

# 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 !!<sup>1</sup>
- By 2010 more than half of data centers will have to relocate to new facilities or outsource some applications<sup>2</sup>
- 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<sup>2</sup>



# 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**

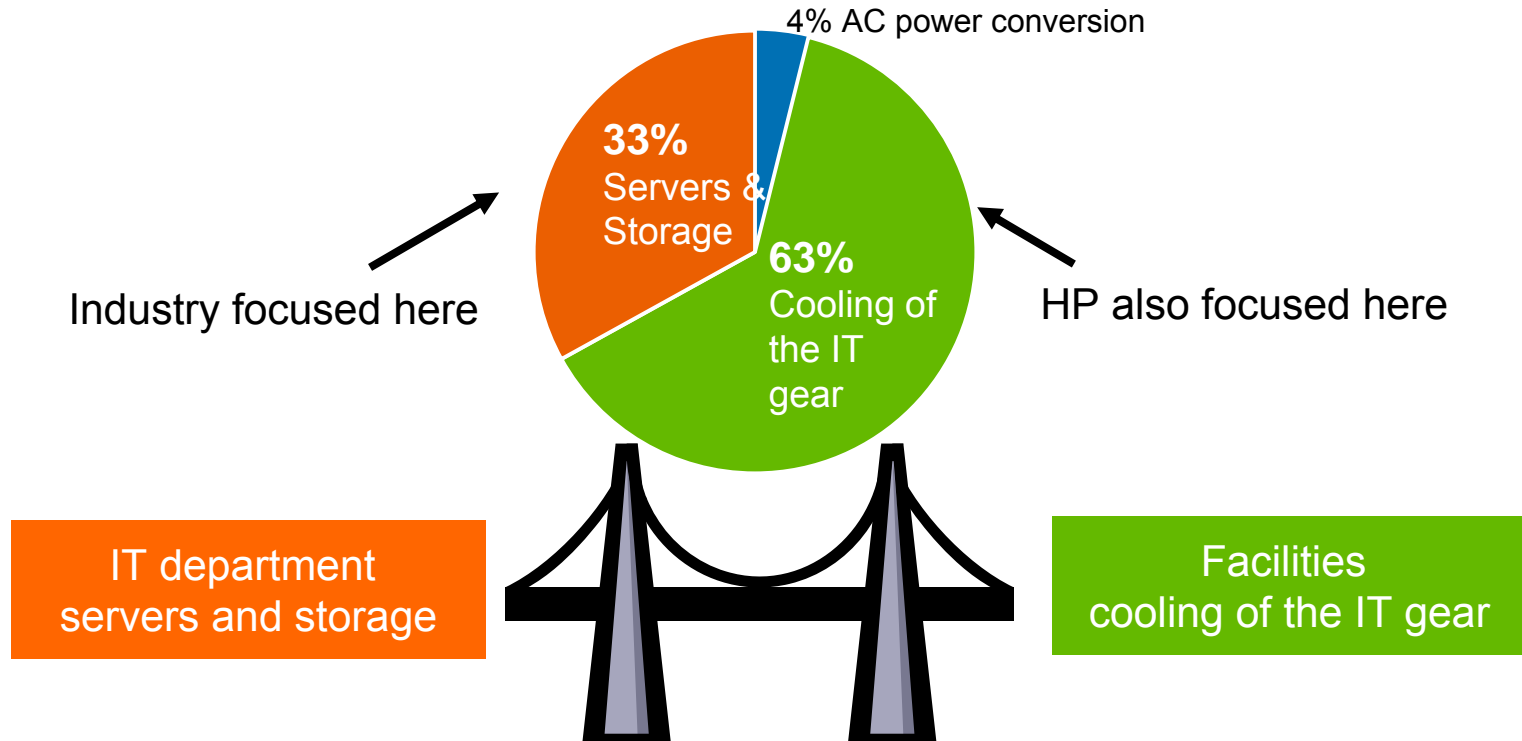


INVENT

# Smart Cooling Solutions

*bridges the gap between IT and Facilities*

## Datacenter power consumption



85% of the World's Data Centers <sup>1</sup>

<sup>1</sup>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,

# 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

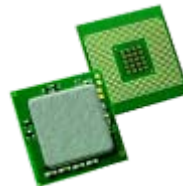
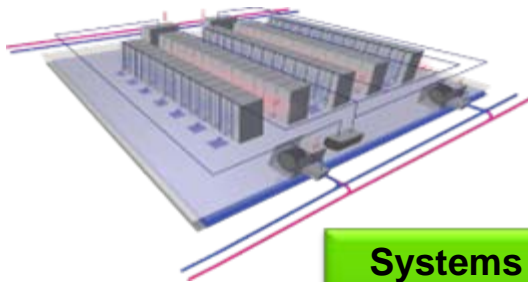
- BladeSystem Enclosures
- Thermal Logic
- PARSEC enclosure cooling
- Active Cool Fans

## 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



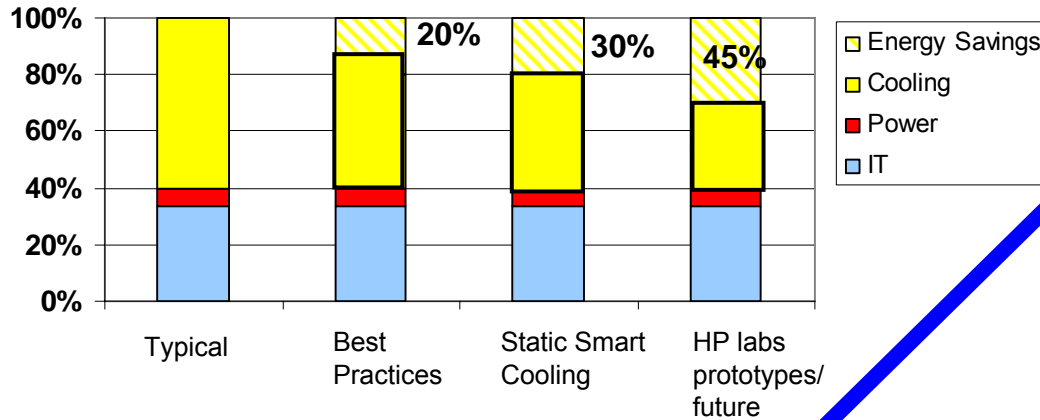
"Chip to Chiller"

Energy Savings

Up to 33% of  
Entire Data  
Center Power

# HP's Smart Cooling Solutions

## Potential energy savings

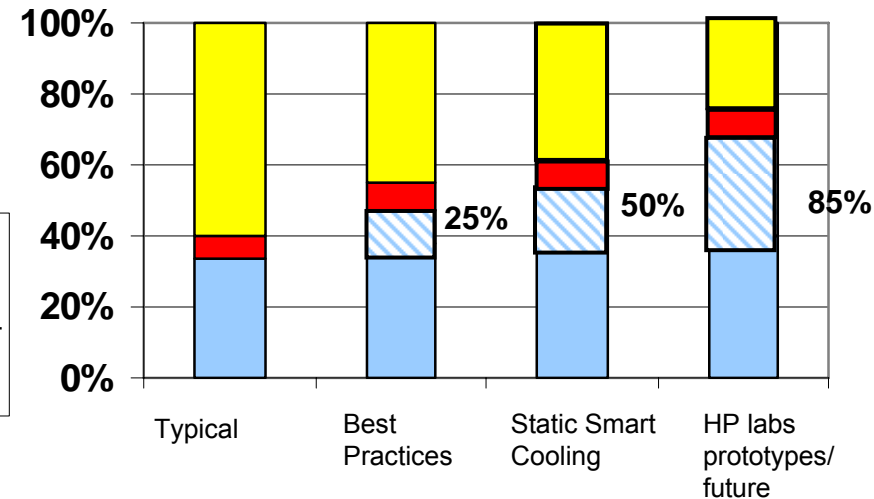


**Optimization can significantly impact data center capacity**



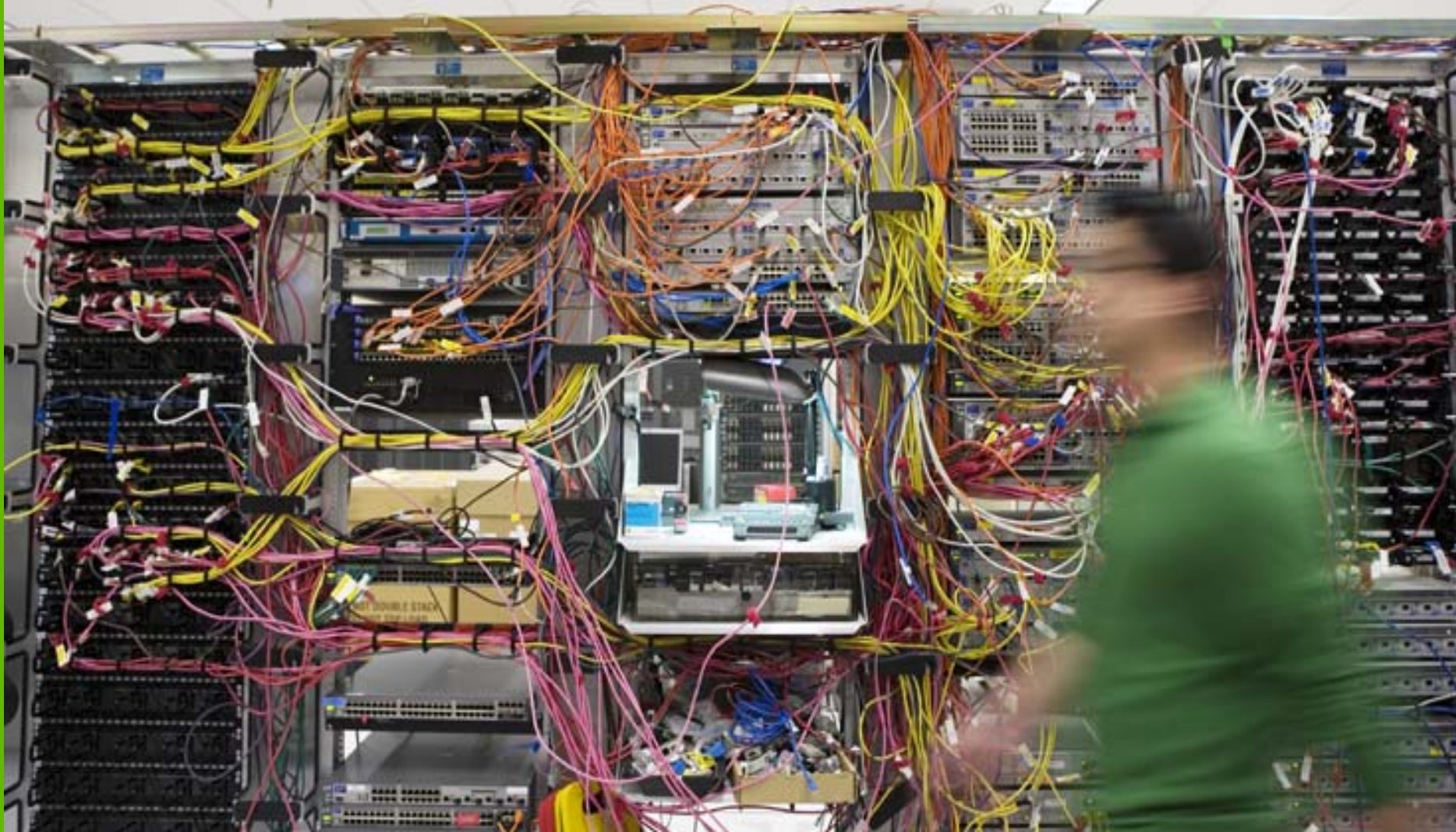
**Optimization can significantly impact energy usage**

## Potential capacity increases





# HP Smart Cooling Solutions



All available for environments with multi-vendor equipment.

# Static Smart Cooling Solutions

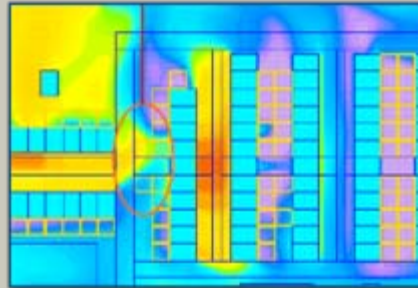
HP delivers three static Smart Cooling Solutions

## HP Thermal Quick Assessment



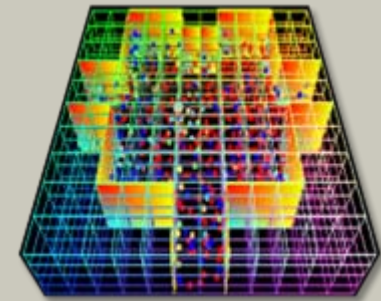
- Visual inspection
- Data measurements
- Basic report and recommendations
- 2 weeks

## HP Thermal Intermediate Assessment



- 2 D Under floor modeling
- Thermal modeling and “what if’s”
- Extensive report and recommendations
- 2-4 weeks

## HP Thermal Comprehensive Assessment

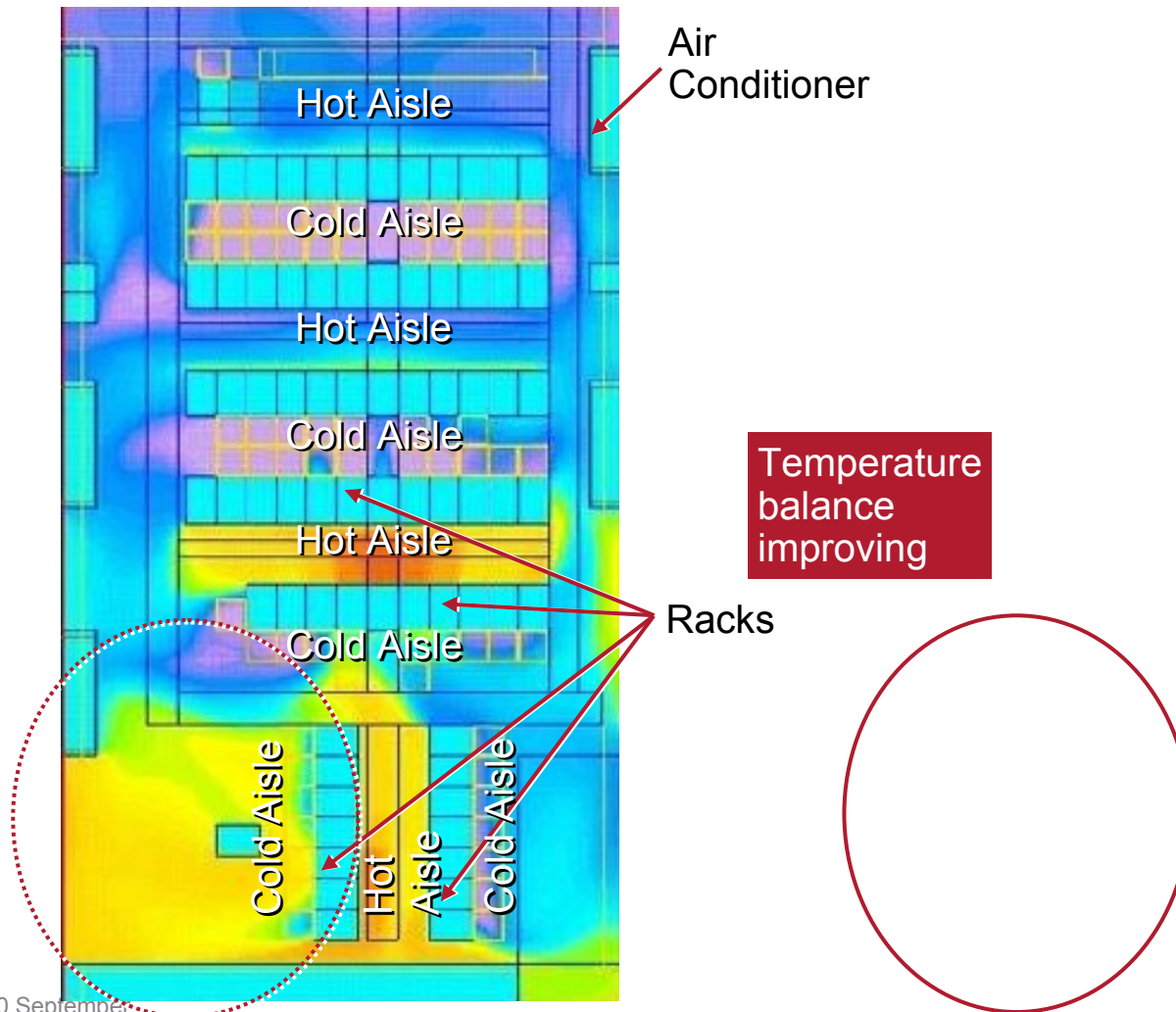


- 3D under- and above- floor modeling
- Thermal prediction/zone mapping
- Comprehensive report and recommendations
- 4-8 weeks

# HP Smart Cooling: before and after

Before

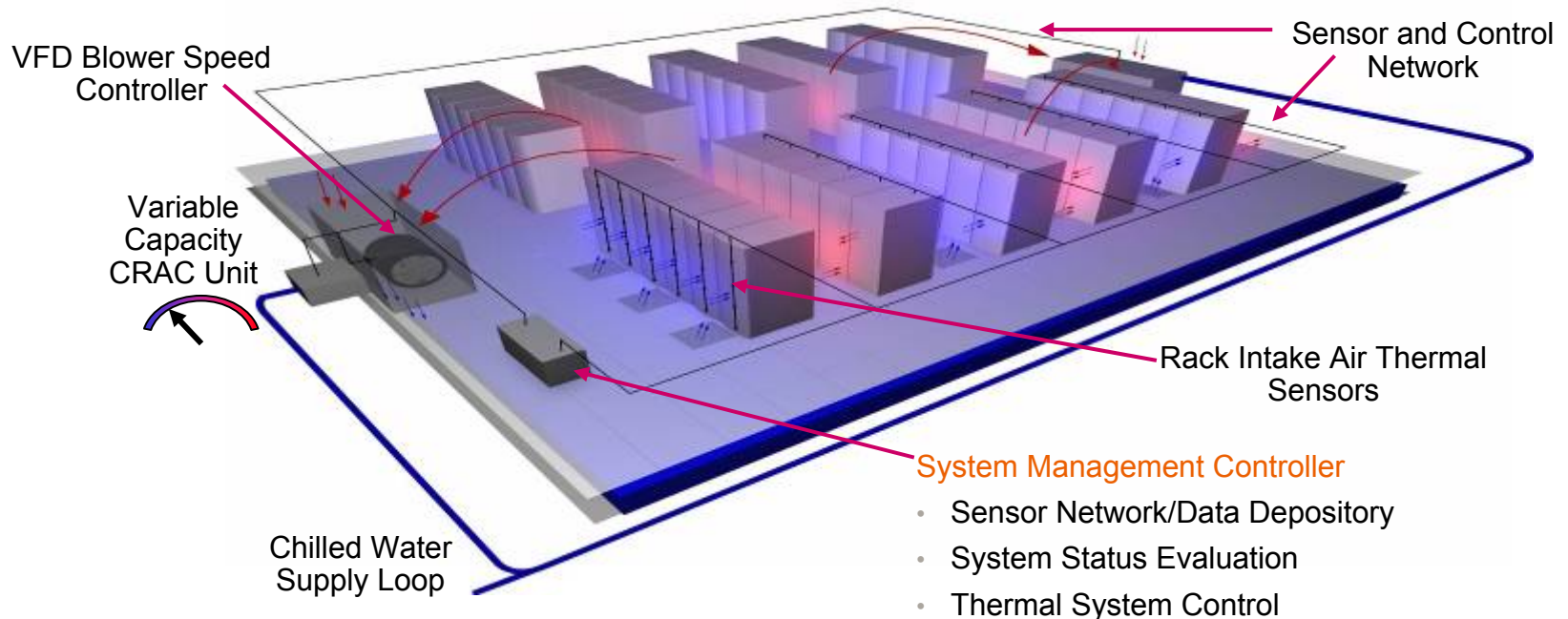
After



# 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



30 September

# 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<sup>15</sup>
- American data centers could cut carbon emissions up to 9 million tons each year<sup>16</sup>
  - 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<sup>17</sup>
  - By 2010 Asia will be the largest consumer of primary energy<sup>18</sup>
  - By 2020 China & India will produce more carbon emissions than the USA & Europe combined<sup>19</sup>



# 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



November 2006: HP & World Wildlife Fund joint initiative to cut HP greenhouse gas emissions.

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.

30 September  
2008

# 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



# The Road to Improvement



*“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

A pair of hands is shown holding a small, translucent green globe. The globe features a faint grid of latitude and longitude lines and a darker green map of the world's continents. The hands are positioned to cradle the globe from the sides and bottom. The background is a plain, light-colored surface. Overlaid on the center of the globe is the text "Thank you!" in a bold, white, sans-serif font.

**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

- 1: Source: Processor.com July 27, 2007 by Chickowski quoting the Uptime Institute estimates.
- 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
- 7: Power Regulator 3rd Edition Tech Brief Feb 2007, ISS Performance Testing Engineering assuming 320 watt server
- 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 Shanghi Data Center.
- 10: IDC White Paper, “Forecasting Total Cost of Ownership for Initial Deployments of Server Blades” June 2006, p6.
- 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. ( $\$7.2 \text{ Billion} \times .60$ ) = 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. ( $61 \text{ Billion kWh} \times .60$ ) = 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
- 17: Asia International News: Singapore Edition August 2007
- 18: The International Institute for Strategic Studies, “The Asian Energy Predicament”, by Robert A. Manning page #1
- 19: The International Institute for Strategic Studies, “The Asian Energy Predicament”, by Robert A. Manning page #1