



Greener Data Centre Economy or Ecology?

Panduit

Acknowledgements: LA CDR, HBR various articles on climate change and other sources mentioned in the presentation



Panduit Cisco Relationship snapshot

PARTNERSHIP

CISCO NETWORKING ACADEMY

- Sponsorship
- Curriculum Development
- Joint Marketing



DATA CENTRE

- Video on Demand
- Whitepaper
- New Partnership Model



TECHNOLOGY DEVELOPER PROGRAM

- IP Communications
- Storage
- Wireless



SOLUTION TECHNOLOGY INTEGRATOR

- WLAN Reseller
- (In US, with Global options)

MARKETING

CISCO EVENTS

- Networkers
- Partner Summits
- Expos



JOINT FIELD ENGAGEMENT

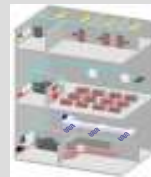
- Wireless LAN
- Data Centre
- IP Communications



SALES

CISCO CONNECTED REAL ESTATE

- Joint Architecture for CRE/CBS
- Joint Showcase at Panduit EBC
- Joint Ecosystem of Partners



CATALYST6K CABLE MGMT SOLUTION

- Joint Development
- Cisco Co-Development
- Potential New Distribution



PRODUCT DEVELOPMENT

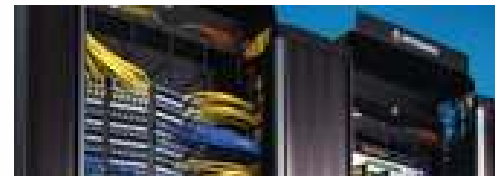




Panduit

Company Description

- Panduit is an established market leader in network connectivity and electrical products
 - Founded in 1955
 - >\$750 million sales
 - 5000+ employees worldwide



Innovation • Quality • Service

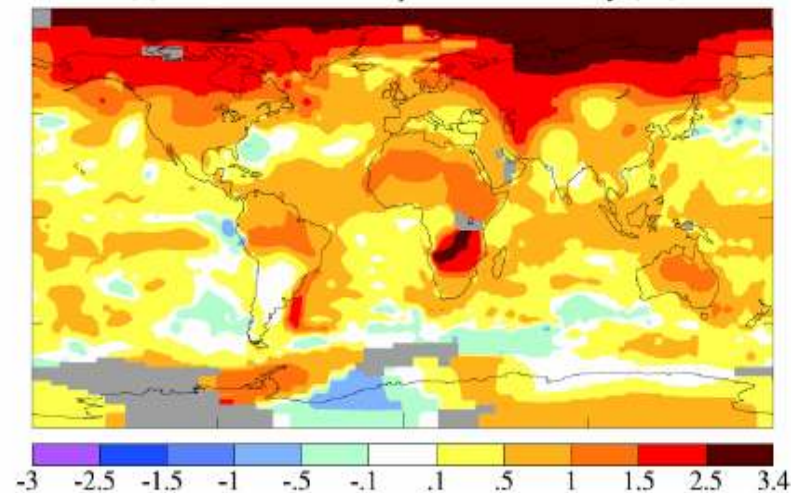


Take away thought

Given CLIMATE CHANGE and today's trends in terms of energy consumption and social responsibility,
under a renewed business strategy and organisational design,
the **ONLY** way to achieve efficiencies and sustainable savings in the build and maintenance of a data centre is to strategically integrate the planning, deployment and operations within the concept of
TOTAL ENGINEERING
(Telecommunications, Electronic, Mechanical and Electrical)

The concept, studies and value proposition of the EcoDC (UK) helps us justify proven savings and efficiencies of up to 70% thanks to integrated and modular solutions

- **Environment:** Technology, Globalisation and climate change
- **Business strategies**
- **IT Strategies**
- **Examples: EcoDC**



Source: J. Hansen, R. Ruedy, M. Sato, and K. Lo. GISS Surface Temperature Analysis—Global Temperature Trends: 2005 Summation. NASA Goddard Institute for Space Studies and Columbia University Earth Institute, New York, NY 10025, USA. See <http://data.giss.nasa.gov/gistemp/2005/>, accessed June 4, 2006. Scale shows the *deviation* in average annual temperatures from long-term averages. The northern-most parts of the northern hemisphere recorded the highest deviations in 2005.

- Global, IT and climate
 - The user the driver
- Sustainable development:
 - Our problem?
- Regulation and risk
- Non renewable energy sources and consumption
- Electricity, emissions and operations (datacentres)
- Due to technology innovation and high density:
 - Energy cost = IT cost
 - Energy, IT problem

- Country and institutions response
 - Kyoto, LEED (US), EU Code of conduct
- Business strategies, organisation redesign and aligned investment
- Savings and operational efficiency
- Convergence and data centre
- Technology and engineering partnerships

Future GENERATIONS

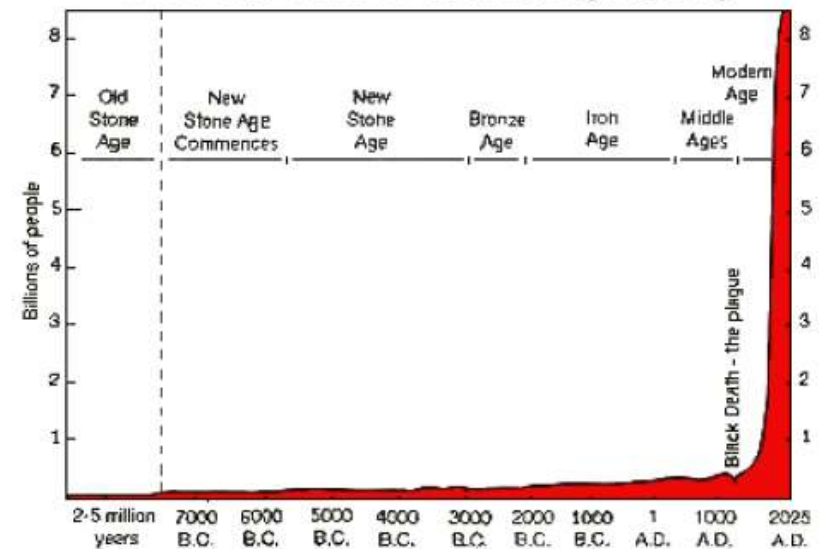


- Social:
 - Demographics and health
 - Virtual communities
- Economic:
 - FDI and trade
- Political:
 - Freedom, open societies
- Legal:
 - Deregulation and regulation

● Three big market forces:

- Technology
- Global
- Climate

World Population Growth Through History

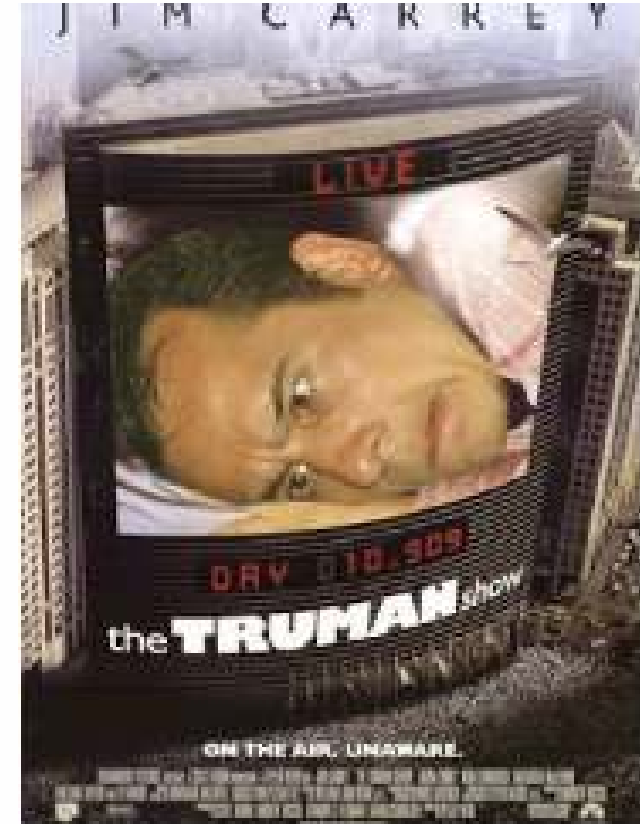




Technology trends

IP Video and tele-presence
Collaboration - webex
Social Networking - facebook
The Virtual organisation
High definition TV
Green IP Buildings / factory

VDI (thin client) and Applications virtualisation
Automation and intelligence, SOA
Virtual / clustering -> Consolidation
HPC and blade servers. NGDC
40G/100G, Infiniband, Ethernet 10G fiber and copper





Business, ICT and electricity supply

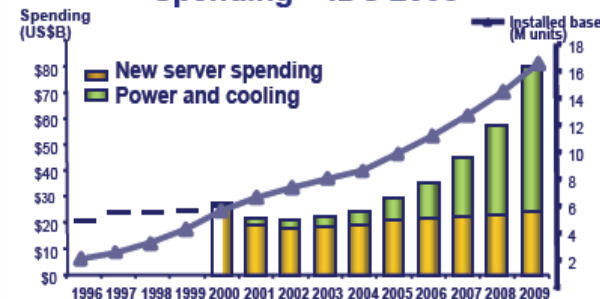
Businesses and legislation/standards: Environment, ISO, SOX, Basel2, ITIL

ICT Growth = data centre growth, increased specific needs

Datacentres

- 4% of US Electricity consumed
- 5-10% of energy consumption of western economies
- represent 2% of total CO2 emissions worldwide

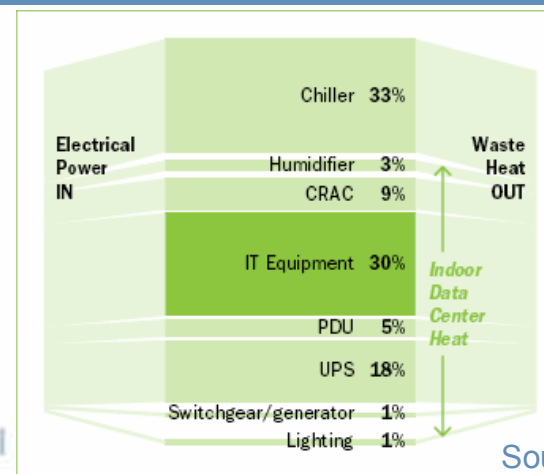
Power and cooling exceeds server
Spending – IDC 2006



On Average 30% of total electricity cost goes to IT; energy can be bigger than equipment cost

Why IT people do not look at the electricity bill:

- Bill comes much later than the charges are generated
- They are not IT department responsibility
- The electricity account could be included in wider facilities account



Source: The Green Grid



Energy efficiency IT: from coal to server, waste

Agios Dimitrios, Europe's dirtiest power plant.
© WWF Greece / Zisis Karaberis



**16.66 MW
Coal Energy**

**5-10%
distribution loss**

**5 MW
to the
Data centre**

**15-30% Server and
Storage
utilization**

**0.35-0.5 MW
“Useful Server
Cycles”**

**60% Lost
through chimney**

**65% DC power
Conversion and cooling loss**

1MW cost 1M Eur/p.a. (5MW = 1800 servers = 4M Eur = 44 GWh pa and 66.766 TmCO2)

Greek annual electricity production 55.000 GWh.

Innovation • Quality • Service



Data centre energy inefficiencies

Non-integrated design

Misaligned financial analysis

Engineering disciplines not talking to each other

High density / space requirements badly designed

Operations & maintenance ignored in the concept

Cooling and electricity supply

Redundancy = duplicity

Over-sizing of UPS

Low utilisation & performance of PDU, forced air

Non intelligent and non efficient buildings



- 60% of TCO for Data Centre is Space, Cooling and Power
 - 30% of TCO for Data Centre is Engineering, Installation, service
- (Morgan Stanley, Refining the Data Centre May 06)

EU Initiatives & Strategy for climate change

European Strategic Energy Technology Plan (SET-Plan)

Identify key technologies for EU to accelerate development and deployment by working in focused and coordinated coalitions/partnerships sharing risks and leveraging resources.

Examples of technologies: biorefineries, sustainable coal and gas technologies, fuel cells and hydrogen and Generation IV nuclear fission

Build on and complement existing initiatives:

- National energy strategies and reviews,
- Environmental Technologies Action Plan (ETAP)
- ICT for Sustainable Growth

Given Coal's role in GHG emissions:

- Development and deployment of technologies for zero-emission power generation from coal

EU Emissions Trading Scheme (started 2004)

11,400 installations/ 5,000 firms (energy generation, steel and concrete manufacturing). Most residential and transportation emissions excluded

Submission of NAPs by countries and EUAs distributed by governments to producers yearly. Installations could trade with any other installations or private individuals to meet annual targets



COMMISSION OF THE EUROPEAN COMMUNITIES

Commission Communication "Limiting Climate Change to 2°C - Policy Options for the EU and the World for 2020 and Beyond"

Energy Green Paper 'A European Strategy for a Sustainable, Competitive, and Secure Energy'

**Renewable Energy and Clean Coal trends and studies
CO2 Capture and Storage (CCS) Technologies and Options for CO2 geological storage**

Other markets and forums: US people and companies
Chicago Climate Exchange
USCAP (US Climate Action Partnership, companies initiative)
Pew Center's Business Environmental Leadership Council
Global Roundtable on Climate Change
World Business Council for Sustainable Development
Renewable Energy Certificates (RECs)

1. **Understand Carbon Footprint and measure:**
Method, the Greenhouse Gas Protocol:
www.ghgprotocol.org
2. **Carbon related risks and opportunities**
 - Not corporate responsibility but strategy
 - Porter analysis (HBR)
 - Outside in
 - Inside out
3. **Adapt your business in relation to risk and opportunities:**
Strategy or operational efficiency
4. **Do it better than your competitors**



EU Code of Conduct

- Best practices
- Facilities integrated into data centre design: IT Load and Facility Load
- The Green Grid as a reference

all participants data centre owners and operators should initially report and monitor energy consumption using the Green Grid definition of data centre efficiency (DCE)



EUROPEAN COMMISSION
DIRECTORATE-GENERAL JRC
JOINT RESEARCH CENTRE
Institute for Environment and Sustainability
Renewable Energies Unit

Code of Conduct on Data Centres
Version 0.7

(WORKING DRAFT)

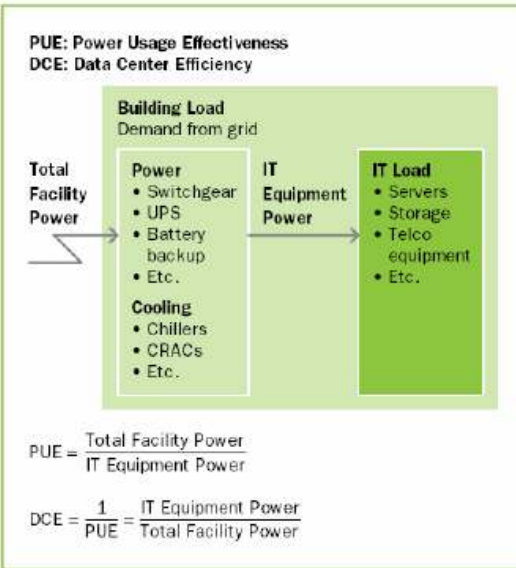


Figure 1: Illustration of How PUE and DCE Would Be Calculated In A Datacenter



LEED (US)

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™: LEED gives building owners and operators the tools they need to have an immediate and measurable impact on their buildings' performance.

- Program of the U.S. Green Building Council (USGBC) www.usgbc.org

European Union

Energy Performance of Building Directive (2002/91/EC)

- Buildings Certification
- Energy efficiency
- impact on the buildings' energy performance.
- In country since 2006



Example, Coca Cola Greece: Corporate Responsibility only?

From their PR: "The acknowledgement of corporate responsibility regarding environmental protection is the main concern of Coca-Cola HBC Greece"

Facilities are certified ISO 14001 environmental standard
Biological cleaning and handling of liquid waste, as well as recycling programs
Reduction of emission and solid waste discharge
Control of electric power consumption, water and fuel, effective use
Setting environmental goals, monitoring results and auditing processes
Natural gas, alternative source at Schimatari plant; plans for all the rest
Investment in training and cultivating employees' environmental awareness

internal

Contribution to program for water conservation Northern Greece
"Voluntarism and Environmental Protection Program"
Cleaning Podoniftis River bed, Filothei area
"Revival of the Routes to Ancient Olympia" with NGO "Conservation Volunteers Greece"
Supporting Educational Ecological Park, Neo Psychiko Municipality

external



Another example: Panduit

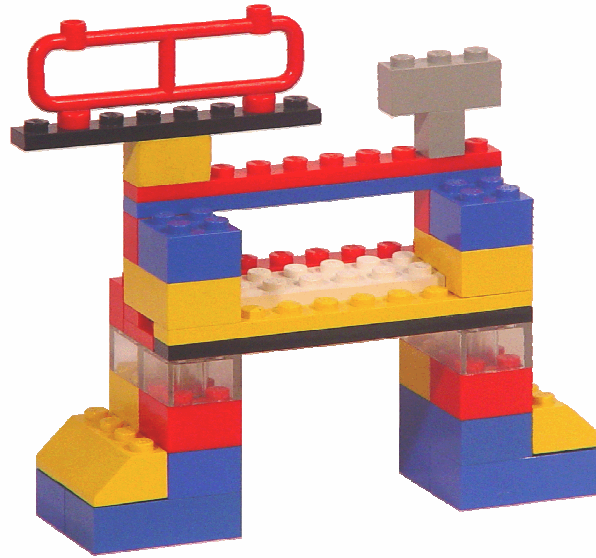
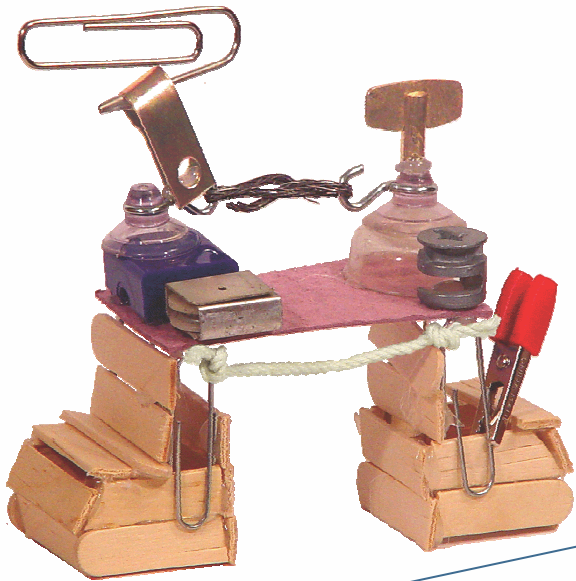
Corporation drive:

- example new HQ, LEED gold
- Regulation compliance:
 - ISO14000 in all factories
 - ROHS in ALL products
- Strategic Marketing Initiatives
 - The Green Data Centre
- New product / solutions development:
 - Software and appliances
 - New cabinets series
 - Cable management
 - Structureground™
 - GridRunner™





Panduit and EcoDC initiative



Standard

Modular

Scalable

Integrated

Repeatable

Comprehensive

Predictable



EcoDC

Ecological Data Centre

Innovation • Quality • Service



The New Data Centre: Ecology and economy

Goal:

produce the same amount of processing power
under today's energy and space limitations

Strategies:

Value Added TOTAL Engineering aligned with company strategy, social responsibility policies and operational efficiency

- Intelligence and business process automation (reduce regulatory and operational risk, prepare for SOX, Basel2, ISO, ITIL)
- Efficiency through passive design and usage of space over the long run
- Evaluation of all IT equipment aligned with energy strategy



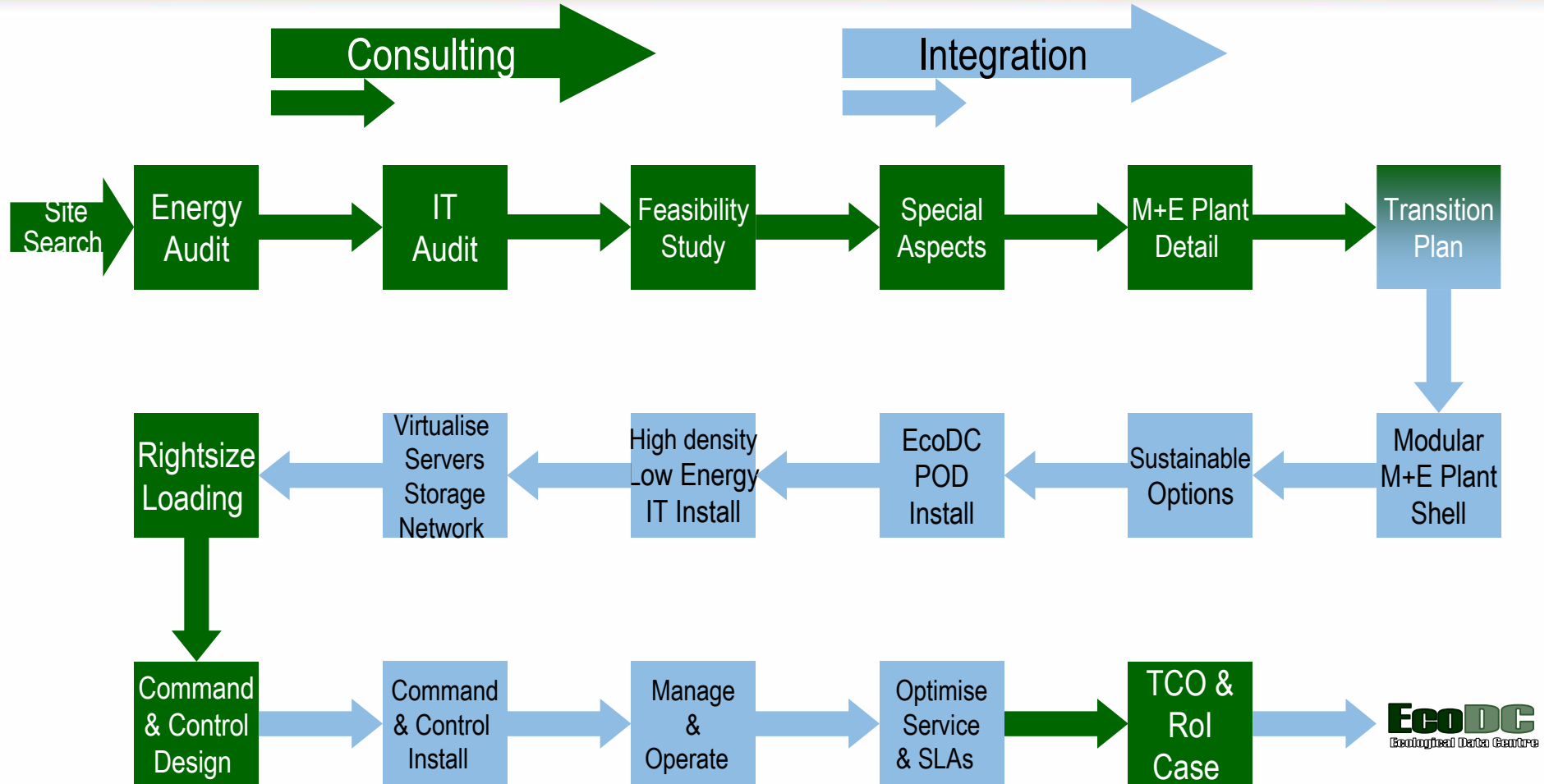
Example: Panduit and EcoDC initiative



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Architecture of a perfect solution





Practical comparison new build

...Same capacity in data processing power...different design

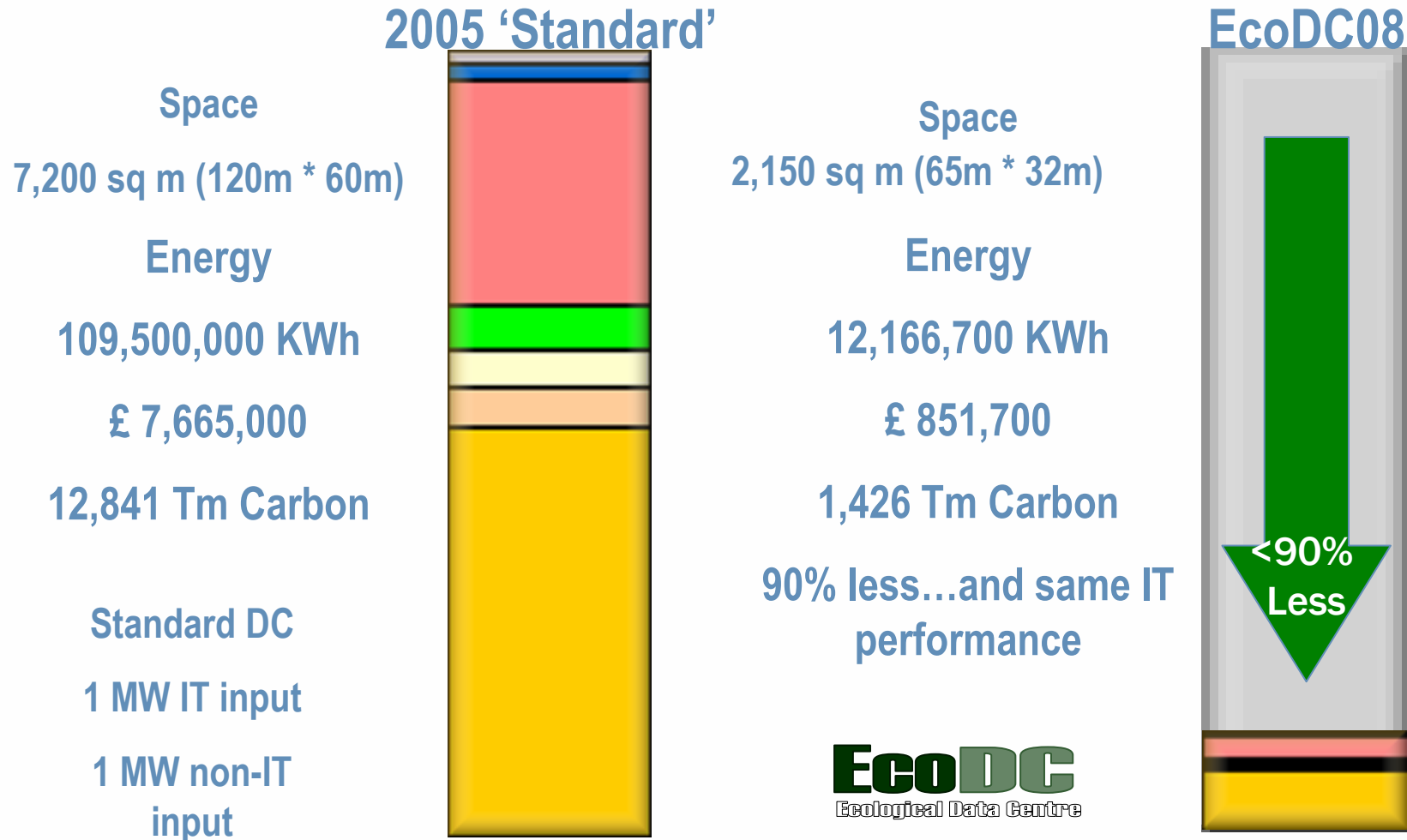
- 50% non-IT support / 50% IT Data Hall
- LARGE range mechanical,electrical plant
- 1793 single thread servers plus storage and networking
- 7,200 sq m (120m * 60m)
- Energy consumption @ 109m kWhr pa
- Carbon impact @ 12,841 tonnes C pa
- Total Capex non-IT @ £45m
- Total Capex IT £15m
- Energy Opex to run each year @ £7,665,000
- Plus staffing
- SAME applications
- NO sustainability options

- 50% non-IT support / 50% IT Data Hall
- MID range mechanical,electrical plant
- 790 multi-thread servers plus storage and networking
- 2,150 sq m (65m * 32m)
- Energy consumption @ 12m kWhr pa
- Carbon impact @ 1,427 tonnes C pa
- Total Capex non-IT @ £16 m
- Total Capex IT £8.4m
- Energy Opex to run each year @ £851,000
- Plus staffing
- Plus transfer of SAME applications
- Plus sustainability OPTIONS selected



Benefits of EcoDC design for new build

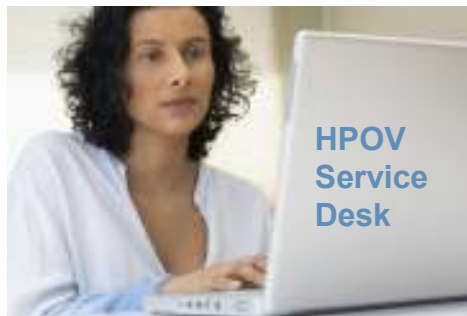
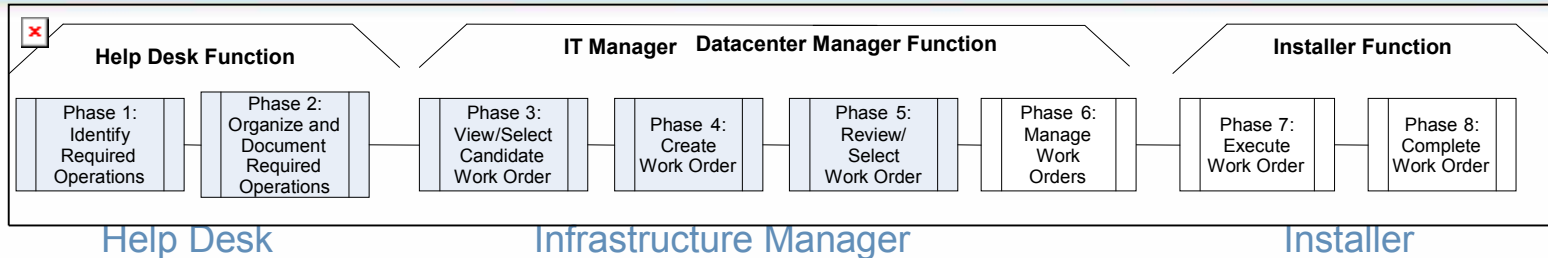
...to achieve equivalent data processing capacity



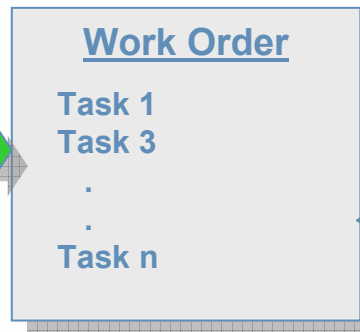
Source: Norman Disney Young 2007



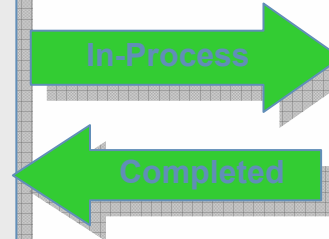
Process automation and Integration benefits. HP Service Desk Example



- Creates Work Requests
- Monitors Progress

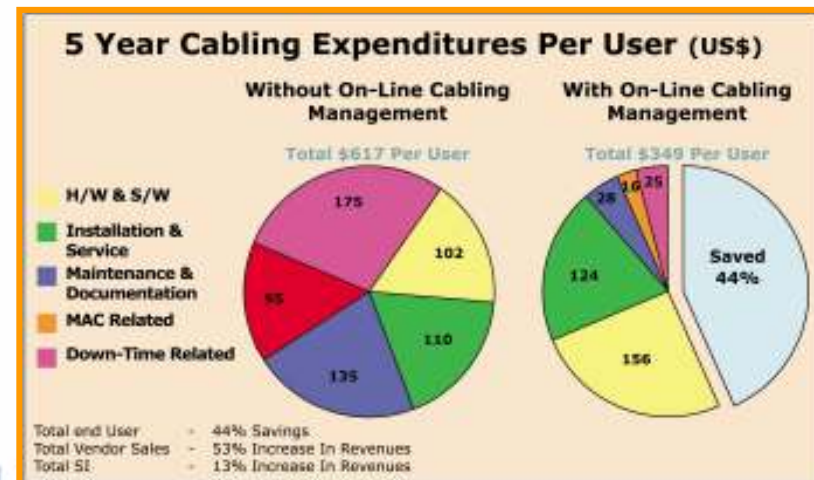


- Creates Work Orders
- Picks Service Path
- Monitors Progress



- Executes Work Orders
- Updates Progress

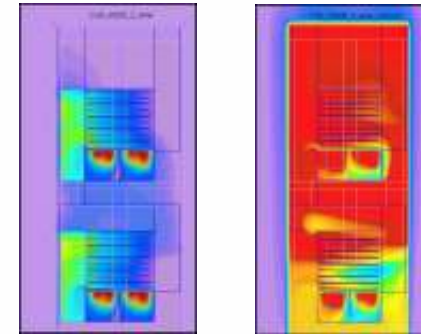
- Work orders are taken from HP Service Desk and are transformed into PanView Work Orders with associated tasks
- Progress is monitored by Service Desk
- Remedy integration of work flow can be made to measure depending on needs





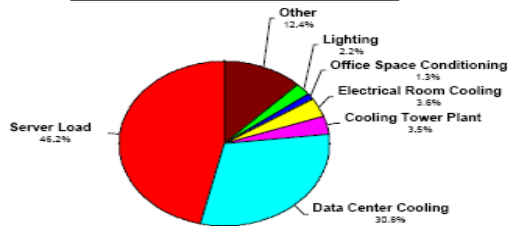
Energy savings contribution

- Thermal management – Example 2 6509 Switches at 6kW
 - Heat reduction in **NET-ACCESS™** (Panduit)
 - Extra heat dissipation 20kwh
 - (tested by Cisco)
 - Savings in extra cooling (no need for fan)
- New server cabinets:
 - Improvement in cooling by using integrated technology for passive cable management. 14% savings in operational costs.

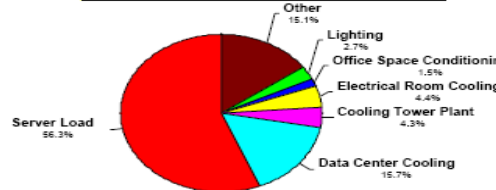


Typical Data Center Power Distribution and Energy Savings with Water

Air Cooled Server Racks



Water Cooled Server Racks

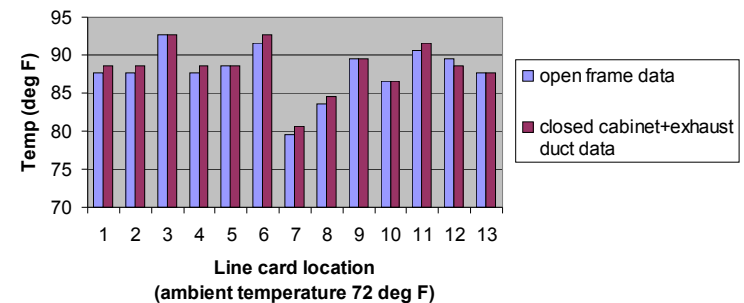


Example:

Description	Electricity Consumption(kW) with Air Cooled Servers	Electricity Consumption(kW) with Water Cooled Servers
Other	402	402
Lighting	73	73
Office Space Conditi	41	41
Electrical Room Coo	118	118
Cooling Tower Plant	114	114
Data Center Cooling	1000	418
Server Load	1500	1500
Total Load	3248	2666

Savings of 1/2 million dollars/year at \$0.10 / kw-hr

9513 test data-PANDUIT Net-Access™ Cabinet with exhaust ducting versus open rack



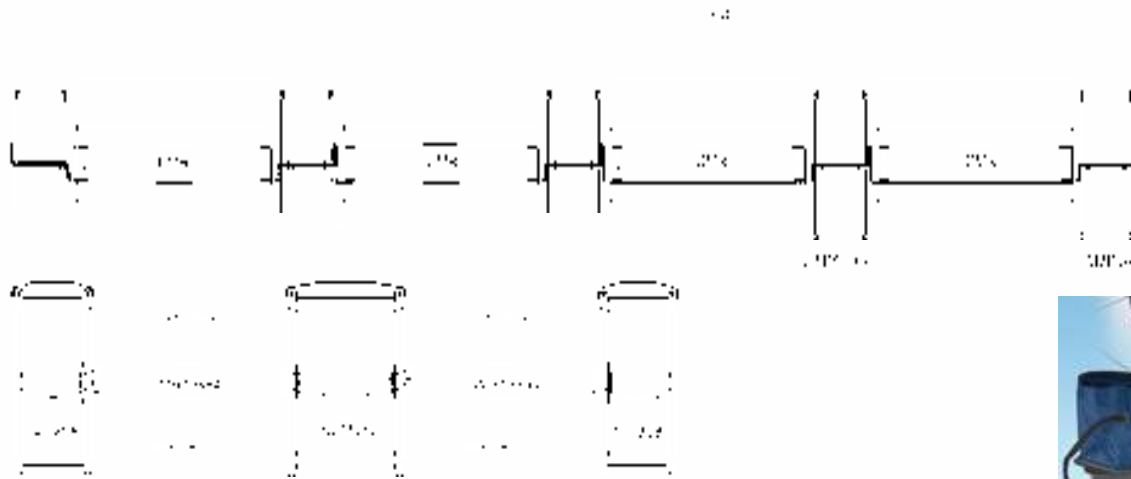
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Availability and cost

- Grounding and bonding: Electronics warranties do not cover improperly bonded and grounded machines. Norms:
 - Normally used German norm DIN EN 300253, ratified locally does cover human risk but not equipment
 - IEEE 1100 and TIA 942 recommended to reduce risk
- Space savings in high density environment: up to 40% of capex (real estate, sqm)
 - Use of angled panels, rational cable management accessories, zone cabling and consolidation points liberate spaces in raised floor too.
 - 55%-87% saving in installation time thanks to modular routing



More than 50% of chilled air is lost due to incorrect cable routing

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Future GENERATIONS





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Questions

- Thank you for your attention.