HP Data Center Efficiency For The Next Generation

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Power and Cooling Services
# The HP difference

## Industry-wide expertise, global reach
- HP operations span more than 170 countries
- Understands power curve, from processor to data center infrastructure
- Holistic approach to data center efficiency—data center as a whole
- Active in power and cooling industry standards bodies: ASHRAE, Uptime Institute, Green Grid, EPA

## Proven solutions
- Drives advances in efficient systems, flexible designs, and power optimization
- More than 1000 patents for advances in Power & Cooling technology
- Pioneering work by HP Labs in the use of computational fluid dynamics (CFD) in modeling airflow in the data center
- Acquisition of EYP Mission Critical
Data Centers need your attention now!!

- Average age of data centers is over 15 years old. Power consumption per square foot almost tripled from 40 watts to 100 watts!!

- By 2010 more than half of data centers will have to relocate to new facilities or outsource some applications.

- Power failures and limits on power availability will interrupt data center operations at more than 90 percent of all companies over the next five years.

1 Dave Edwards, Morgan Stanley, Always On Stanford Summit 07
2 AFCOM’s Data Center Institute, AFCOM 2006
Facilities & IT: A new level of dialog

• Fact 1: Data center power density up 10x in the last 10 years
  − 2.1kW/rack (1992); 14kW/rack (2006)
  − Customers often do not fill their racks to capacity due to power/cooling constraints

• Fact 2: Increasing processor power
  − Moore’s law confronting the laws of physics

• Fact 3: Energy costs going up
  − 3-year energy cost roughly equivalent to acquisition cost (U.S.); in Europe, it could be as high as 2X
  − Larger proportion of IT spend dedicated to energy

• Fact 4: Iterative power life cycle
  − Can take as much power to cool the heat generated from a system as it takes to power the system

• Fact 5: Over-provisioning
  − Many data centers are over-provisioned with cooling and yet still have hot spots
Power and Cooling

“A study of 19 computer rooms with more than 200,000 square feet of combined floor space done by the Uptime Institute, a research group, found they had 2.6 times the cooling capacity required, but wasted more than 60% of capacity because of poorly designed layouts and airflow, among other deficiencies. As a result, more than 10% of the server racks ran too hot.”

“New Cooling Technologies Tackle Data Center Heat”, Information Week, Sep 25, 2006
Smart Cooling Solutions
*bridges the gap between IT and Facilities*

Datacenter power consumption

- **63%** Cooling of the IT gear
- **33%** Servers & Storage
- **4%** AC power conversion

85% of the World's Data Centers

Delivering energy efficient solutions for the IT Power & Cooling Chain

Optimizing from chip to chiller

**Data Center & Facilities**
- Dynamic Smart Cooling
- Modular Cooling System
- Power Distribution Rack
- Three Phase UPS

**Manageability Tools**
- Insight Power Manager and iLO 2
- Dynamic Capacity Management
- Thin Provisioning & Data de-duplication
- Virtualization

**Systems**
- BladeSystem Enclosures
- Thermal Logic
- PARSEC enclosure cooling
- Active Cool Fans

**Servers & Storage**
- Efficient Power Supplies
- Energy Optimized Servers
- Small Form Factor Drives
- Low Power Processors
- Low Power Memory

**Services**
- Thermal Zone Mapping, Data Center Assessments, Data Center Site Preparation

Energy Savings
Up to 33% of Entire Data Center Power

“Chip to Chiller”
HP’s Smart Cooling Solutions

Potential energy savings

Optimization can significantly impact data center capacity

Potential capacity increases

HP Smart Cooling Solutions
Static Smart Cooling Solutions
HP delivers three static Smart Cooling Solutions

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All available for environments with multi-vendor equipment.
HP Smart Cooling: before and after

Before

Hot Aisle
Hot Aisle
Cold Aisle
Hot Aisle
Cold Aisle
Hot Aisle
Cold Aisle
Cold Aisle

After

Air Conditioner

Temperature balance improving

Racks

Source: Chandrakant Patel, HP
Dynamic Smart Cooling

A power & cooling data center management solution

- Provides thermal sensing at the rack level
- The distributed temperature sensing devices signal the software to rebalance the cooling
- Energy (power) consumption is smoothly managed by controlling the CRACs and supplying cooling dynamically

Up to 50% savings in cooling costs, experimental data from HP Labs
Benefits of HP Power and Cooling Services

- Cooling design improvements
  - Proper placement & provisioning of CRACs and airflow panels
  - Supply air temperature
  - Supply air volume
  - Sizing and location of panels
- Ideal locations for high-density equipment
- Significant opportunities for energy savings
- Identification of IT capacity gains
- Carbon footprint reduction
Reducing your carbon footprint

If the world used HP power saving solutions

- The world’s data centers could save over $4 billion/yr in US currency equivalents\(^\text{15}\)

- American data centers could cut carbon emissions up to 9 million tons each year\(^\text{16}\)
  - Equivalent to taking 5 million autos off the road every year

- Asia could curb its growing need for energy
  - China now emits more carbon into the atmosphere than any other country\(^\text{17}\)
  - By 2010 Asia will be the largest consumer of primary energy\(^\text{18}\)
  - By 2020 China & India will produce more carbon emissions than the USA & Europe combined\(^\text{19}\)
HP cares about customers & climate
Helping to Sustain the Environment

- Recycled 1 billion pounds of electronics – goal of 2 billion by 2010
- HP will reduce our own energy usage by 20% by the year 2010
- The environment is an HP tradition – Design for Environment launched in 1992
- A founding partner with ongoing support for the EPA Energy Star Program


May 2007: HP plans to allocate more than $2 million in cash and HP equipment to WWF to establish three projects aimed at addressing the causes and consequences of climate change.
Summary

- Proven solutions to customer’s space, power and cooling challenges in the data center
- Effective and efficient cooling strategies for high-density equipment using thermal modeling tools and techniques
- Simplify the addition of new equipment to your data center
- Results in facilities optimized for reliability, maintainability, and energy efficiency
“Correctly managing power and cooling issues in mission-critical environments requires an end-to-end approach including:

• use of more energy efficient servers
• efficient approaches to providing power and cooling
• dynamic power and cooling management
• consulting and support services to provide power and cooling expertise to IT management”

Jed Scaramella, Matt Healey  IDC, May 2007
Thank you!
Resources

Data Center Services
• HP.com: [www.hp.com/services/datacenterservices](http://www.hp.com/services/datacenterservices)
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Source Documentation

2: HP internal calculations based on savings measured in HP data center & HP lab environments
3: HP internal calculations based on savings measured in HP data center & HP lab environments
4: Network World July 25, 2007 “HP adds thermal mapping to energy-saving hot and cold spots in 3-D models” by Denise Dubie, quoting the HP press announcement.
5: Data Center News, “Gartner predicts data center power and cooling crisis”, June 14, 2007 by Bridget Botelho, quoting Mr. Michale Bell Vice President at Gartner Inc.
6: HP Press outreach June 6, 2007
8: The Register, “How green is my V-Word?” July 18, 2007 by Dennis Szubert
9: Case Study of Aim High Incorporated, one of the largest financial & insurance companies. Mr. Cody Power VP at Aim High consolidated to HP BladeSystems, Integrity and Storage works solutions in the Shanghai Data Center.
11: HP Power Calculator comparing Power Optimized DL380g5 to a 100 watt processor DL380g5. Each server had 2 drives, 6 fans and the same memory & PCI-e cards
12: The Register, “How green is my V-Word?” July 18, 2007 by Dennis Szubert
13: HP Power Calculator, comparing a 100 watt Intel Processor to a 50 Watt Intel Processor
14: HP Internal Hard Drive Testing Lab comparing SFF SAS drives to 3.5” SAS drives of similar capacity and rotational speed.
15: Newsfactor.com “Data Center Energy Use” Feb 19, 2007 by Jennifer LeClaire. Assuming the world’s data centers achieved 37% energy cost savings by implementing Virtualization, HP Thermal Mapping and HP Dynamic Smart Cooling. ($7.2 Billion x .60) = 4.3 Billion kWh savings
16: Based on the US Department of Energy data center energy consumption of 61 Billion kWh in 2006. And, assuming all US data centers achieved a 60% power reduction by fully Consolidating storage & servers, plus using HP Thermal Mapping & Dynamic Smart Cooling. (61 Billion kWh x .60) = 36 Billion kWh = 9.8 M Tons of carbon saved. (9.8 M Tons/3600 pounds of carbon for a typical vehicle) = 5.5 million cars assuming average mileage of 15,000 miles per year
18: The International Institute for Strategic Studies, “The Asian Energy Predicament”, by Robert A. Manning page #1