

Rack and power planning with HP Insight Control Power Management

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Introduction

Compared to previous server generations, today's high-performance servers are efficient. As server performance-per-watt steadily increases, wattage-per-server requirements also rise. With increasing server density and the increasing number of servers in data centers, planning and managing your facility power and cooling resources is critically important.

This technology brief will focus on integrating HP Insight Control power management with two data center management tools:

- nlyte Software Intelligent Capacity Planning™ available from nlyte Software
- Eaton Power Xpert Software™ available from Eaton Corporation.

It will describe how HP Insight Control shares extensive, precise data with the management tools. This sharing more accurately predicts data center requirements. It also eliminates overloaded circuits, by automatically sensing each server's power requirements

HP power management technology

HP power management technology is software, firmware, and hardware components that improve server density and power efficiency. They monitor actual power consumption and thermal output. Insight Control reduces power and cooling overhead throughout the rack as it increases compute capacity. It provides scalable, policy-based power management.

HP power management technology takes inventory, measures peak potential power, lets you cap power use to match workloads, and delivers this information to existing rack and power planning tools and processes. Using this precise data lets you safely provision less power and cooling to servers. The following sections describe these components.

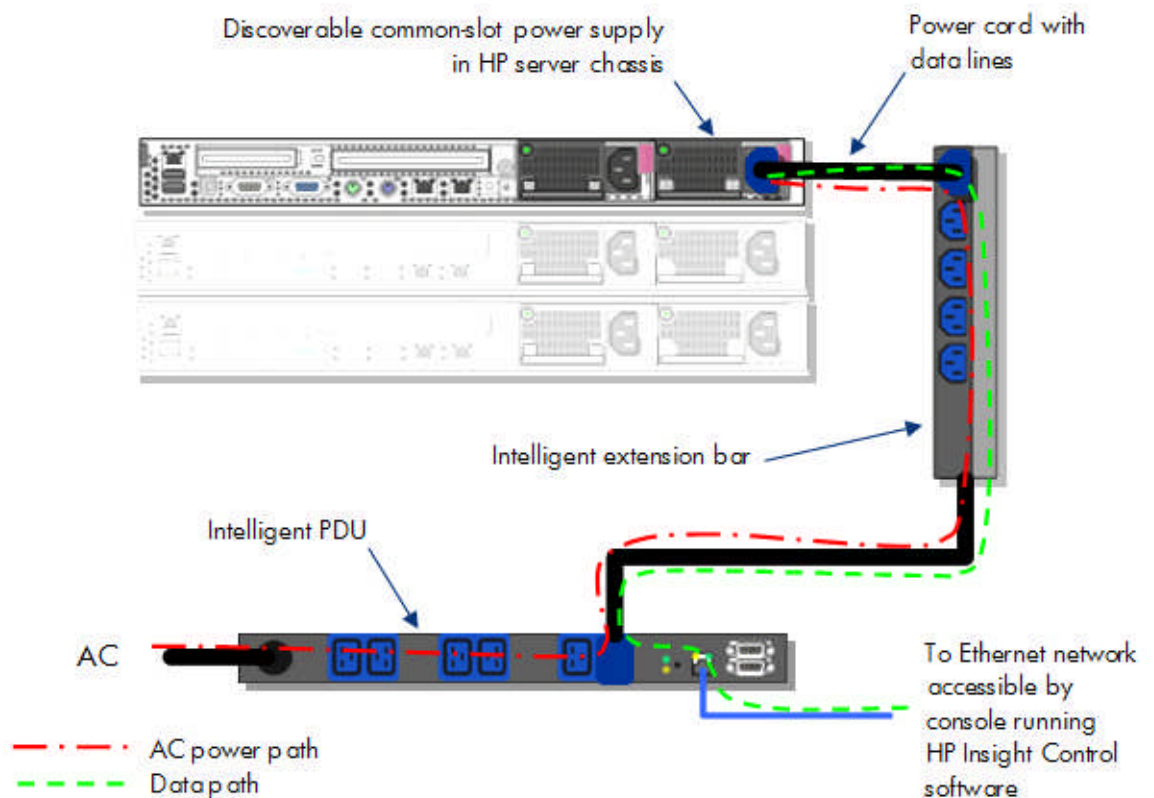
HP Intelligent Power Discovery

HP Intelligent Power Discovery consists of power distribution components and applications that work together to let you automatically discover detailed data center topology. These components interact with discovery-compatible IT equipment to define power capacity requirements. It includes the following key elements:

- Intelligent Power Distribution Units (PDU) and extension bars
- Discoverable common-slot power supplies
- Power cords with data lines

Figure 1 shows the key components in a single-server topology with a single AC bus. With HP Intelligent Power Discovery, all parts of the power infrastructure communicate with each other to simplify power planning.

Figure 1. Components of the HP Intelligent Power Discovery solution



Intelligent PDUs and Intelligent Extension Bars

Intelligent PDUs provide the hardware/firmware foundation for intelligent power discovery and control. These PDUs and intelligent extension bars use monitored AC outlets that report power use over data lines. A display panel monitors the Intelligent PDU, any secondary PDUs, and all intelligent extension bars in the rack. With a 1U or 0U configuration, these components have little impact on rack space.

A management module in the PDU core collects measured power data from transformers connected to outlets in the core and any attached intelligent extension bars. All power measurement and topology data collected by Intelligent PDUs is available through a GUI accessible by common web browsers using a single IP address.

Discoverable common-slot power supplies

HP ProLiant and c-Class BladeSystem servers support discoverable common-slot power supplies. On HP ProLiant servers data interfaces transfer information between the server and the Intelligent PDU. These power supplies use power cords with data lines to transfer data.

The discoverable common-slot power supply has an RS-232 port on the C14 connector and an additional interface to an internal bus that connects to iLO. This lets iLO share the following data with the management module on the PDU:

- Server UUID
- Server product name
- HP part number
- Device name
- Power supply slot number
- IP address
- IP port
- Firmware version
- IPMI version

The Intelligent PDU polls the discoverable common-slot power supply for that data; the power supply gets the data from iLO and sends it back to the PDU. For more information on HP Intelligent Power Discovery see

<http://h20000.www2.hp.com/bc/docs/support/SupportManual/c02505050/c02505050.pdf>

HP ProLiant server power capping technologies

HP Power Capping and HP Dynamic Power Capping are power management features in system hardware and firmware of HP ProLiant servers. They are independent of the operating system and applications, and they let you manage the power consumption for a server or group of servers.

Server power consumption depends on many factors, and it can actually vary significantly. Some factors, such as the number of options installed in the server, have a predictable effect on server power consumption. Other factors, including data center temperature, CPU activity, memory, disk drives, I/O, and even the mix of instructions being executed, have an effect on power consumption. To establish power cap guidelines, the power management system executes a set of tests during POST to determine each server's power consumption at idle and under a simulated maximum load. These empirically-determined values are inherently accurate and consider the server configuration and its current physical environment.

Power capping lets you provision the cooling infrastructure at an effective level. Using power capping to limit peak server power consumption lets more servers operate reliably within a pre-existing cooling infrastructure. For more information about HP Power Capping technologies, visit this HP web site:

http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01549455/c01549455.pdf?jumpid=reg_R1002_USEN.

HP Integrated Lights-Out

The minimum and maximum power consumption values for a server are initially determined during POST, but they can change slightly while the server is running. The iLO Web GUI supports Dynamic Power Cap configuration for an individual server, and it will raise or lower the power levels as necessary. During normal operation, iLO and the power management system continually monitor both the 5-minute average and the peak power readings. This gives you a 24-hour graph with 5-minute sample intervals as well as a 20-minute graph with 10-second sample intervals. iLO will send SNMP traps as alerts when a power threshold is exceeded. For more information about iLO go to

www.hp.com/go/iLO.

BladeSystem enclosure monitoring

The HP BladeSystem enclosure monitors, measures, tests, and records power data; this includes maximum, minimum, and average actual power use. It provides power size rating and power supply specifications, and it sets and maintains the power cap settings. Additionally, it provides peak power data on each specific server by implementing a burn test during POST. Again this data is accurate because the system can communicate with the actual power supply in the system.

The Onboard Administrator (OA) actively manages the power caps. It uses a sophisticated, multi-tiered algorithm to actively adjust the power caps of the individual servers so that the total matches the power budget. This process repeats every 20 seconds to continuously maintain the power cap. The OA adjusts the power use among the server blades to keep consumption below the enclosure power cap. For more information on the HP Onboard Administrator, go to

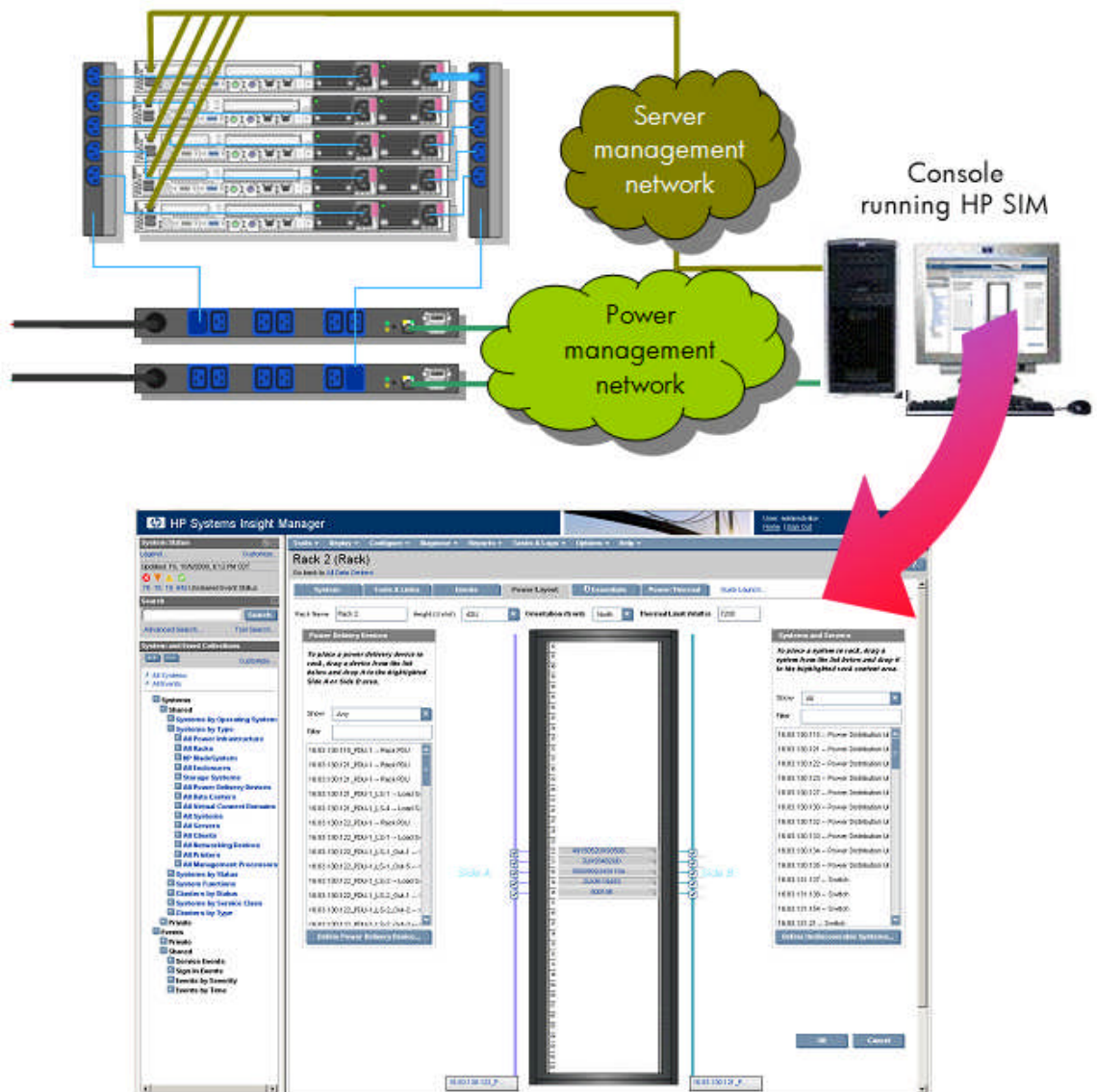
http://h18004.www1.hp.com/products/blades/components/onboard/index.html?jumpid=reg_R1002_USEN.

HP Insight Control management software

HP Insight Control is a suite of software solutions that includes unified infrastructure management from HP SIM 6.0. This software lets you define, monitor, and control the power topology of a complete data center from a local or remote console.

In Figure 2, a console running HP SIM 6.0 discovers and communicates with Intelligent PDUs to retrieve power topology and measurement data through the power management network. The same console discovers and communicates with servers through the server management network. HP SIM then maps the server and PDU data to define the data center topology.

Figure 2. HP Intelligent Power Discovery with HP SIM



HP SIM gives you a detailed power summary at several specific distribution levels: outlet, extension bar, PDU, rack, and data center. Insight Control software detects non-discoverable components connected to a PDU or extension bar outlet and provides alerts with recommended actions. You can

manually enter identification information for non-discoverable components. Insight Control software also detects components that should be configured for power redundancy. HP SIM provides specific recommendations.

HP Insight Control imports information that lets you gain insight into the power delivery infrastructure. With this data gathered from rack and power planning tools, you can understand the connection topology of servers, PDUs, and circuits.

Integrating HP Insight Control with rack and power planning tools generates accurate power data based on actual configurations. This results in a safer and more useful infrastructure.

Web services interface

HP Insight Control lets administrators monitor entire groups of servers and maintain years of historical records of peak and average power consumption. A program interface moves power control data, power history, power topology, and physical topology information between third party software and HP ProLiant server platforms. This interface sends information to the planning tools which means rack planners use automatically generated precision data in their planning processes. You implement the interface as a web service using the Simple Object Access Protocol (SOAP). Table 1 lists a few of the dataset parameters returned by the web service interface.

Table 1. Example dataset parameters used by the Insight Control web service Interface

Name	Description
GUID	Global unique identifier of management processor
hostname	Host name of management processor
ipAddress	Internet address of management processor
measuredMaximumWatts	Calibrated Maximum Power, or cumulative peak power
measuredMinimumWatts	System idle power level
powerSupplyRatingWatts	Max power input faceplate
serialNumber	Device manufacturer serial number

Rack and power planning software integration

HP Insight Control integration with rack and power planning tools bridges the gap between IT and facilities, resolving the key issue of basing planning on estimates. Additionally, this integration lets configuration data from rack and power planning software flow to Insight Control. For more detailed information refer to the HP Insight Control power management User Guide, <http://h20000.www2.hp.com/bc/docs/support/SupportManual/c02048495/c02048495.pdf>.

nlyte Software Intelligent Capacity Planning™

nlyte software is a data center performance management tool for rack and power planning that helps you plan and provision power and cooling resources to your servers. nlyte makes these calculations using an extensive materials catalogue that provides the power required for each piece of IT equipment. Insight Control integrated with nlyte software lets you plan and allocate power, and visualize data center thermals using accurate power demand for HP servers. HP Insight Control integrates with the nlyte data center management product on Windows platforms.

nlyte software allows HP Insight Control access to its physical and power topology information databases. A system with nlyte software already configured has a great deal of information about power topology, racks, switches, and servers. By installing Insight Control in a data center that is

already running nlyte 5.1 or above, you can save a great deal of manual setup time by importing the nlyte physical and power topology information.

Importing data from nlyte to Insight Control

To integrate with HP Insight Control, all shared servers and enclosures must be modeled in both management tools and the serial numbers must match. Insight Control provides a set of tools designed to collect, convert, and import information from this database. The "nlyte2txt" tool extracts data in the form of an SQL file or web services query. The conversion tool, "ipmtxt2xml" will convert the output to a text format suitable for use by the Insight Control import tool, "ipmimport".

After installing Insight Control but before discovery, run the following steps on the HP Systems Insight Manager (SIM) Central Management Server (CMS). Execute these steps from a command shell window on a Windows platform:

1. Run the Insight Control collection tool "nlyte2txt" to produce the file "data.txt". The syntax is **nlyte2txt HostName > data.txt**, unless the CMS is the same as the host name, in which case this argument can be omitted.
2. Run the command **ipmtxt2xml data.txt > ignore.txt**, to validate the datacenter set up. Edit "data.txt" to remove any errors, or any unwanted devices.
3. Import "data.txt" into Insight Control using the **ipmimport data.txt** command.
4. Add needed Insight Control licenses to the servers through the command line or GUI.

Exporting data from Insight Control to nlyte

Insight Control can export its capabilities and specialized knowledge (peak, min, and max power data collected every 24 hours) about licensed servers for management and data collection. The primary integration point is the XML file "lpm.xml". The following is a summary of the steps:

1. Use Insight Control export tool ("ipmexport") to get a list of relevant servers, enclosures, and racks to import.
2. Create a County/City/Room datacenter location using the nlyte Administration tool.
3. Add all racks and servers, set their location to the desired room and rack respectively, and then complete creation to activate. Include rack thermal limits that have been set in Insight Control. Make sure that the serial number on each device matches the one in Insight Control.
4. Add blade enclosures as a chassis, set their location to the desired rack, and then complete creation to activate. From the chassis, click "mounted assets" to add individual blades. Individual blade serial numbers are available from Insight Control or through the "mxnode -lf nodename" command. Add any Insight Control licenses needed so that the list of tracked servers matches exactly.
5. Enter the login and password into the XML file that has HPSIM Administrator privileges or has authorization for the "Monitor Tools" toolbox on the CMS. The password may be encrypted using the "encrypt.jar" functionality described in the nlyte documentation.
6. Enter the make and model of all servers to be covered. Wildcards are encouraged, for example, `<lpmConfig Manufacturer="Hewlett*" Model="ProLiant*" DefaultVoltage="220" Class="com.gdcm.nlyte.integrator.power.ExtractPowerMetricslpm">`.
7. Verify the collection of Insight Control capabilities by clicking on the advanced /real-time data tab of any server in nlyte.

nlyte lets you model potential changes in the data center, allowing you to assess the effects on all aspects of measurable capacity. Once you determine the best course of action, nlyte guides you through the steps of implementing these changes using best practices and procedures. For more information on nlyte Intelligent Capacity Planning, see the web site: <http://www.nlyte.com>.

Eaton Power Xpert Software™

Power Xpert Software is a comprehensive solution for system-level management of the power infrastructure via a Web-browser. It takes the complexity out of managing the power system and provides a clear picture of what is happening at a component, device and system level. Power Xpert Software gives you insight into cost savings and downtime prevention by gathering, presenting and analyzing detailed, system-wide data. For more information on Eaton Power Xpert Software go to http://www.eaton.com/EatonCom/Markets/Electrical/Products/PowerQualityManagement/PowerXpertArchitecture/CT_111822.

Insight Control integrates with the Eaton Power Xpert Reporting product on Windows platforms. It can use one-line power diagrams and circuit reporting hierarchy data to build a clearer picture of the data center. Eaton Power Xpert Reporting contains information from the power feed, through the panels, down to the branch-circuit level. This integrates neatly with the rack and device data that Insight Control discovery provides. If you install Insight Control in a datacenter that already runs Eaton Power Xpert Reporting, you can save a great deal of setup time by importing Eaton power topology information.

Importing data from Eaton Power Xpert Software to Insight Control

To integrate with HP Insight Control, all shared servers and enclosures must be modeled in both management tools and the serial numbers must match. The “eaton2txt” and “ipmimport” tools are provided to import Eaton datacenters into HP Insight Control. After installing Insight Control but before discovery, run the following steps on the HP Systems Insight Manager (SIM) Central Management Server (CMS). Execute these steps from a command shell window on a Windows platform.

1. Run the Insight Control application specific collection tool “eaton2txt” to produce the file “data.txt”. The syntax is **eaton2txt HostName > data.txt**, unless the CMS is the same as the host name, in which case this argument can be omitted.
2. Run the command **ipmtxt2xml data.txt > ignore.txt**, to validate the datacenter set up. Edit “data.txt” to remove any errors, or any unwanted devices.
3. Import “data.txt” into Insight Control using the **ipmimport data.txt** command.
4. Add needed Insight Control licenses to the servers through the command line or GUI.

For more information

For additional information, refer to the resources listed below.

Resource description	Web address
HP Power Capping and HP Dynamic Power Capping for ProLiant servers	http://www.hp.com/go/powercapping
HP Insight Control Management	http://www.hp.com/go/ipm
HP Power Regulator	http://www.hp.com/servers/power-regulator
HP Integrated Lights-Out 3	http://www.hp.com/go/iLO
HP Onboard Administrator	http://h18004.www1.hp.com/products/blades/components/onboard/index.html?jumpid=reg_R1002_USEN
HP Insight Control power management User Guide	http://h20000.www2.hp.com/bc/docs/support/SupportManual/c02048495/c02048495.pdf
nlyte Intelligent Capacity Planning	http://www.nlyte.com
Eaton Corporation	http://www.eaton.com/EatonCom/index.htm

Call to action

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