



Why HP BladeSystem – Power and Cooling

HP delivers a more complete solution

Overview: Energy costs in the datacenter are a major challenge for customers. Experts estimate that for every \$1.00 spent on new hardware, an additional \$0.50 is spent on power and cooling.ⁱ And the infrastructure needed to support a tier IV datacenter is approximately \$25,000/kWⁱⁱ. Therefore your choice of infrastructure provider should be a key consideration when addressing the energy efficiency challenge.

Why HP BladeSystem



HP has been focused on improving energy efficiency for many years, at the server, component and data center levels. HP Thermal Logic is our portfolio of technologies, available throughout our server, storage and networking product lines. It is one of the foundational technologies of HP BladeSystem and helps customers:

REDUCE energy + RECLAIM capacity = EXTEND the life of their data centers

| What we do | How we do it |
|--|--|
| Deliver the most efficient power supplies | HP offers Power Supply Units PSUs with the 80Plus Platinum rating, 94% efficient, highest efficiency in the market. |
| Automatically optimize power supply efficiency | HP Dynamic Power Saver automatically puts power supplies into a hot-standby mode to ensure the remaining power supplies are operating at optimal efficiency. |
| Optimize Power Delivery | Size power supplies exactly match redundant three phase data center power, insuring matched power utilization across all three phases. Each power supply precisely matches the data center circuit size, thus avoiding waste of circuits that can cost upwards of \$25,000/kW. |
| Optimize cooling | The entire enclosure shares up to 10 HP Active Cool fans in zones. These fans (20 patents pending) deliver best-in-class acoustics, power consumption, and air movement capacity. The zoned cooling precisely routes airflow over the hottest components and minimizes airflow waste. |
| Real time temperature measurement and feedback | Sea of Sensors in the HP BladeSystem constantly monitor temperature and adjust the fans to optimize cooling and provide energy savings. |
| Cap power at breaker speed | HP Dynamic Power Capping enables one power cap to be set for an entire BladeSystem enclosure that dynamically adjusts to changes in workloads between individual blades. The enclosure will re-allocate power capacity between blades to stay below the power cap and based on changing workloads. |
| Tune power to application workload requirements | HP Power Regulator constantly monitors the utilization of the processors, and will auto throttle the processor input power and frequency to match the application load. |
| Manage every watt | Insight Control power management is an integrated power monitoring and management application that provides centralized control of server power consumption and thermal output. |

These innovative technologies that have been developed through years of data center experience and collaboration with customers and partners, help lower operating expenses and infrastructure costs while improving the overall data center environmental impact. Built in monitoring and automation, combined with the best-in-class product design deliver the most energy-efficient solutions available today.



Where Cisco falls short

Cisco has several gaps when compared to HP in the area of power and cooling:

| | 80Plus PSU Platinum rating | Dynamic Power Supplies | Three-Phase Power | Zone Cooling/Active Fans | Dynamic Power Capping | Power Forecasting |
|--------------|----------------------------|------------------------|-------------------|--------------------------|-----------------------|-------------------|
| HP | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Cisco | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ |

Additional areas where Cisco UCS can't match HP

| Feature | Why we are better | Why it matters |
|-----------------------------|--|--|
| Balancing three phase-power | Cisco's four (4) single-phase power supplies (all required to configure the UCS in an N+N, AC line redundant set up) make it more complex to balance loads across three phase data center power (4 is not evenly divisible by 3). HP BladeSystem was designed with the choice of single- or three-phase power supplies that balance across three phases. See: <i>"Powering HP BladeSystem c7000 Enclosures"</i> http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01543629/c01543629.pdf | As power requirements for high density compute systems increase, the benefits of distributing three-phase power to individual racks become more significant. Strictly speaking, IT equipment does not use three-phase power—the benefits are in its distribution within the rack and enclosure including easier load balancing for improved efficiency, cable reduction for simplicity, and larger power rating capability and expandability. See "Increasing energy efficiency with modular HP three-phase power distribution" http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01173322/c01173322.pdf |
| Air Flow Optimization | Tests conducted show that Cisco's UCS demands significantly more airflow than a comparable HP BladeSystem. Cisco UCS systems require ~2.6X as much airflow for cooling purposes when compared with HP BladeSystem. See: <i>Tolly Test Report: "HP BladeSystem c7000 with ProLiant BL460c G6 Servers vs. Cisco UCS 5100 with B200 Servers – Chassis Airflow Comparison"</i> , May 2010. http://www.tolly.com/Docdetail.aspx?Docnumber=210108 | A study by HP and The Uptime Institute suggests that in a majority of the world's data centers 63% of a datacenter's power is associated with the power of cooling the IT equipment. ⁱⁱⁱ HP optimizes this portion of the energy budget using a sea of sensors so that each fan can run at the minimum speed to properly cool the IT gear. This prevents wasting energy with air flow that is over provisioned and not performing useful work (heat transfer). |
| Dynamic Power Capping | HP Dynamic Power Capping can bring a server experiencing a sudden increase in workload back under its power cap in less than 0.5 seconds and is tested to ensure that it can prevent tripping circuit breakers that have a specified trip time of three seconds or longer at 50°C and 150% overload. According to Cisco's own documentation if the Cisco UCS exceeds its power cap, the power in the enclosure is reallocated within 20 to 30 seconds which is a significantly slower response than a circuit breaker. See: <i>Cisco Whitepaper: "Power Management in the Cisco Unified Computing System: An Integrated Approach"</i> | A tripped circuit breaker can be a catastrophic event in a datacenter. To avoid this failure, without dynamic capping, electrical circuits are usually provisioned at the full face plate rating of the IT gear. Dynamic Power Capping can control server power consumption quickly enough to prevent transient power demands that may trip circuit breakers thereby enabling administrators to reclaim data center capacity by putting more servers on a given circuit. See HP Power Capping and HP Dynamic Power Capping for ProLiant servers: http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01549455/c01549455.pdf Without similar power capping Cisco UCS may force data center operators to provision power at the full face plate rating. |
| Power Management | HP Insight Control offers extensive power management tools and analysis. Display graphs of up to 3 years of peak and average power consumption and server temperature data to understand the cost of powering and cooling servers, and export data to other reporting tools. Compare power budgets from facilities against actual power usage numbers. Cisco can't match this level of management. | Insight into past, current and future power usage enables intelligent management of resources and reclamation of lost power by looking strictly at nameplate power. |

Bottom line: HP BladeSystem delivers a much more complete offering in the area of power and cooling than Cisco's UCS to better address the to address challenge of energy efficiency in the data center.

ⁱ IDC: Solutions for the Datacenter's Thermal Challenges, January 2007

ⁱⁱ Uptime Institute Whitepaper "Cost Model: Dollars per kW plus Dollars per Square Foot of Computer Floor for redundant UPS capacity".
[http://uptimeinstitute.org/wp_pdf/\(TUI3029A\)CostModelDollarsperkWPlusDollars.pdf](http://uptimeinstitute.org/wp_pdf/(TUI3029A)CostModelDollarsperkWPlusDollars.pdf)

ⁱⁱⁱ HP, Christopher Malone, PhD, Christian Belady, P.E., "Metrics to Characterize Data Center & IT Equipment Energy Use", Digital Power Forum, Richardson, TX (September 2006) & "How to Minimize Data Center Utility Bills", HP C. Belady, P.E., Sept 2006

