resource tag.

Power Supply Resources

The entity location for the power supply resource is the bay number for that power supply given by the iLO2 RIBCL plug-in.

The resource tag for a power supply resource is the label value returned for that power supply from the RIBCL GET_EMBEDDED_HEALTH_DATA command. It is displayed as Power Supply *N*, where *N* is the power supply

Power Module (VRM) Resources

The entity location for a power module resource is the VRM slot number for that module given by the iLO2 RIBCL plug-in. The resource tag for a power module resource is the label value returned from the GET_EMBEDDED_HEALTH_DATA command. It is displayed as VRM *N*, where *N* is the slot number.

Fan Resources

The entity location for a fan resource is the fan index number given by the iLO2 RIBCL plug-in. Note, for the DL360 server and the DL365 server, the index number specifies a block of several fans.

The resource tag for a fan resource is constructed by combining the label and zone values for the fan that are returned by the GET_EMBEDDED_HEALTH_DATA command.

Example Syntax For DL380 and DL385 Servers:
Fan 2 Location I/O Board

Example Syntax For DL360 and DL365 Servers:
Fan Block 2 Location CPU

The DL360 and DL 365 Servers report information for block fans.

Resource RDR Mappings

All inventory data repositories, areas, and fields are read-only. The supported HPI inventory APIs include the following:

- saHpiIdrInfoGet()
- saHpiIdrAreaHeaderGet()
- saHpiIdrFieldGet()

Sensor readings are updated only during a discovery operation due to the overhead of the iLo2 communication latency.

Sensor readings are also updated with the periodic resource discovery performed by the openhpid daemon's oh_discovery_thread_loop, and occur approximately every three minutes. The sensor reading returned from saHpiSensorReadingGet() is the cached value obtained during the most recent discovery operation.

This section contains information on the following topics:

- HP ProLiant Chassis RDRs
- Processor RDRs
- Memory RDRs
- Power Supply RDRs
- Fan (Cooling Device) RDRs
- Voltage Regulator Module (VRM) RDRs
- Sample hpitop Output for Supported Servers

HP ProLiant Chassis RDRs

Chassis Controls

Table 4 identifies the chassis controls available and supported by the iLO2 RIBCL plug-in. Table 6 on page 15 provides a summary of the chassis controls that are available and supported by the iLO2 RIBCL plug-in.

Table 4 Supported Controls

| Control | Description |
|---|---|
| Unit Identification Light (UID) Control | <p>Unit Identification Light status can be queried using the <code>saHpiControlGet</code> API and the light can be turned on or off using the <code>saHpiControlSet</code> API. Valid values for the Unit Identification Light (UID) Control include:</p> <ul style="list-style-type: none"> • .. On(1) • .. Off(0) |
| Power Saver Control | <p>The iLO Power Regulator Feature on HP ProLiant Rack Mount servers allow various power modes for the systems to run. The current Power Regulator value can be queried on all supported HP ProLiant Rack Mount servers.</p> <p>Changing the Power Regulator value is fully supported on DL360 and DL380. DL365 does not support the Power Saver Set feature. DL385 supports only the HP Static Low Power Mode. The valid modes for Power Regulator Setting (Power Saver) Control include:</p> <ul style="list-style-type: none"> • OS Control Mode or Disabled Mode for iLO(1) • HP Static Low Power Mode(2) • HP Dynamic Power Savings Mode(3) • HP Static High Performance Mode(4) |
| Auto Power Control | <p>The <i>iLO Automatic Power On</i> and <i>Automatic Power On with Delay</i> features allow users to change the values to suit their needs. Valid values for the Automatic Power On include:</p> <ul style="list-style-type: none"> • Enabled with a minimum delay(1) • Disabled(2) • Enabled with random delay up to 60 seconds(3) • Enabled with 15 seconds delay(15) • Enabled with 30 seconds delay(30) • Enabled with 45 seconds delay(45) • Enabled with 60 seconds delay(60) <p>NOTE: The values presented are valid on iLO3 managed systems. However, iLO3 sets these fields to a RANDOM value up to a maximum of 120 seconds.</p> |

Table 5 Chassis Control Summary

| Control | Output Type | Type |
|---|--------------------|--------------------------|
| Unit Identification Light (UID) Control | SAHPI_CTRL_LED | SAHPI_CTRL_TYPE_DIGITAL |
| Power Saver Control | SAHPI_CTRL_GENERIC | SAHPI_CTRL_TYPE_DISCRETE |
| Auto Power Control | SAHPI_CTRL_GENERIC | SAHPI_CTRL_TYPE_DISCRETE |

Chassis Inventory

The system chassis IDR is read-only and includes an area called SAHPI_IDR_AREATYPE_CHASSIS_INFO that contains the following four read-only fields:

Table 6 Chassis Inventory Fields

| Field ID | Field Type | Value |
|----------|-----------------------------------|----------------------------------|
| 1 | SAHPI_IDR_FIELDTYPE_PRODUCT_NAME | Model number |
| 2 | SAHPI_IDR_FIELDTYPE_SERIAL_NUMBER | Serial number |
| 3 | SAHPI_IDR_FIELDTYPE_MANUFACTURER | "Hewlett Packard" |
| 4 | SAHPI_IDR_FIELDTYPE_CUSTOM | iLo3 and later firmware revision |

The iLO firmware version returned by the custom Field ID 4 is expressed as:

iLo_Firmware: <major rev>.<minor rev>

Example Chassis IDR Output

The following is an example of the chassis IDR output that is returned from the hpiinv command.

```
Resource[0] Tag: ProLiant DL385 G2 SN:2UX72901KM ( 4) has inventory capability
{RAK_MOUNTED_SERVER:4} {ROOT:0}
```

```
RDR[30000]: Inventory, IdId=0 ProLiant DL385 G2
SN:2UX72901KM ( 4) Inventory
```

```
AreaId[1] Chassis Area
```

```
FieldId[1] Product Name : ProLiant DL385 G2
```

```
FieldId[2] Serial Number : 2UX72901KM
```

```
FieldId[3] Manufacturer : Hewlett Packard
```

```
FieldId[4] Custom Field : iLo_Firmware: 1.30
```

Chassis Sensors

There are three severity type sensors located on the System Chassis resource. These sensors correspond to the system's general health, and display information given in the HEALTH_AT_A_GLANCE stanza returned by the GET_EMBEDDED_HEALTH RIBCL command.

All three sensors have the RDR's EventCtrl element set to SAHPI_SEC_PER_EVENT, which allows you to change the sensor enable, sensor event enable, and assert/deassert masks via the OpenHPI APIs. In addition, the System Chassis resource does not have the SAHPI_CAPABILITY_DEASSERTS capability set, so the assert and deassert masks can be asymmetrical.

Table 7 Chassis Sensors HPI Data

| Sensor | Type | Category | Events |
|---------------------|--------------------|---|--|
| Fan Health | SAHPI_FAN | SAHPI_EC_SEVERITY | SAHPI_ES_OK SAHPI_ES_MAJOR_FROM_LESS SAHPI_ES_MAJOR_FROM_CRITICAL SAHPI_ES_CRITICAL |
| Temperature Health | SAHPI_TEMPERATURE, | SAHPI_EC_SEVERITY SAHPI_EC_THRESHOLD | SAHPI_ES_OK SAHPI_ES_CRITICAL |
| Power Supply Health | SAHPI_POWER_SUPPLY | SAHPI_EC_SEVERITY | SAHPI_ES_OK SAHPI_ES_MAJOR_FROM_LESS SAHPI_ES_MAJOR_FROM_CRITICAL SAHPI_ES_CRITICAL |

Table 8 Chassis Sensor Values

| Sensor | RIBCL Value | HP Generated Event | Sensor Reading |
|---------------------|-------------|--|----------------|
| Fan Health | OK | SAHPI_ES_OK | 0 |
| | Degraded | SAHPI_ES_MAJOR_FROM_LESS SAHPI_ES_MAJOR_FROM_CRITICAL | 1 |
| | Failed | SAHPI_ES_CRITICAL | 2 |
| Temperature Health | OK | SAHPI_ES_OK | 0 |
| | Failed | SAHPI_ES_CRITICAL | 2 |
| Power Supply Health | OK | SAHPI_ES_OK | 0 |
| | Degraded | SAHPI_ES_MAJOR_FROM_LESS SAHPI_ES_MAJOR_FROM_CRITICAL | 1 |
| | Failed | SAHPI_ES_CRITICAL | 2 |

Processor RDRs

The IDR for a processor resource is read-only and includes an area called SAHPI_IDR_AREATYPE_BOARD_INFO that contains the following single, read-only field:

Table 9 Processor Inventory Field

| Field ID | Field Type | Value |
|----------|----------------------------|-----------------|
| 1 | SAHPI_IDR_FIELDTYPE_CUSTOM | Processor Speed |

The processor speed returned by the custom Field ID 1 is the processor's rated speed. The processor speed returned by the custom Field ID 1 is expressed as:

Speed: <speed> MHz

Example Processor IDR Output

The following is an example of the processor IDR output that is returned by the `hpiinv` command.

```
Resource[26] Tag: Proc 1 has inventory capability
{PROCESSOR:1} {RACK_MOUNTED_SERVER:4} {ROOT:0}
RDR[30000]: Inventory, IdId=0 Proc 1 Inventory
AreaId[1] Board Area
FieldId[1] Custom Field : Speed: 2200 MHz
```


Memory RDRs

The IDR for a memory resource is read-only and includes an area called SAHPI_IDR_AREATYPE_BOARD_INFO that contains the following two, read-only fields:

Table 10 Memory Inventory Fields

| Field ID | Field Type | Value |
|----------|----------------------------|--------------|
| 1 | SAHPI_IDR_FIELDTYPE_CUSTOM | Memory Size |
| 2 | SAHPI_IDR_FIELDTYPE_CUSTOM | Memory Speed |

The memory size is returned by the custom Field ID 1 and is expressed as:

Size: *<size>* MB

The memory speed is returned by the custom Field ID 2 and is expressed as:

Size: *<speed>* MHz

Example Memory IDR Output

The following is an example of the memory IDR output returned from the `hpiinv` command:

```
Resource[28] Tag: DIMM 1A has inventory capability
{MEMORY_DEVICE:1} {RACK_MOUNTED_SERVER:4} {ROOT:0}
RDR[30000]: Inventory, IdrId=0 DIMM 1A Inventory
AreaId[1] Board Area
  FieldId[1] Custom Field : Size: 1024 MB
  FieldId[2] Custom Field : Speed: 667 MHz
```

Power Supply RDRs

Currently, the power supply resource has no additional RDRs

Fan (Cooling Device)

Currently, the fan resource has no additional RDRs.

Voltage Regulator Module (VRM) RDRs

Currently, the power module (voltage regulator) resource has no additional RDRs.

Sample hptop Output for Supported Servers

Table 11 The following is a sample hptop output for all supported HP ProLiant Rack Mount servers.

Table 11 Sample hpitop Output

| Supported Server | Output |
|------------------|--|
| DL380 G6 | <pre> {RACK_MOUNTED_SERVER,1} +--- {RACK_MOUNTED_SERVER,1} ___ Control Num: 1, Type: DIGITAL, Output Type: LED, Tag: Unit Identification Light (UID) Values: On(1)/Off(0) ___ Control Num: 2, Type: DISCRETE, Output Type: GENERIC, Tag: Power Regulator Control Power Modes: Disabled(1)/Low(2)/DynamicSavings(3)/High(4) ___ Control Num: 3, Type: DISCRETE, Output Type: GENERIC, Tag: Auto Power Control Delay:Min.(1)/Disabled(2)/random (3)/15 sec (15)/30 sec (30)/45 sec(45)/60 sec(60) ___ Sensor Num: 1, Type: FAN, Category: SEVERITY, Tag: System fans health indicator: Ok(0)/Degraded(1)/Failed(2) ___ Sensor Num: 2, Type: TEMPERATURE, Category: SEVERITY, Tag: System temperature health indicator: Ok(0)/Failed(2) ___ Sensor Num: 3, Type: POWER_SUPPLY, Category: SEVERITY, Tag: System power supply health indicator: Ok(0)/Degraded(1)/Failed(2) ___ Sensor Num: 4, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 1: Ambient ___ Sensor Num: 5, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 2: CPU 1 ___ Sensor Num: 6, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 3: CPU 2 ___ Sensor Num: 7, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 4: Memory ___ Sensor Num: 8, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 5: Memory ___ Sensor Num: 9, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 6: Memory ___ Sensor Num: 10, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 7: Memory ___ Sensor Num: 11, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 8: Power Supply ___ Sensor Num: 12, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 9: Power Supply ___ Sensor Num: 13, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 10: I/O Board ___ Sensor Num: 14, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 11: I/O Board ___ Sensor Num: 15, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 12: I/O Board ___ Sensor Num: 16, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 13: I/O Board ___ Sensor Num: 17, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 14: I/O Board ___ Sensor Num: 18, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 15: I/O Board ___ Sensor Num: 19, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 16: I/O Board ___ Sensor Num: 20, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 17: I/O Board ___ Sensor Num: 21, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 18: I/O Board ___ Sensor Num: 22, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 19: CPU ___ Sensor Num: 23, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 20: CPU ___ Sensor Num: 24, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 21: CPU ___ Sensor Num: 25, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 22: CPU ___ Sensor Num: 26, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 23: I/O Board ___ Sensor Num: 27, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 24: Memory ___ Sensor Num: 28, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 25: Memory ___ Sensor Num: 29, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 26: Memory ___ Sensor Num: 30, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 27: I/O Board ___ Sensor Num: 31, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 28: I/O Board ___ Sensor Num: 32, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 29: System ___ Sensor Num: 33, Type: TEMPERATURE, Category: THRESHOLD, Tag: Temp 30: I/O Board ___ Inventory Num: 0, Num Areas: 1, Tag: ProLiant DL380 G6 SN:USE019NB77 (1) Inventory +--- {RACK_MOUNTED_SERVER,1}{PROCESSOR,1} ___ Inventory Num: 0, Num Areas: 1, Tag: Proc 1 Inventory +--- {RACK_MOUNTED_SERVER,1}{PROCESSOR,2} ___ Inventory Num: 0, Num Areas: 1, Tag: Proc 2 Inventory +--- {RACK_MOUNTED_SERVER,1}{MEMORY_DEVICE,3} ___ Inventory Num: 0, Num Areas: 1, Tag: PROC 1 DIMM 3A Inventory +--- {RACK_MOUNTED_SERVER,1}{MEMORY_DEVICE,6} ___ Inventory Num: 0, Num Areas: 1, Tag: PROC 1 DIMM 6B Inventory +--- {RACK_MOUNTED_SERVER,1}{MEMORY_DEVICE,9} ___ Inventory Num: 0, Num Areas: 1, Tag: PROC 1 DIMM 9C Inventory +--- {RACK_MOUNTED_SERVER,1}{MEMORY_DEVICE,12} ___ Inventory Num: 0, Num Areas: 1, Tag: PROC 2 DIMM 3A Inventory +--- {RACK_MOUNTED_SERVER,1}{MEMORY_DEVICE,15} ___ Inventory Num: 0, Num Areas: 1, Tag: PROC 2 DIMM 6B Inventory +--- {RACK_MOUNTED_SERVER,1}{MEMORY_DEVICE,18} ___ Inventory Num: 0, Num Areas: 1, Tag: PROC 2 DIMM 9C Inventory +--- {RACK_MOUNTED_SERVER,1}{POWER_SUPPLY,1} +--- {RACK_MOUNTED_SERVER,1}{POWER_SUPPLY,2} +--- {RACK_MOUNTED_SERVER,1}{COOLING_DEVICE,1} +--- {RACK_MOUNTED_SERVER,1}{COOLING_DEVICE,2} +--- {RACK_MOUNTED_SERVER,1}{COOLING_DEVICE,3} +--- {RACK_MOUNTED_SERVER,1}{COOLING_DEVICE,4} +--- {RACK_MOUNTED_SERVER,1}{COOLING_DEVICE,5} +--- {RACK_MOUNTED_SERVER,1}{COOLING_DEVICE,6} End of {RACK_MOUNTED_SERVER,1} </pre> |

Hot Swap Operations

This section covers information for Field Replaceable Units (FRU) Non-managed Hot Swap.

FRU Non-Managed Hot Swap

There are no managed hot swappable components in HP's ProLiant Rack Mount servers. As a result, the iLO2 RIBCL plug-in implements the simple hot swap model events, *Not Present* or *Active* as defined in the *SAF-HPI Specification for Field Replaceable Units (FRUs)*. The FRUs may include units such as CPUs, memory modules, fans, and power supplies. These FRUs can only be replaced when the system is powered down.

Resource Events and Hot Swap Events

The Rack Mounted Server itself (the top level resource) is not a FRU and does not send resource or hot swap events. It has the `SAHPI_CAPABILITY_RESOURCE` bit set in its `ResourceCapabilities`, but does not set the `SAHPI_CAPABILITY_FRU` flag.

All other resources within the Rack Mount Server are FRUs, but do not support managed hot swap. These resources have the `SAHPI_CAPABILITY_FRU` flag set in their `ResourceCapabilities`, but do not have the `SAHPI_CAPABILITY_MANAGED_HOTSWAP` flag set. These resources support a subset of the HPI hot swap states (Active or Not Present). Some of these resources can also send resource events.

All FRU resources within the server can send hot swap events with a `HotSwapState` of either `SAHPI_HS_STATE_ACTIVE` or `SAHPI_HS_STATE_NOT_PRESENT`. For instance, if while the `openhpid` is running, a managed Rack Mount Server was shut down and one of the memory DIMMS was removed, when power to the iLO is restored, the plug-in would issue a hot swap event with a `HotSwapState` of `SAHPI_STATE_NOT_PRESENT` for that memory DIMM resource. If a new memory DIMM was added, the plug-in would send a hot swap event for the new `MEMORY_DEVICE` resource with a `HotSwapState` of `SAHPI_HS_STATE_ACTIVE`.

Many of the FRU resources can also send a resource event as well, with a `ResourceEventType` of either `SAHPI_RESE_RESOURCE_FAILURE` or `SAHPI_RESE_RESOURCE_RESTORED`. The only resources that currently do not support these resource event types are the processor and the memory DIMMS, as the RIBCL interface currently does not pass a failure status for these two resource types.

| Entity Type | Resource Event Types | Hot Swap States |
|---------------------|--|--|
| RACK_MOUNTED_SERVER | — | — |
| PROCESSOR | — | SAHPI_HS_STATE_ACTIVE, SAHPI_HS_STATE_NOT_PRESENT |
| MEMORY_DEVICE | — | SAHPI_HS_STATE_ACTIVE, SAHPI_HS_STATE_NOT_PRESENT |
| POWER_SUPPLY | SAHPI_RESE_RESOURCE_FAILURE, SAHPI_RESE_RESOURCE_RESTORED | SAHPI_HS_STATE_ACTIVE, SAHPI_HS_STATE_NOT_PRESENT |
| POWER_MODULE | SAHPI_RESE_RESOURCE_FAILURE, SAHPI_RESE_RESOURCE_RESTORED | SAHPI_HS_STATE_ACTIVE, SAHPI_HS_STATE_NOT_PRESENT |
| COOLING_DEVICE | SAHPI_RESE_RESOURCE_FAILURE, SAHPI_RESE_RESOURCE_RESTORED | SAHPI_HS_STATE_ACTIVE, SAHPI_HS_STATE_NOT_PRESENT |

Resource Event Log

None of the resources in a Proliant Rack Mount Server maintain resource event logs. Therefore, all resources will not have the `SAHPI_CAPABILITY_EVENT_LOG` flag set in their `ResourceCapabilities` within their RPT entry. All of the `saHpiEventLog*()` APIs will return `SA_ERR_HPI_CAPABILITY` when used with these resources.

OpenHPI Domain Event Log

The OpenHPI framework uses a Domain Event Log (DEL) to store events occurring in a domain, for all plug-ins and instances of plug-ins. The size of the DEL is configurable with a default maximum size of 10,000 events.

You can change the default maximum size using the `OPENHPI_DEL_SIZE_LIMIT` option in the `openhpi.conf` file before starting `openhpid`. Please note that this is a dynamically, configurable parameter. If you set `OPENHPI_DEL_SIZE_LIMIT = 0`, the DEL is unlimited in size.

In addition, options to save the DEL to disk using the (`OPENHPI_DEL_SAVE`) and set the minimum severity level of events that are saved in the DEL (`OPENHPI_LOG_SEV`) are provided in the `openhpi.conf` configuration file.

OpenHPI Domain Alarm Table

The Domain Alarm Table (DAT) stores events generated with severities greater than or equal to `SAHPI_MINOR`. The size of the DAT is unlimited by default, but may be restricted by using the `OPENHPI_DAT_SIZE_LIMIT` configuration option located in the `openhpi.conf` file.

OpenHPI iLO2 RIBCL Plug-In Supported APIs

Table 12 provides a list of HPI FunctionAPIs and their associated support status and supporting modules.

Table 12 Supported APIs for iLO2 RIBCL Plug-In

| HPI FunctionAPI | Support Status | Supporting Module |
|---|----------------|--------------------|
| General | | |
| <code>saHpiVersionGet</code> | Yes | OpenHPI framework |
| Session Management | | |
| <code>saHpiSessionOpen</code> | Yes | OpenHPI framework |
| <code>saHpiSessionClose</code> | Yes | OpenHPI framework |
| Domain Discovery | | |
| <code>saHpiDiscover</code> | Yes | iLO2 RIBCL plug-in |
| <code>saHpiDomainInfoGet</code> | Yes | OpenHPI framework |
| <code>saHpiDrtEntryGet</code> | Yes | OpenHPI framework |
| <code>saHpiDomainTagSet</code> | Yes | OpenHPI framework |
| Resource Presence Table | | |
| <code>saHpiRptEntryGet</code> | Yes | OpenHPI framework |
| <code>saHpiRptEntryGetByResourceId</code> | Yes | OpenHPI framework |
| <code>saHpiResourceSeveritySet</code> | Yes | iLO2 RIBCL plug-in |
| <code>saHpiResourceTagSet</code> | Yes | iLO2 RIBCL plug-in |
| <code>saHpiResourceIdGet</code> | Yes | OpenHPI framework |

Table 12 Supported APIs for iLO2 RIBCL Plug-In *(continued)*

| HPI FunctionAPI | Support Status | Supporting Module |
|--|----------------|--------------------|
| saHpiGetIdByEntityPath | Yes | OpenHPI framework |
| saHpiGetChildEntityPath | Yes | OpenHPI framework |
| Event Log Management | | |
| saHpiEventLogInfoGet | Yes | OpenHPI framework |
| saHpiEventLogEntryGet | Yes | OpenHPI framework |
| saHpiEventLogEntryAdd | Yes | OpenHPI framework |
| saHpiEventLogClear | Yes | OpenHPI framework |
| saHpiEventLogTimeGet | Yes | OpenHPI framework |
| saHpiEventLogTimeSet | Yes | OpenHPI framework |
| saHpiEventLogStateGet | Yes | OpenHPI framework |
| saHpiEventLogStateSet | Yes | OpenHPI framework |
| saHpiEventLogOverflowReset | Yes | OpenHPI framework |
| saHpiEventLogCapabilitiesGet | Yes | OpenHPI framework |
| Event | | |
| saHpiSubscribe | Yes | OpenHPI framework |
| saHpiUnsubscribe | Yes | OpenHPI framework |
| saHpiEventGet | Yes | — |
| saHpiEventAdd | Yes | OpenHPI framework |
| Domain Alarm Table | | |
| saHpiAlarmGetNext | Yes | OpenHPI framework |
| saHpiAlarmGet | Yes | OpenHPI framework |
| saHpiAlarmAcknowledge | Yes | OpenHPI framework |
| saHp iAlarmAdd | Yes | OpenHPI framework |
| saHp iAlarmDelete | Yes | OpenHPI framework |
| Resource Data Record Management | | |
| saHpiRdrGet | Yes | OpenHPI framework |
| saHpiRdrGetByInstrumentId | Yes | OpenHPI framework |
| Sensor | | |
| saHpiSensorReadingGet | Yes | iLO2 RIBCL plug-in |
| saHpiSensorThresholdsGet | | — |
| saHpiSensorThresholdsSet | | — |
| saHpiSensorTypeGetd | Yes | OpenHPI framework |
| saHpiSensorEnableGet | Yes | iLO2 RIBCL plug-in |
| saHpiSensorEnableSet | Yes | iLO2 RIBCL plug-in |
| saHpiSensorEventEnableGet | Yes | iLO2 RIBCL plug-in |
| saHpiSensorEventEnableSet | Yes | iLO2 RIBCL plug-in |

Table 12 Supported APIs for iLO2 RIBCL Plug-In *(continued)*

| HPI FunctionAPI | Support Status | Supporting Module |
|----------------------------------|---|--------------------|
| saHpiSensorEventMasksGet | Yes | iLO2 RIBCL plug-in |
| saHpiSensorEventMasksSet | Yes | iLO2 RIBCL plug-in |
| Control | | |
| saHpiControlTypeGet | Yes | OpenHPI framework |
| saHpiControlGet | Yes | iLO2 RIBCL plug-in |
| saHpiControlSet | Yes | — |
| Inventory Data Repository | | |
| saHpiIdrInfoGet | Yes | iLO2 RIBCL plug-in |
| saHpiIdrAreaHeaderGet | Yes | iLO2 RIBCL plug-in |
| saHpiIdrAreaAdd | No. The plug-in supports only read-only IDRs. | — |
| saHpiIdrAreaDelete | No. The plug-in supports only read-only IDRs. | — |
| saHpiIdrAreaAddById | No. The plug-in supports only read-only IDRs. | — |
| saHpiIdrFieldGet | Yes | iLO2 RIBCL plug-in |
| saHpiIdrFieldAdd | No. The plug-in supports only read-only IDRs. | — |
| saHpiIdrFieldAddById | No. The plug-in supports only read-only IDRs. | — |
| saHpiIdrFieldSet | No. The plug-in supports only read-only IDRs. | — |
| saHpiIdrFieldDelete | No. The plug-in supports only read-only IDRs. | — |
| saHpiResourceLoadIdGet | No. The plug-in supports only read-only IDRs. | — |
| saHpiResourceLoadIdSet | No. The plug-in supports only read-only IDRs. | — |
| Watchdog Timer | | |
| saHpiWatchdogTimerGet | No. RIBCL does not export Annunciator watchdog controls. | — |
| saHpiWatchdogTimerSet | No. RIBCL does not export Annunciator watchdog controls. | — |
| saHpiWatchdogTimerReset | No. RIBCL does not export Annunciator watchdog controls. | — |
| saHpiAnnunciatorGetNext | No. RIBCL does not export Annunciator controls. | — |
| saHpiAnnunciatorGet | No. RIBCL does not export Annunciator controls. | — |
| saHpiAnnunciatorAcknowledge | No. RIBCL does not export Annunciator controls. | — |
| saHpiAnnunciatorAdd | No. RIBCL does not export Annunciator controls. | — |
| saHpiAnnunciatorDelete | No. RIBCL does not export Annunciator controls. | — |
| saHpiAnnunciatorModeGet | No. RIBCL does not export Annunciator controls. | — |
| saHpiAnnunciatorModeSet | No. RIBCL does not export Annunciator controls. | — |
| Hotswap Management | | |
| saHpiHotSwapPolicyCancel | No. ProLiant Rack Mounts do not have any hot swap components. | — |
| saHpiResourceActiveSet | No. ProLiant Rack Mounts do not have any hot swap components. | — |

Table 12 Supported APIs for iLO2 RIBCL Plug-In (continued)

| HPI FunctionAPI | Support Status | Supporting Module |
|-------------------------------|--|--------------------|
| saHpiResourceInactiveSet | No. ProLiant Rack Mounts do not have any hot swap components. | — |
| saHpiResourceFailedRemove | No. ProLiant Rack Mounts do not have any hot swap components. | — |
| saHpiAutoInsertTimeoutGet | No. ProLiant Rack Mounts do not have any hot swap components. | — |
| saHpiAutoInsertTimeoutSet | No. ProLiant Rack Mounts do not have any hot swap components. | — |
| saHpiAutoExtractTimeoutGet | No. ProLiant Rack Mounts do not have any hot swap components. | — |
| saHpiAutoExtractTimeoutSet | No. ProLiant Rack Mounts do not have any hot swap components. | — |
| saHpiHotSwapStateGet | No. ProLiant Rack Mounts do not have any hot swap components. | — |
| saHpiHotSwapActionRequest | No. ProLiant Rack Mounts do not have any hot swap components. | — |
| saHpiHotSwapIndicatorStateGet | No. ProLiant Rack Mounts do not have any hot swap components. | — |
| saHpiHotSwapIndicatorStateSet | No. ProLiant Rack Mounts do not have any hot swap components. | — |
| Configuration | | |
| saHpiParmControl | No. ProLiant Rack Mounts do not have any configurable components. | — |
| Reset | | |
| saHpiResourceResetStateGet | Yes. HP ProLiant Rack Mount Servers do not support pulsed reset and the only valid value this API returns is:SAHPI_RESET_DEASSERT | iLO2 RIBCL plug-in |
| saHpiResourceResetStateSet | Yes. Supports cold and warm reset. | iLO2 RIBCL plug-in |
| Power | | |
| saHpiResourcePowerStateGet | Yes | iLO2 RIBCL plug-in |
| saHpiResourcePowerStateSet | Yes | iLO2 RIBCL plug-in |