

HP & Duurzaamheid

Greening the enterprise

Media Plaza, 21 november 2007



Hans van den Broek

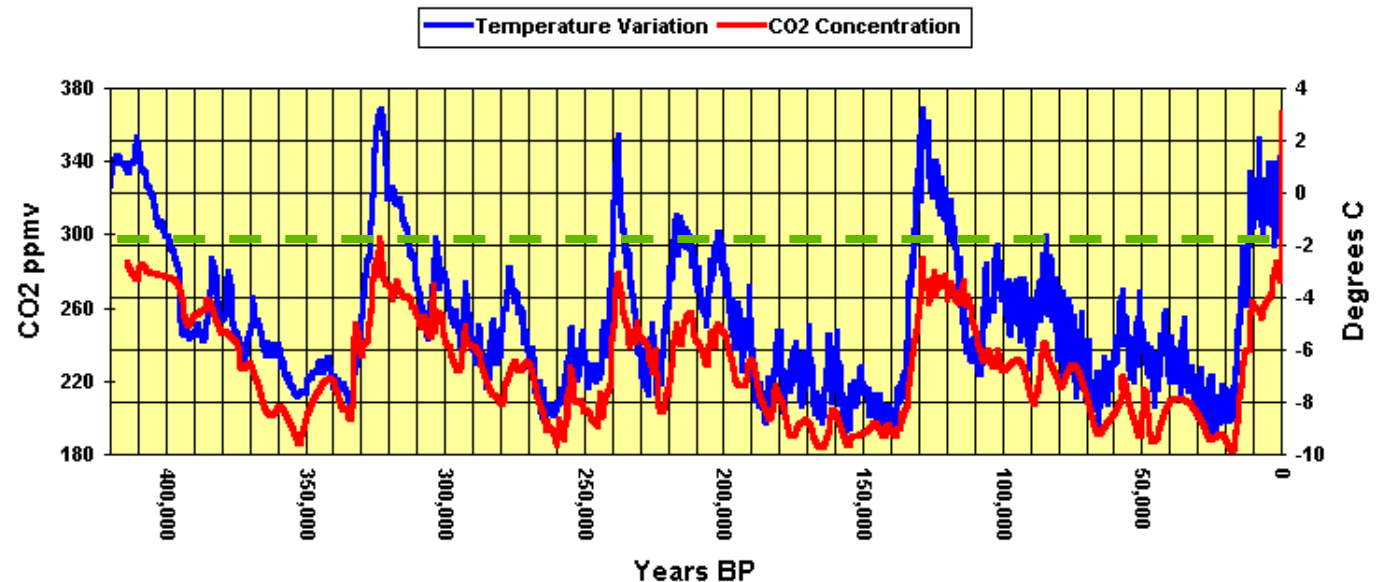
Chief Technology Officer
Technology Solution Group
HP NL B.V.
hans.vandenbroek@hp.com



CO2 concentraties de laatste 420K jaar



Antarctic Ice Core Data 1



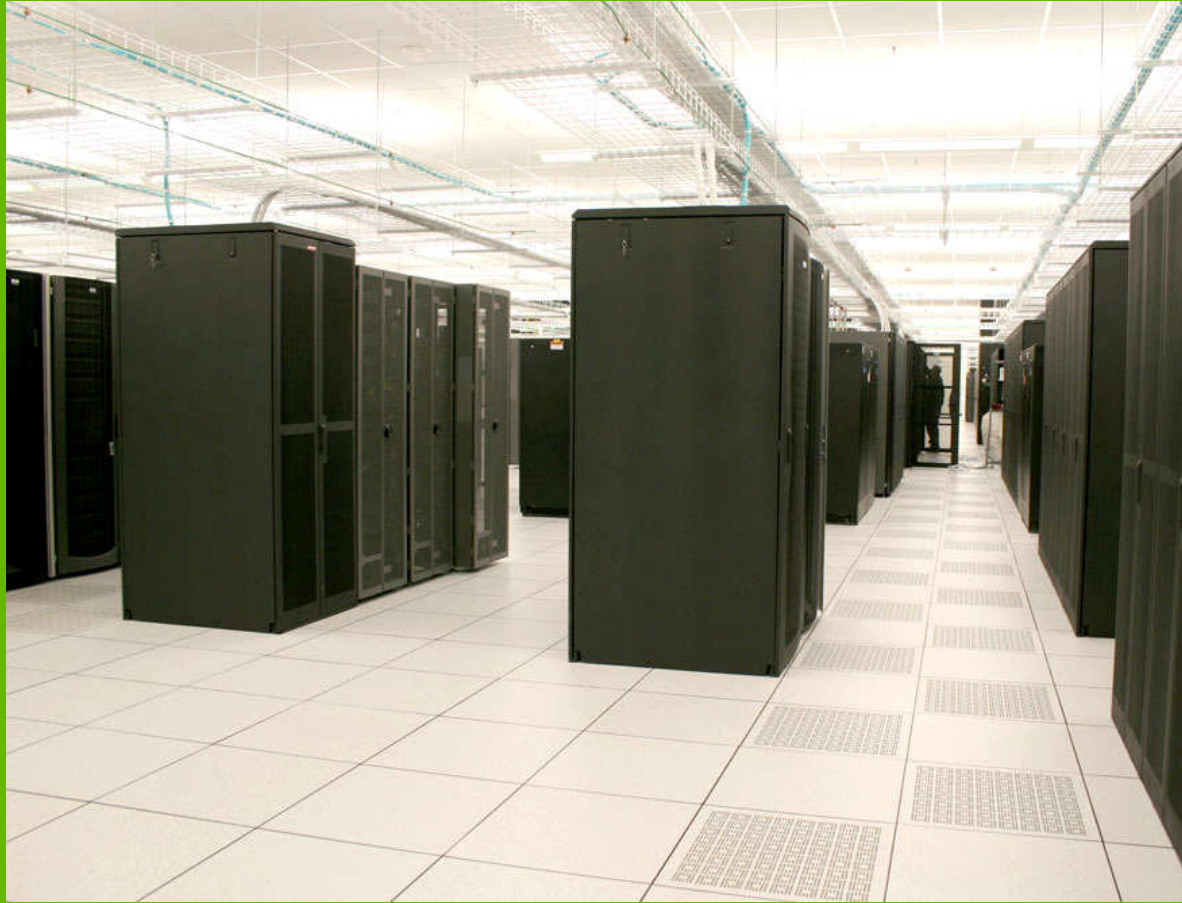
“Many assume, wrongly, that a company exists simply to make money...the real reason HP exists is to make a contribution...to improve the welfare of humanity...to advance the frontiers of science...Profit is not the proper end and aim of management – it is what makes all of the proper ends and aims possible...”

David Packard 1947



There is just one Earth





The Datacenter is the System



Realiteit in Data Centers van vandaag



Lagere budgeten...	Groeiende server	Falende systemen...
Kunnen energie en koel kosten omlaag gebracht worden?	Kunnen er meer systemen in mijn huidige data center?	Kan de huidige omgeving storingen voorkomen?
Kunnen kosten dalen zonder verlies van performance?	Een nieuw Data Center bouwen, voorkomen of uitstellen?	Wat kan er verbeterd worden om een beter DC klimaat te krijgen?

Global trend: Costly Business Interruptions

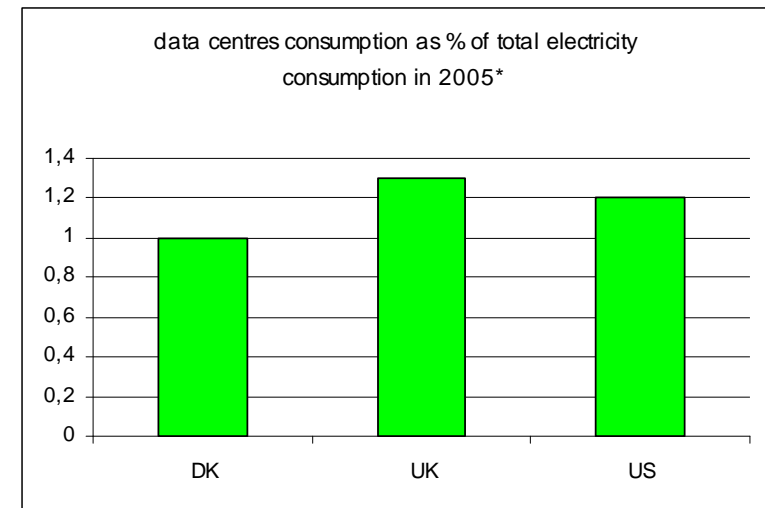
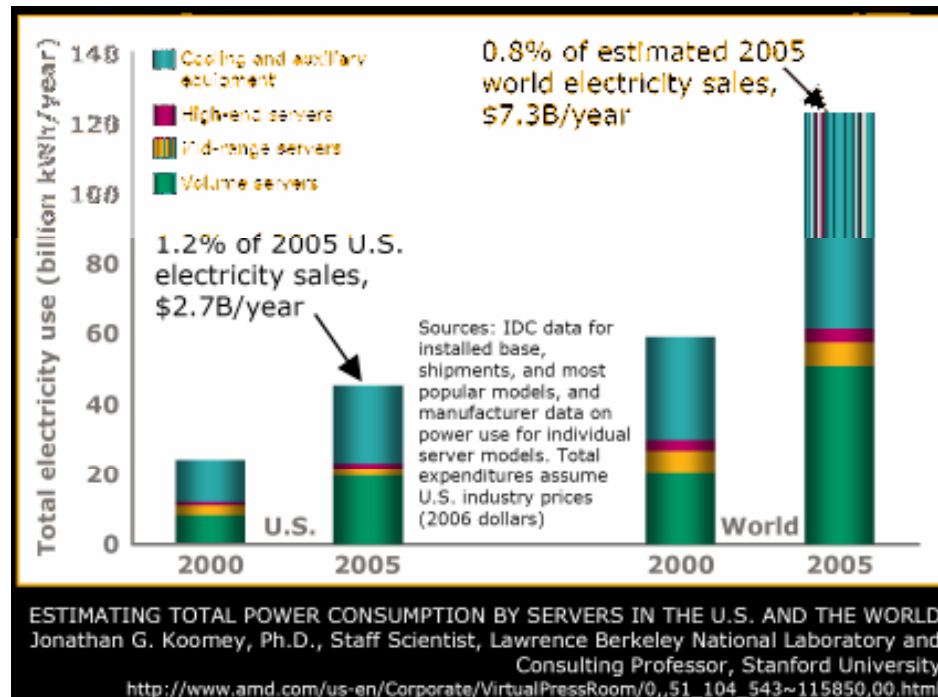
90% of all companies over the next five years will experience power failures and limits on power availability that interrupt data center operations

Example: Outage costs in \$/hour

Cellular Communications	\$41K
Telephone Ticket Sales	\$72K
Airline Reservations	\$90K
Credit Card Operations	\$2.6M
Brokerage Operations	\$6.5M



Power Usage of Servers Worldwide are Growing Rapidly – 2X in 5 years

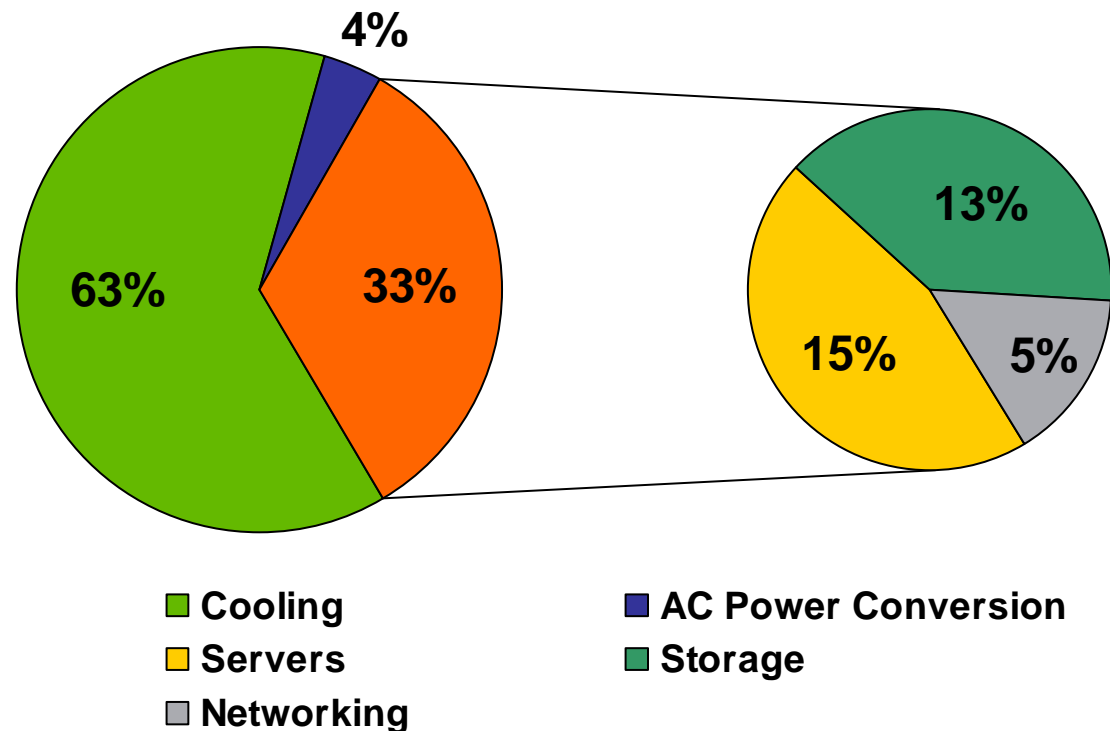


Over-provisioning of cooling capacity



- Cooling represents upwards of **60-70%** of data center power spend
- Approximately **85%** of the world's data centers are over-provisioned by more than double
- Storage represents **~15%** of data center power

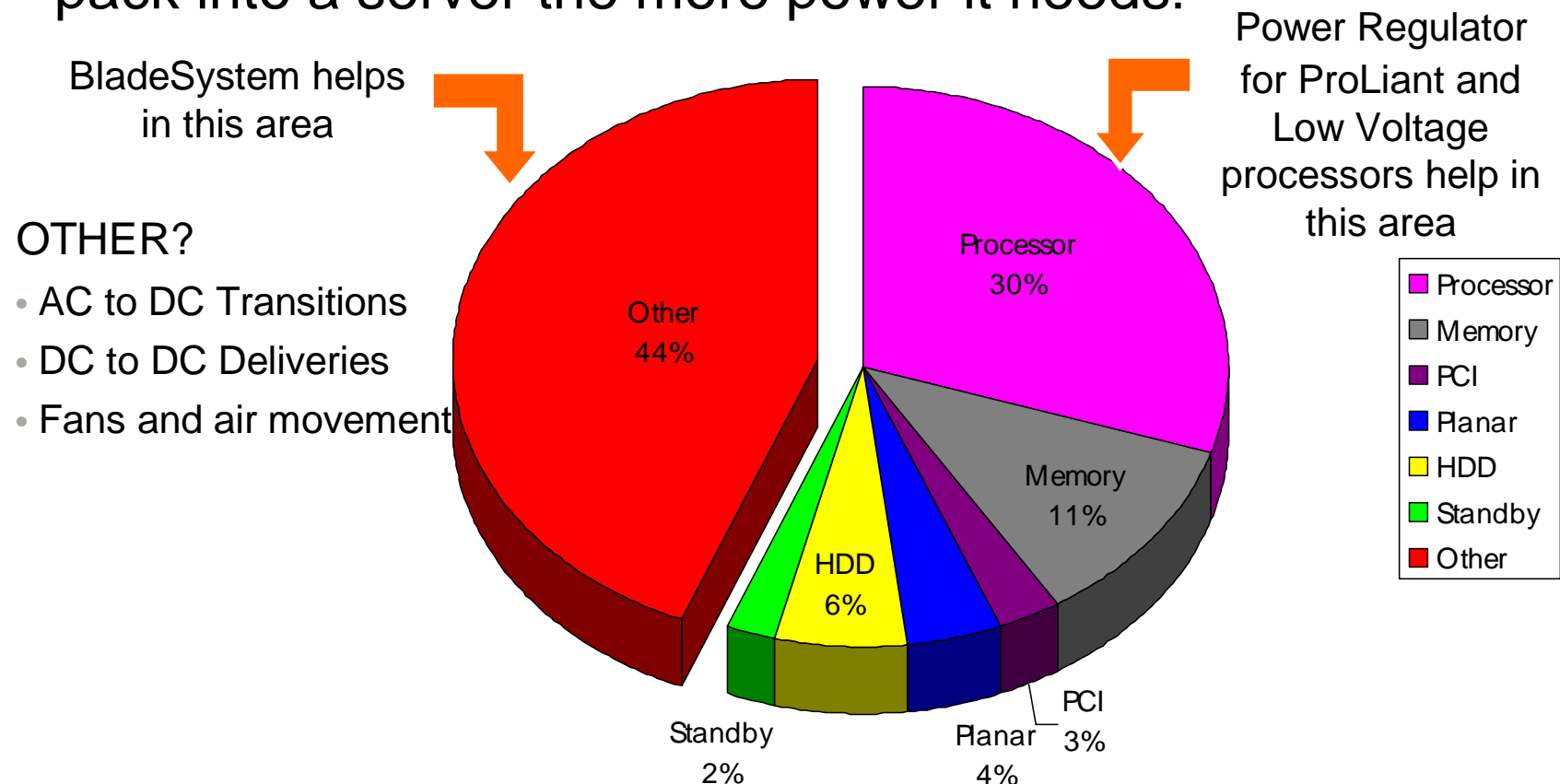
Data center power consumption



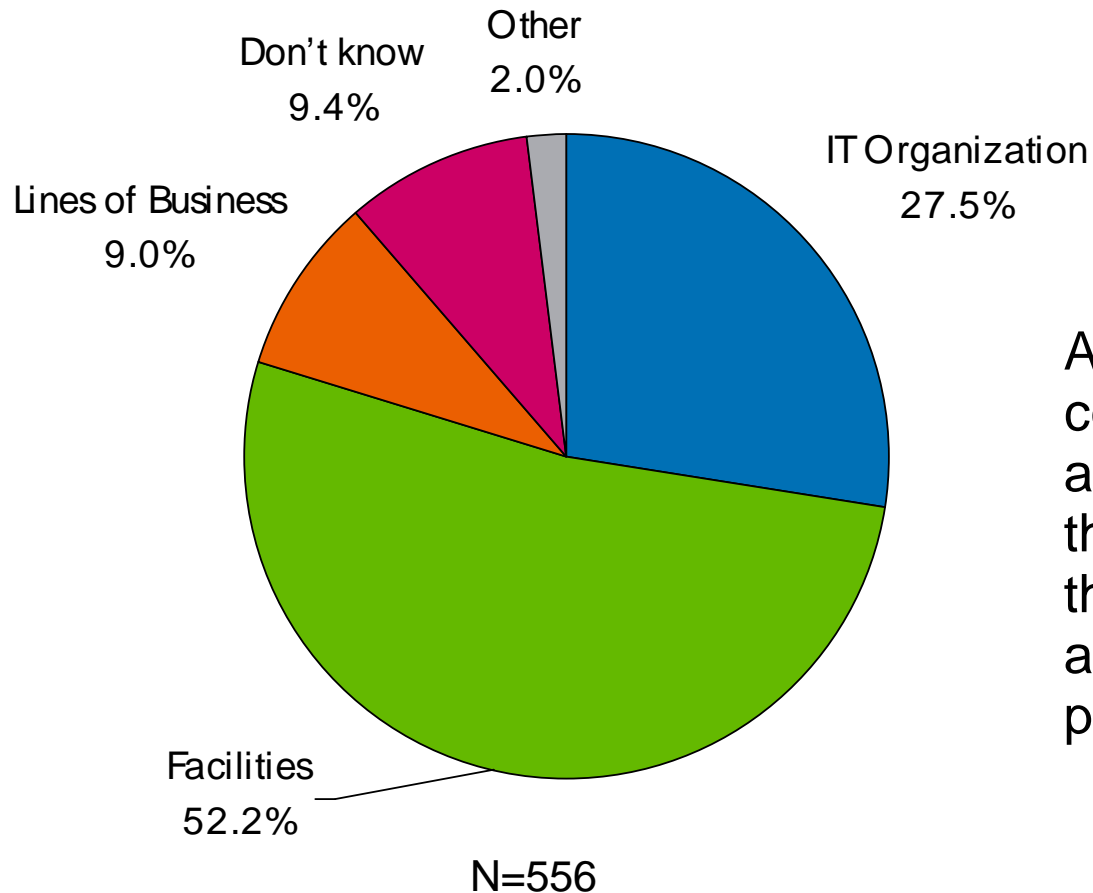
Sources: Preliminary assessment from Uptime Institute; IDC Data Center of the Future US Server Power Spend for 2005 as a baseline (\$6bn); applied a cooling factor of 1; applied a 0.6 multiplier to US data for WW amount; Belady, C., Malone, C., "Data Center Power Projection to 2014", 2006 IThERM, San Diego, CA (June 2006).
NetworkWorld "Green storage means money saved on power", May 2007

What's using the power?

- The processor power growth is the largest single contributor but there are many other areas- the more you pack into a server the more power it needs!



Who pays for power and cooling?

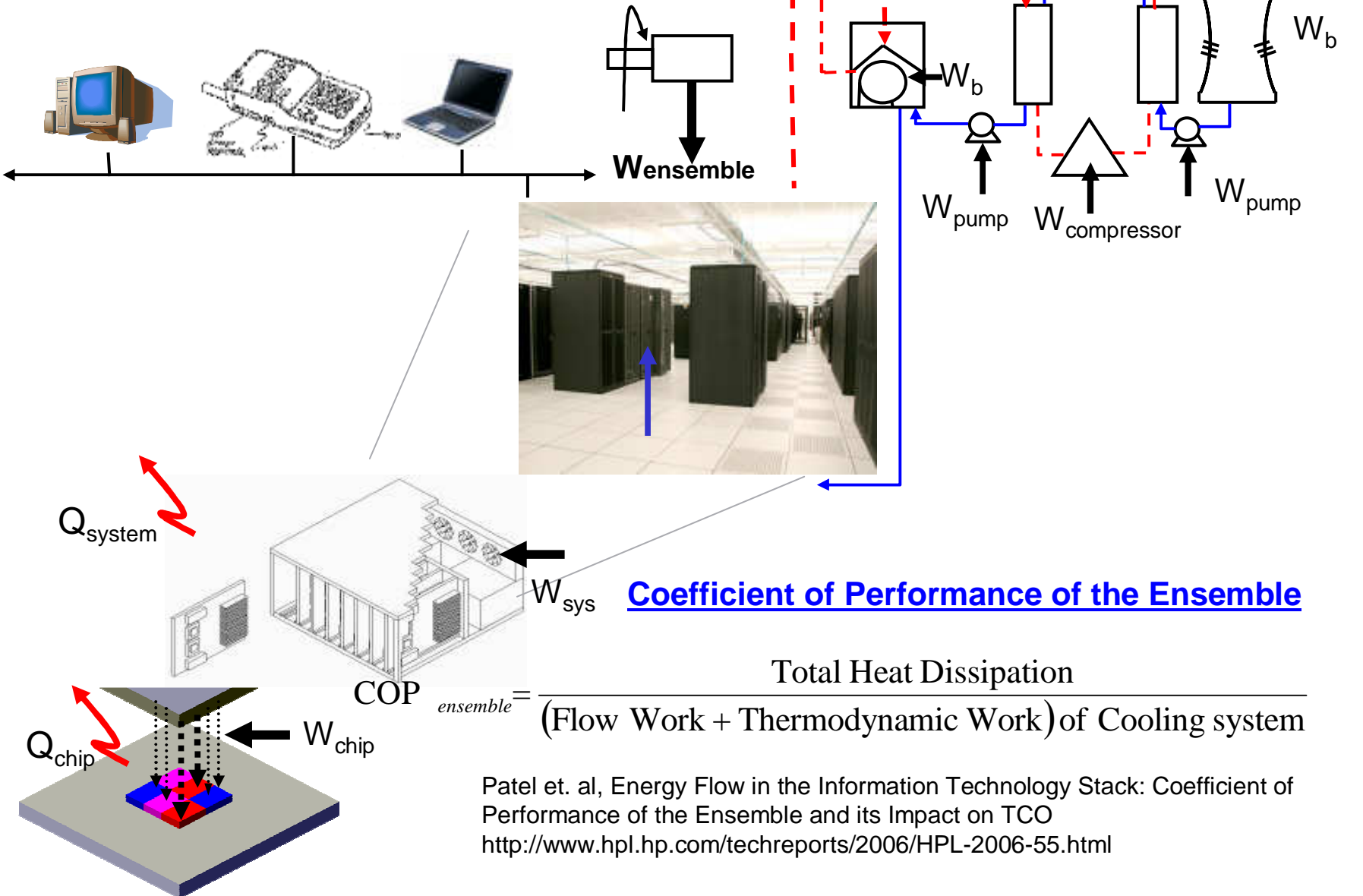


An important component of the power and cooling problem is the disconnect between those that buy hardware and those that manage power and cooling.

Source: IDC's Enterprise IT Advisory Council

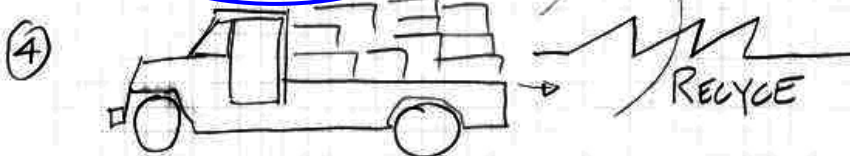
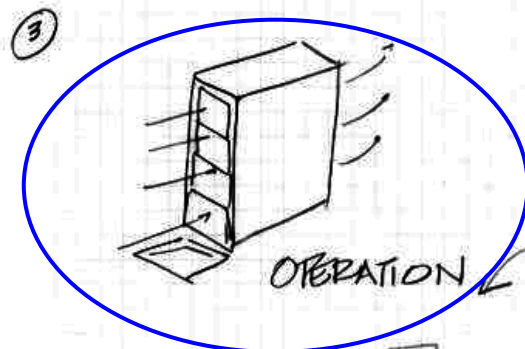
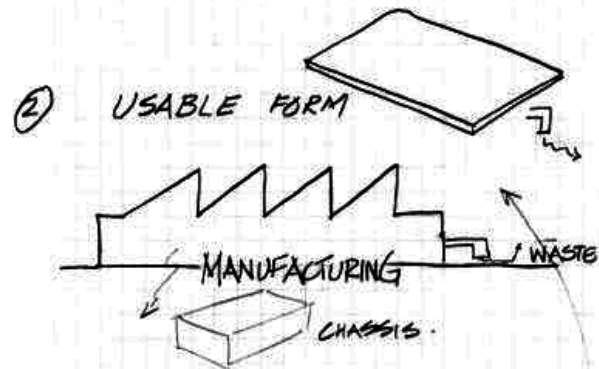
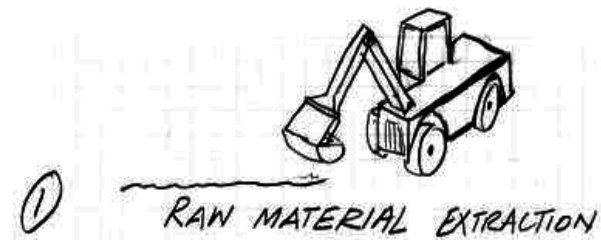
IT Ecosystem

Billions of Users and 1000s of Data Centers



Sustainable IT Ecosystem

supply side + demand side management



FINITE # of T_{ii}

Chandrakant Patel
HP Labs
7.7.2007

Ground State

irreversibility

Framework
needed to
quantify the
destruction of
available energy

Reclaim

“Smart” Data Center

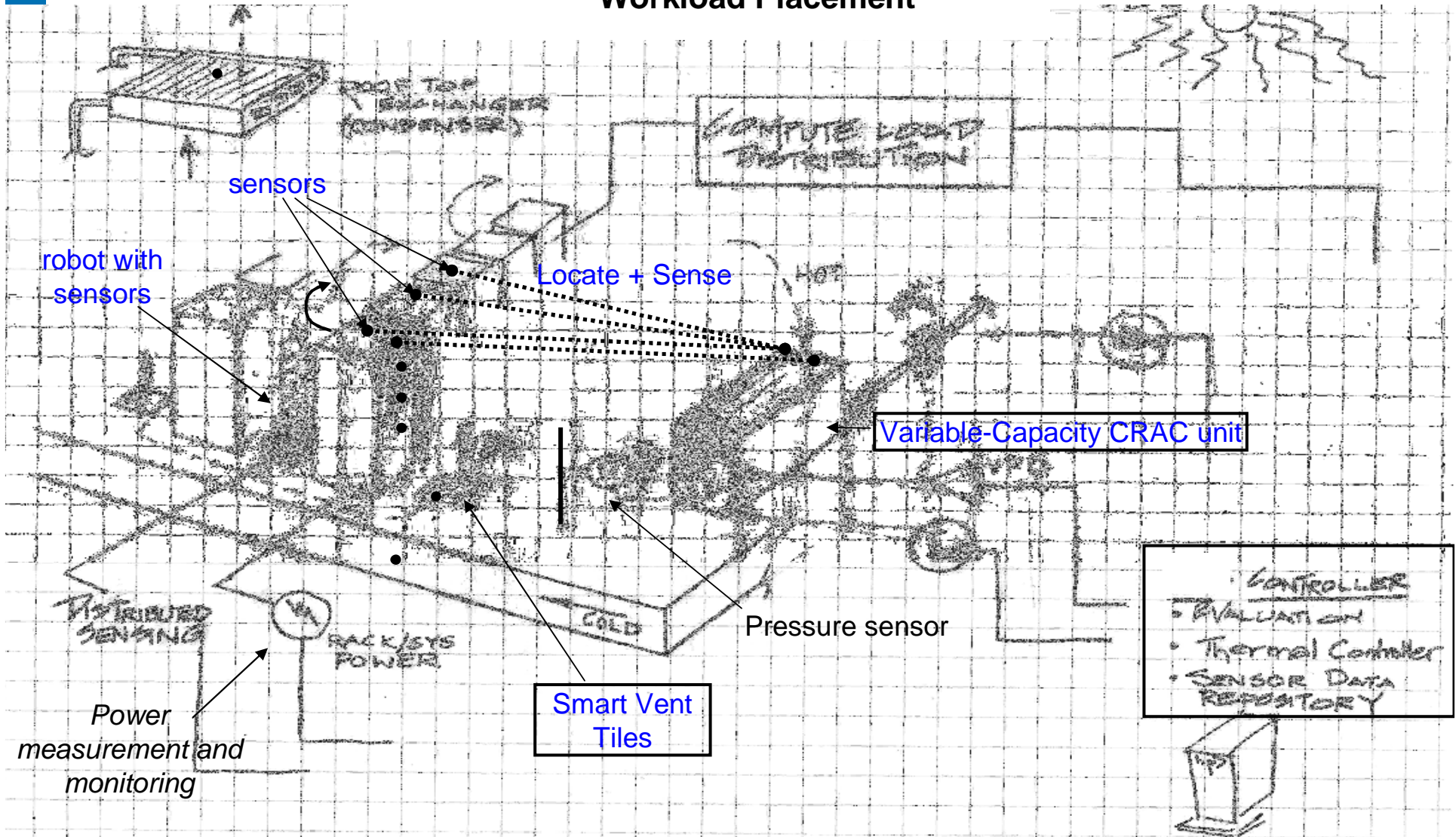
Concept



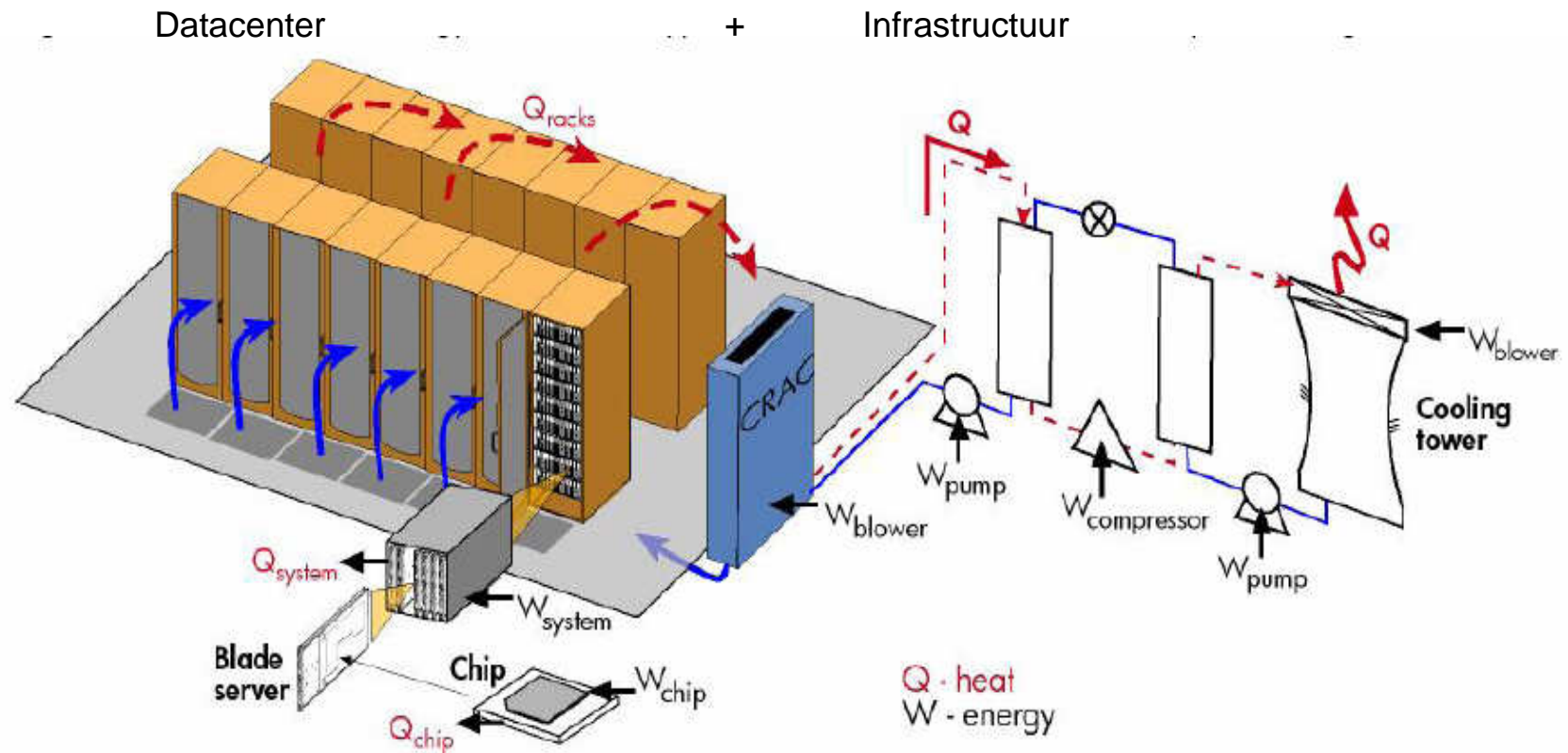
20 °C Ext Ambient

Workload Placement

45 °C Ext Ambient



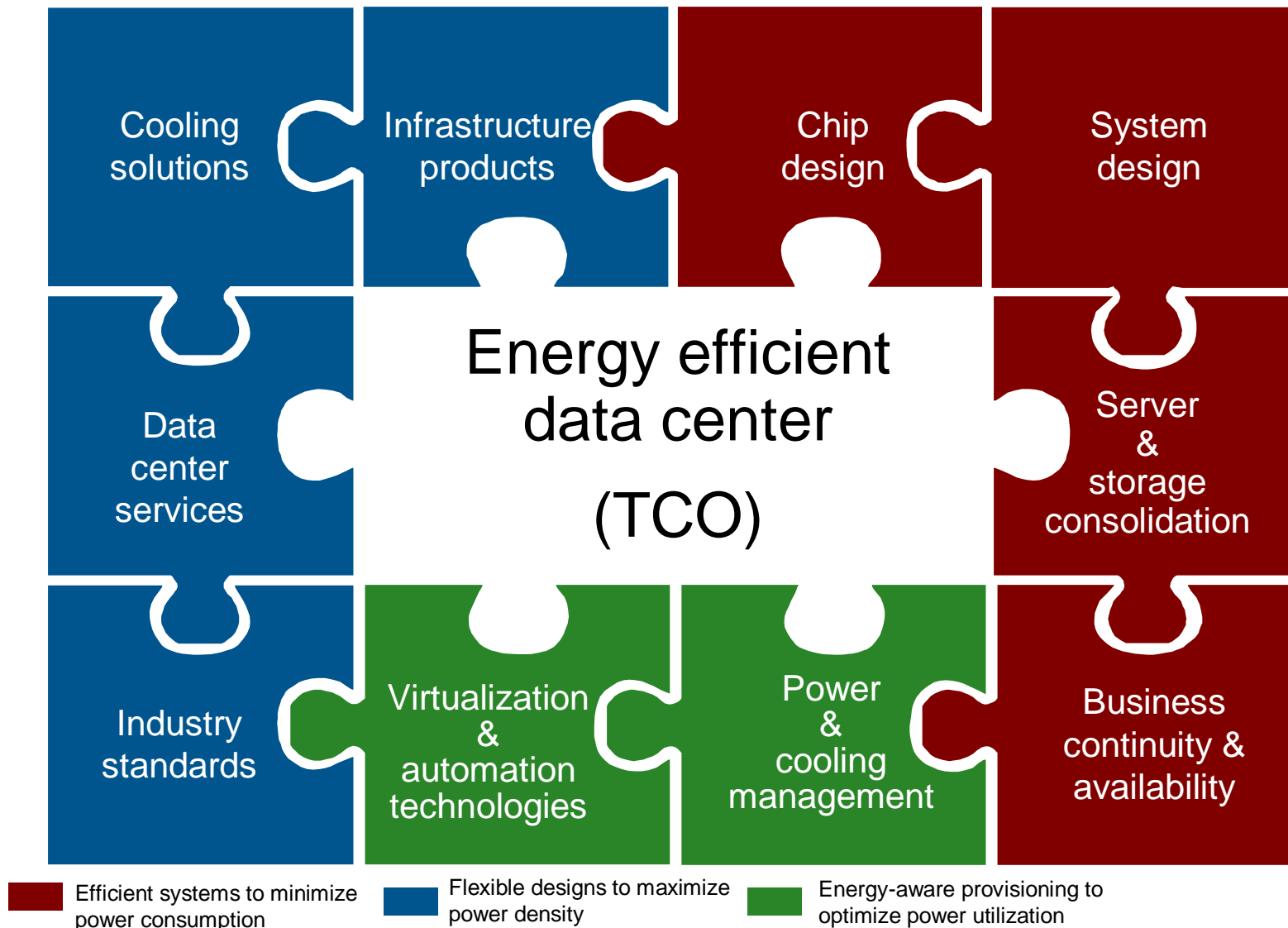
Datacenter holistisch bekeken van chip t/m chiller



“The Datacenter is the system”

What really matters?...all of it!

HP Power and Cooling holistic approach



Design for Environment

Energy efficiency

Materials
innovation

Reuse and

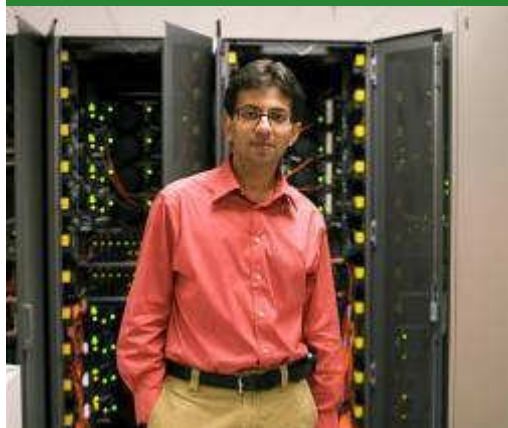


HP's approach to energy innovation

Design energy-efficient products



Improve energy efficiency of customer operations



Rethink energy use to transform society



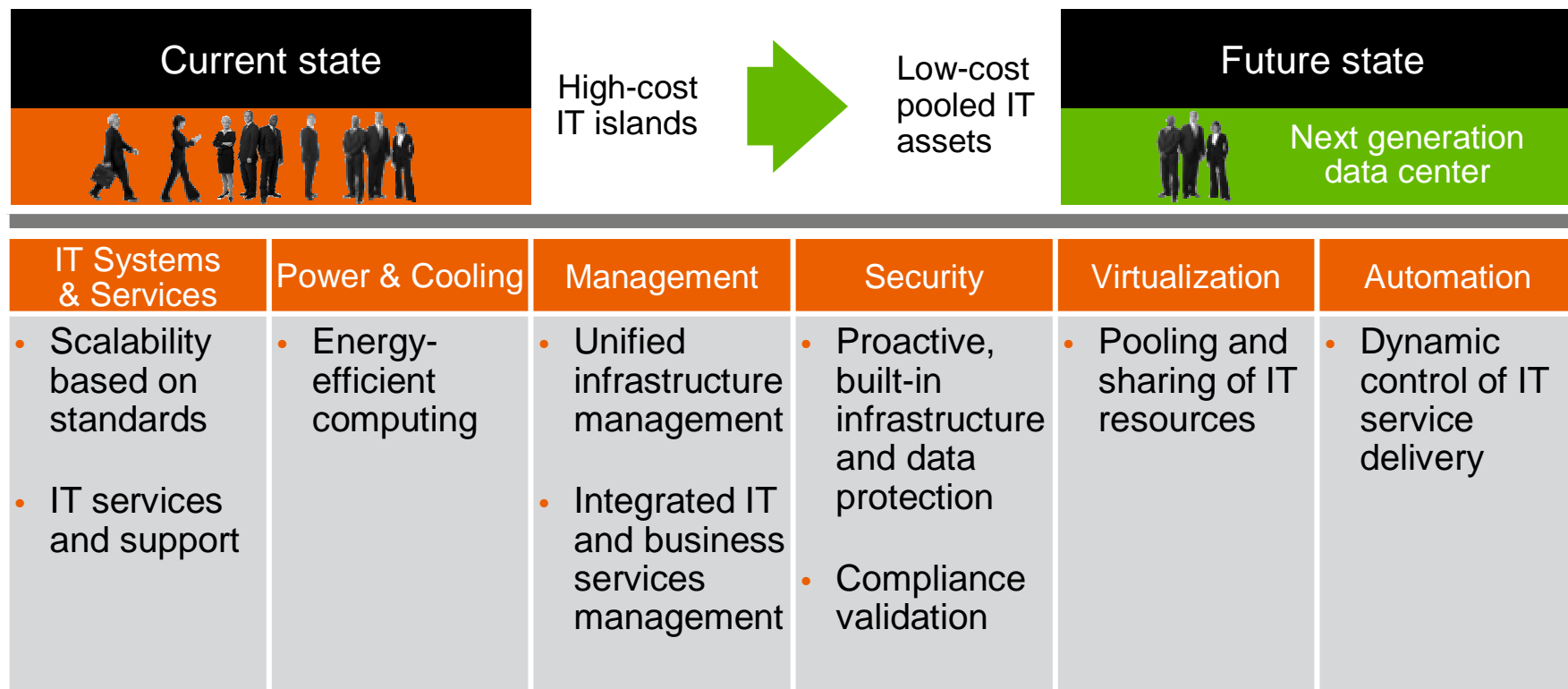
Energy efficient



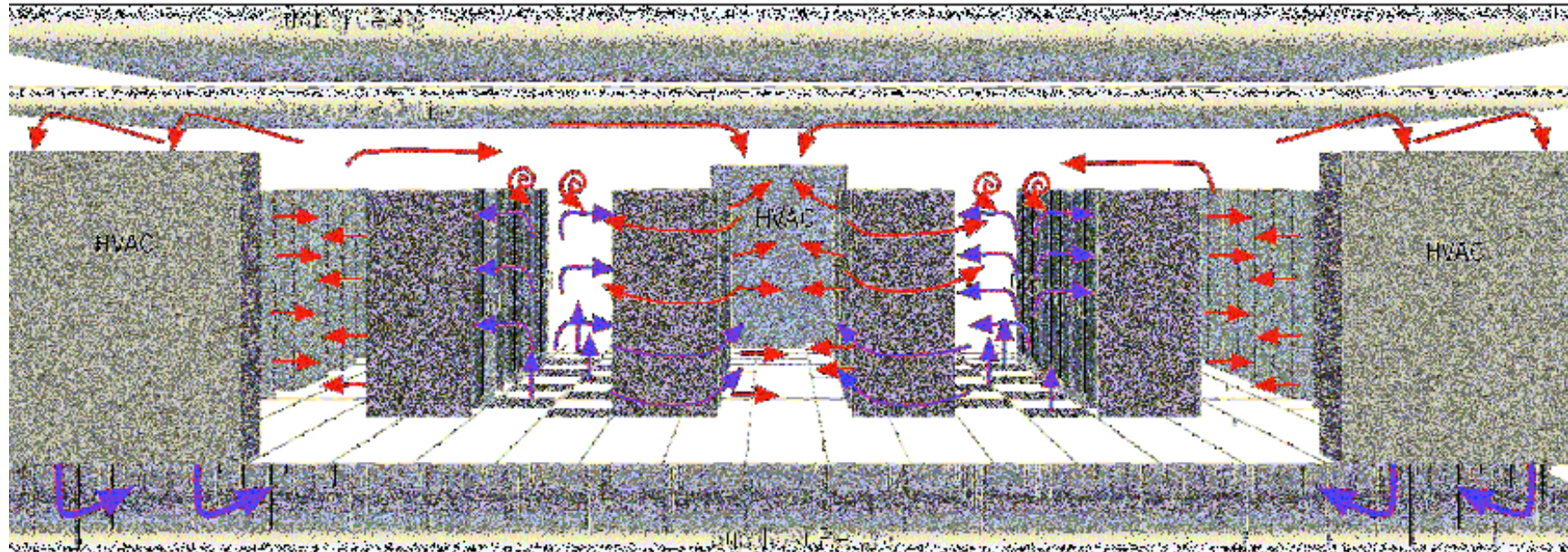
Energy effective

Adaptive Infrastructure

Key enablers



Traditional Datacenter Cooling



- Hot aisle/Cold aisle
- Ideal for up to 8-10 KW per rack
- Beyond 10KW per rack, alternative cooling solution is required

HP Labs Smart Data Center

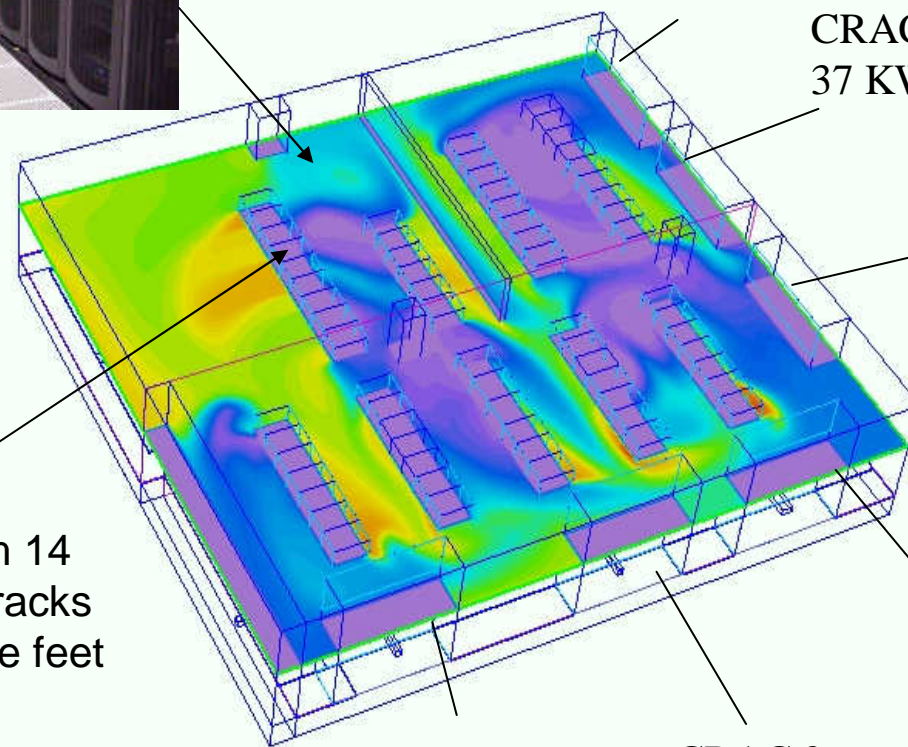
Static Provisioning with Computational Fluid Dynamics Modeling



UDC_66Racks_RR_March08

HD Area:

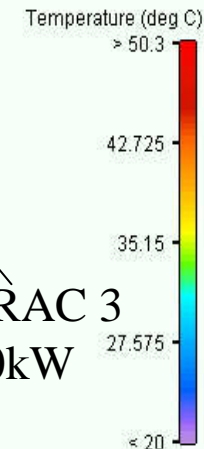
140 KW from 14 fully loaded racks in 400 square feet



CRAC 1
94KW

CRAC 2
92 KW

CRAC 3
80kW

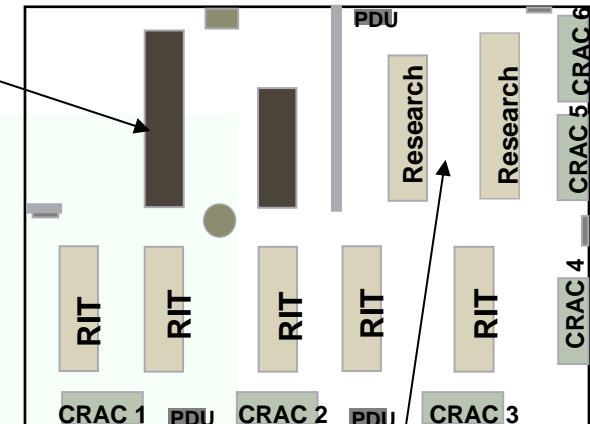


HD Area

CRAC 6
28 KW

CRAC 5
37 KW

CRAC 4
39 KW



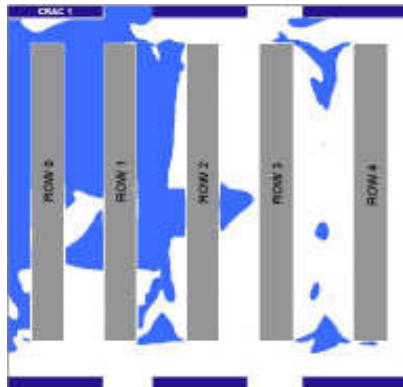
High Performance Cluster – low load in this state

Redundancy & Overlap

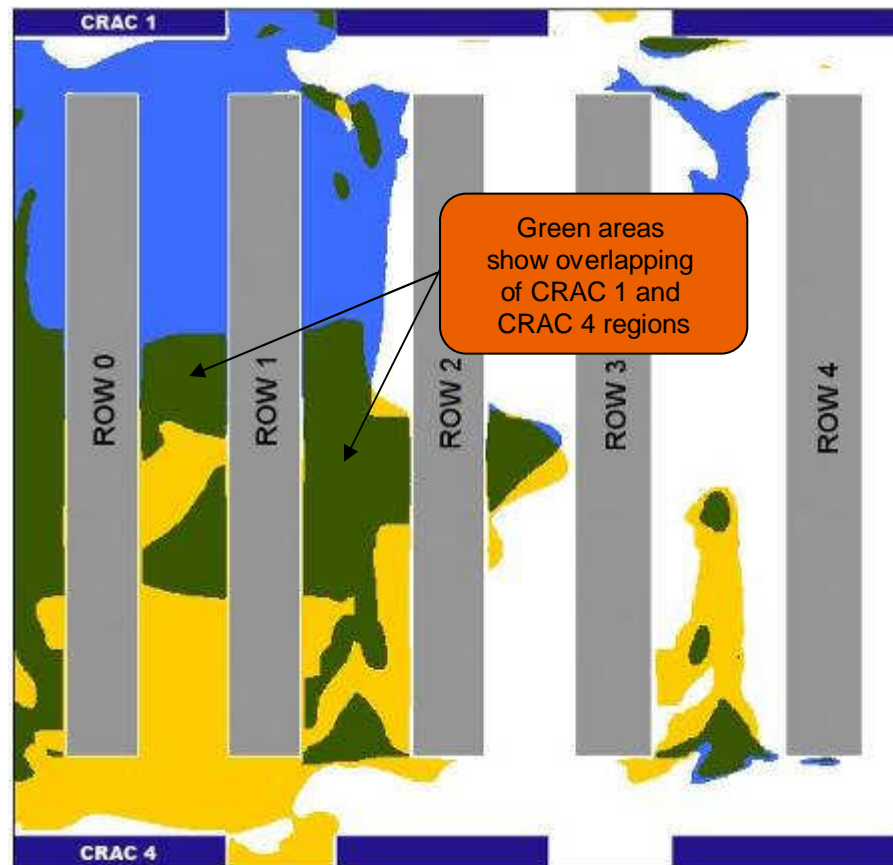
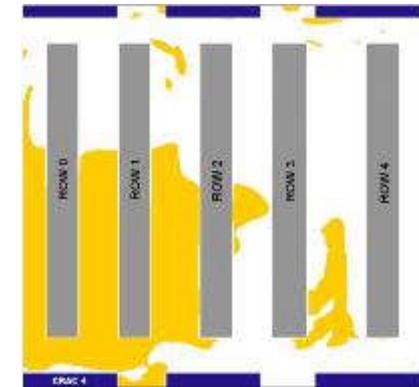
HP-unique numerical CFD post-processing



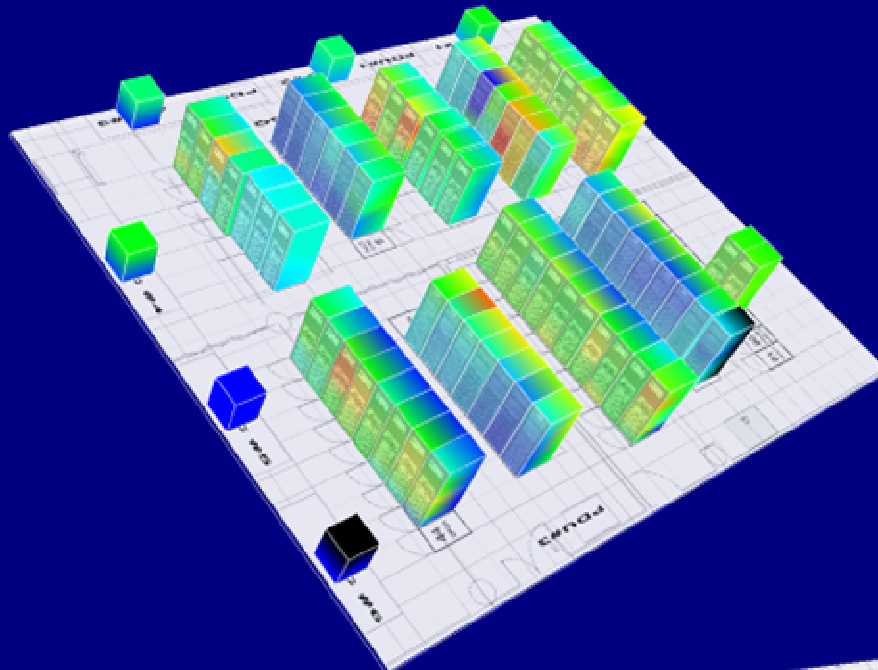
CRAC 1



CRAC 4



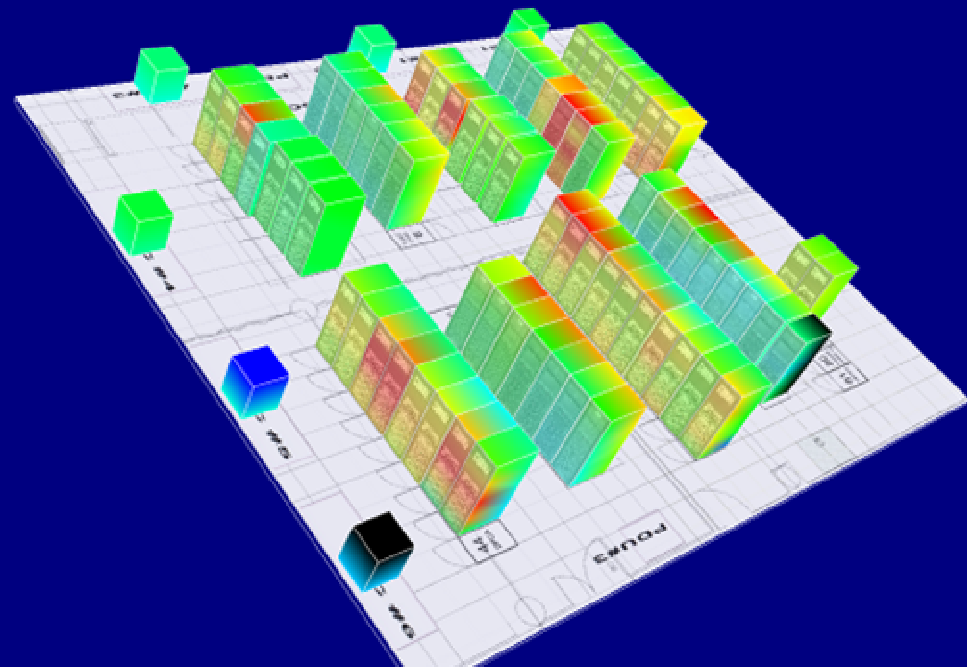
“Right-Provisioning” Cooling in a Data Center



Conventional Mode



Dynamic Smart Cooling
Mode



Data Center Thermal Assessments

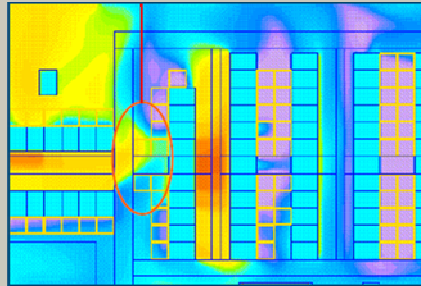
DCS levert 3 soorten thermal assessments

HP Thermal Quick Assessment (TQA)



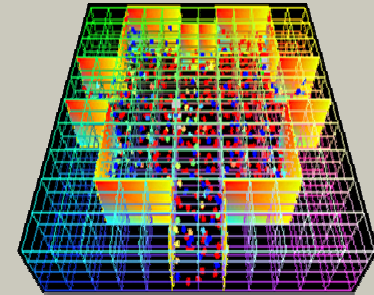
- Visuele inspectie
- Toepassen Best Practices
- Toepasbaar op alle sites
- Tijdsduur: 2 weken

HP Thermal Intermediate Assessment (TIA)



- Thermal Modeling, Alleen **onder** de computervloer 2D
- Scenarios
- Tijdsduur: 2-4 weken

HP Thermal Comprehensive Assessment (TCA)



- Thermal Modeling, **onder en boven** computervloer 3D
- Scenarios
- Tijdsduur: 4-8 weken



HP Smart Cooling Solutions

Statical Smart Cooling

Verbetering tot 10-15 kW per rack

Modular Cooling System

35 KW koel capaciteit met name voor uitrol high density systemen

Thermal Assessment Services part of Datacenter services

Quick wins en best practices voor koeling en extra koelcapaciteit

Dynamic Smart Cooling (Q3 2007)

Verlaging van de energie kosten voor de enterprise omgevingen

Datacenter solution builder program

Een samenwerking met gekwalificeerde marktpartijen voor koeling- en energievoorziening



Energy savings with HP DSC

HP IT adopting DSC as a standard for new consolidated data centers

Data Center Size	Small	Medium	Large
Cooling	Refrigerant	Chilled Water w/ Air-Cooled	Chilled Water w/ Cooling Tower
% Energy Reduction	40%	30%	20%
kW savings per MW	450kW	300kW	200kW
CO2 Emission Reduction (metric tons/year)	5,000	8,780	10,000
	Annual Cost Savings (000s)		
US @ .11/kwh	\$578	\$1,012	\$1,116
EMEA @ .15/kwh	\$788	\$1,380	\$1,576
APJ @ .24/kwh	\$1,261	\$2,220	\$2,520

HP Labs Test Data Center

- 242 ft²/room; 10kW per rack; 200W/sq ft; 46kW total cooling power
- DSC controlled CRAC supply temp and fan speed: 45% reduction in energy
- DSC tested to 300W/sq ft densities.

Source: HP Labs research and internal DSC projections



Recent HP Smart Data Center Innovations

Over 1,000 patents in power and cooling



Industry
1st

HP Power Regulator

Reduce power consumption by controlling CPU frequency when max performance is not necessary



Industry
1st

HP Modular Cooling System

First to support 30kW of IT equipment per rack



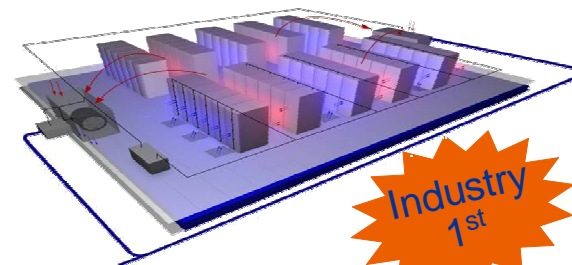
Industry
1st

HP Thermal Logic

Optimize environment within blade chassis c-Class BladeSystem with technology innovations

Dynamic Smart Cooling

Active thermal control for data centers



Industry
1st

2004

2007



Green disk storage from HP



Green Storage from HP – Reducing Power & Cooling Costs by 50%



- New disk storage systems to improve power efficiency by 40%
- Tape is cool – decrease power requirements by 99%
 -
- Committed to make a difference
 - HP Smart Data Center Innovation, Assessment Services and Dynamic Smart Cooling help your data center be energy-efficient





HP StorageWorks EVA

Up to 50% improved capacity utilization

What's new?

- Better capacity management and automated provisioning
- Up to a 24% performance improvement
- Fully switched architecture with multiple redundant paths

Cost-effective green storage with the EVA

- Less storage required with EVA Dynamic Capacity Management Software
- Save power with true space efficient copy
- Use 1/4 power for equivalent 500 GB FATA drives compared to 146 GB FC drive



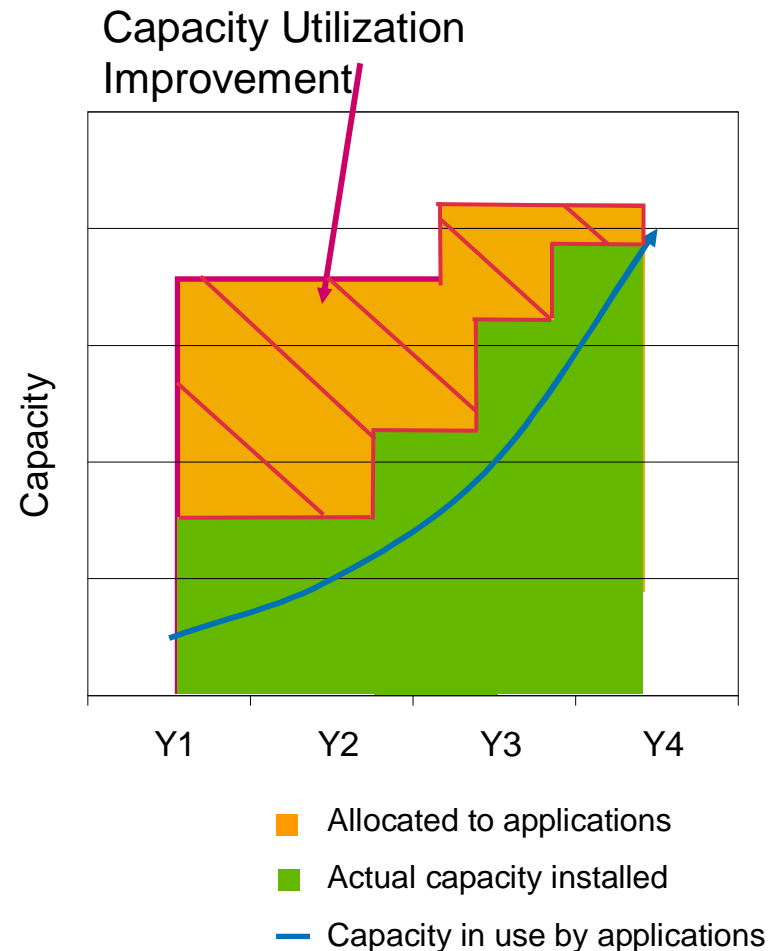
EVA Dynamic Capacity Management



Improved disk utilization improves power efficiency

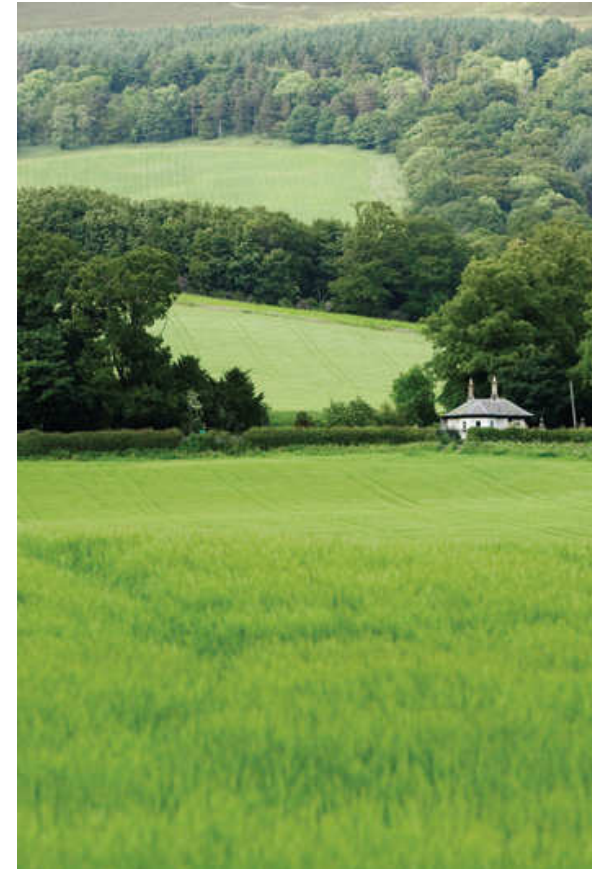
Only buying what you need today

- Less storage capacity at purchase and delay the purchase of new capacity
- Virtually eliminated stranded storage
- Less floor space
- Raises capacity utilization efficiency by up to 2X
- **Save up to 45%** on power
- Save up to 45% on hardware purchases – over \$135,000



EVA Power Savings

- Cumulative yearly savings for an average EVA
 - Capacity utilization savings of up to 50% of total disk drives, nearly \$200,000 savings in HDD purchases for average EVA
 - Save 42,000 kW/year = \$3,900 (@ 9.28 cents per Kilowatt-hour) for average EVA configuration
- Cumulative yearly savings for all >30,000 EVAs sold are over 1.2B kWh per year or \$117M
 - This is equivalent to the output of 60 small power plants and power nearly 115,000 U.S. homes!





Tape is Cool



Challenges...

- Data retention requirements continue to increase
- Companies store ~12 copies of production data
- Data access needs decrease over time
- Data must be 100% “safe”

Imagine a piece of data
spinning on a disk
for 20 years...



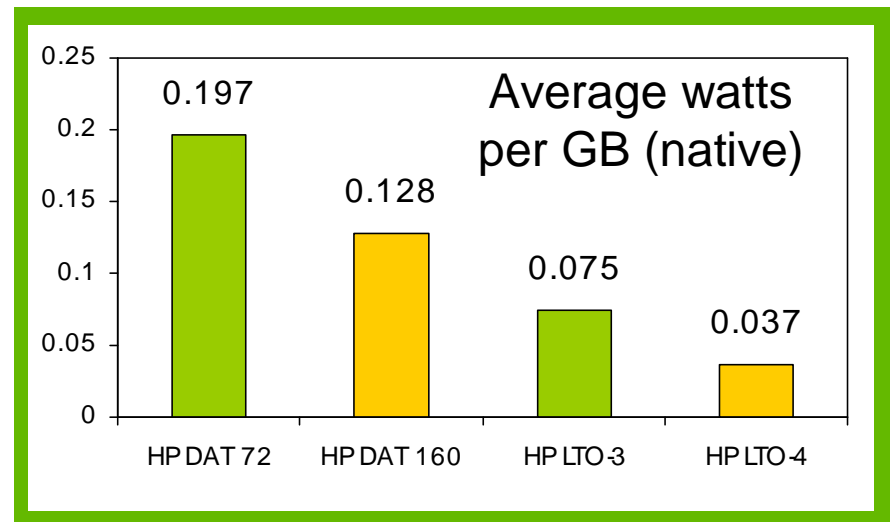
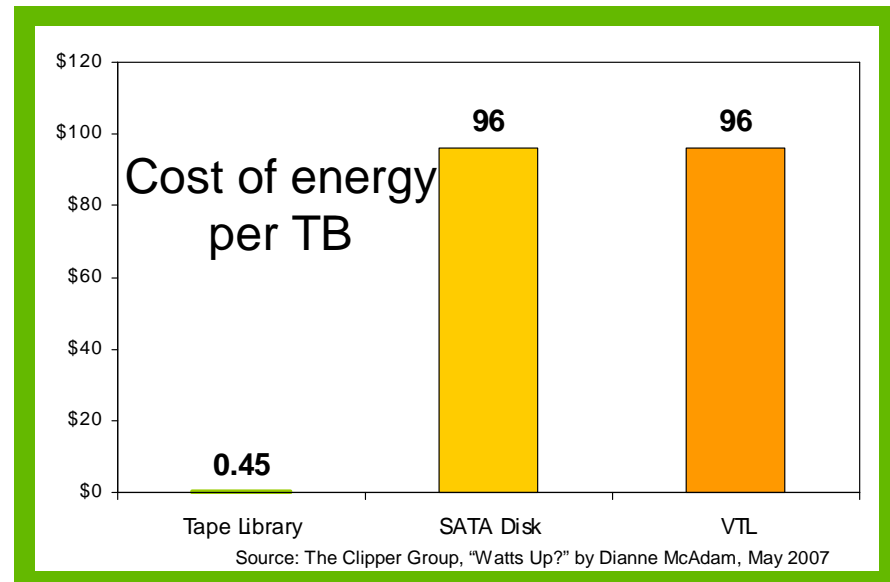


Tape is cool

Decrease power requirements by 99%

It's the storage technology that is:

- Lowest cost per TB
 - And costs 99% less to power and cool than disk
- Most energy efficient per TB



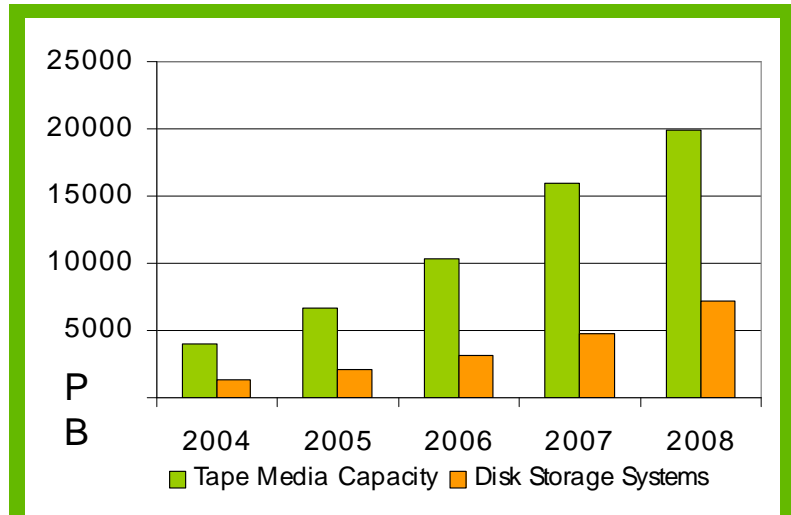


Tape is reliable

Designed for long term data retention:

- Growing faster than disk
- WORM and encryption
- 30-year lifespan LTO media
- HP testing verifies tape media readability after 2.5 million passes
- HP File System Extender (FSE) to migrate and archive data to tape
- HP Enterprise Tape Library Architecture (ETLA) delivers reliable backups

and proven
on Mount Everest



Greening the datacenter

HP's holistic approach & portfolio



minimize power & reduce heat

optimize energy & cooling

Efficient systems
to minimize power
consumption

- ⚡ HP BladeSystem
- ⚡ HP ProLiant
- ⚡ HP Integrity
- ⚡ HP Integrity NonStop
- ⚡ HP StorageWorks

Flexible designs
to maximize
power density

- ⚡ BladeSystem Thermal Logic
- ⚡ HP-UX 11i Virtual Server Environment
- ⚡ EVA Dynamic Capacity Management
- ⚡ Modular Cooling System

Energy-aware
provisioning
to optimize power
utilization

- ⚡ Insight Power Manager
- 🌡️ Dynamic Smart Cooling
- 🌡️ Rack and power management solutions
- 🌡️ Smart Cooling Services

cooler systems

cooler datacenters

HP is a global citizen

with an environmental conscience



hp.com/go/report

- The environment is an HP tradition – Design for Environment launched in 1992
- A founding partner with ongoing support for the EPA Energy Star Program
- Will achieve 1 billion pound recycling goal in 2007 - programs in 40 countries
- Will reduce greenhouse gas emissions by 20% by 2010 & will purchase 11 million kW/H of renewable energy in 2007



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.

Green initiatives take root across various industries....



FORTUNE_10 Green Giants



Industries across the world have realized the specific needs and the benefits of going green, very much evident from the fact that the Fortune list of Green giants spans across industries such as Automotive, Aviation, FSI, Metal Manufacturing, Utilities, IT and Retail. Some of the key initiatives are :

Automotive: Honda's focus on alternative fuels

Aviation: Continental's emphasis on green operations

Oil: Suncor's GHG management programs

Retail: Tesco's wind-powered stores, high-tech recycling, biodiesel delivery trucks

Metal Manufacturing: Alcan's clean and efficient methods enabling reduction of GHG emission

FSI: Swiss Re's development of financial tools to deal with the risks of climate change.

You have to be Green To be Seen !

Source: Fortune. Greenpeace.



There is just one Earth





The Datacenter is the System

"It's not just good to do. It's good for business."

Mark Hurd, CEO of Hewlett-Packard

Questions and answers

