Global Green Data Center Best Practices In Action

DOUG WASHBURN
VICE PRESIDENT & RESEARCH DIRECTOR

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Four questions I will answer

1. Why is ‘green’ important to your business?
2. Why is green important to your data center?
3. What green data center best practices should you follow?
4. How to prioritize green data center investments?
Why is green important to your business?
In 2010, green wasn’t a priority
What 2,691 global business decision makers told Forrester.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Top two priorities by issue</th>
<th>% selecting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth</td>
<td>Grow overall company revenue</td>
<td>64%</td>
</tr>
<tr>
<td></td>
<td>Acquire and retain customers</td>
<td>54%</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Lower the firm’s overall operating costs</td>
<td>44%</td>
</tr>
<tr>
<td></td>
<td>Improve quality of products and/or processes</td>
<td>37%</td>
</tr>
<tr>
<td>Innovation</td>
<td>Improve our ability to innovate as an organization</td>
<td>32%</td>
</tr>
<tr>
<td></td>
<td>Drive new market offerings or business practices</td>
<td>28%</td>
</tr>
<tr>
<td>Talent</td>
<td>Acquire and retain talent</td>
<td>38%</td>
</tr>
<tr>
<td></td>
<td>Improve workforce productivity</td>
<td>31%</td>
</tr>
<tr>
<td></td>
<td>Comply with government regulations and requirements</td>
<td>14%</td>
</tr>
<tr>
<td>Responsibility</td>
<td>Improve corporate environmental sustainability and social responsibility</td>
<td>10%</td>
</tr>
</tbody>
</table>
In 2013, green *still* isn’t a priority
What 2,192 global *business decision makers* told Forrester.

<table>
<thead>
<tr>
<th>Business Objective</th>
<th>High priority</th>
<th>Critical priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquire and retain customers</td>
<td>42%</td>
<td>31%</td>
</tr>
<tr>
<td>Grow overall company revenue</td>
<td>42%</td>
<td>31%</td>
</tr>
<tr>
<td>Address the rising expectations of customers...</td>
<td>45%</td>
<td>23%</td>
</tr>
<tr>
<td>Improve margins</td>
<td>41%</td>
<td>25%</td>
</tr>
<tr>
<td>Improve the quality of our products/services</td>
<td>46%</td>
<td>17%</td>
</tr>
<tr>
<td>Lower the firm's overall operating costs</td>
<td>39%</td>
<td>24%</td>
</tr>
<tr>
<td>Improve the firm's ability to innovate</td>
<td>39%</td>
<td>17%</td>
</tr>
<tr>
<td>Hire, develop, and retain the best employees</td>
<td>37%</td>
<td>18%</td>
</tr>
<tr>
<td>Improve the capabilities of your products/services</td>
<td>40%</td>
<td>14%</td>
</tr>
<tr>
<td>Grow in emerging markets</td>
<td>32%</td>
<td>19%</td>
</tr>
<tr>
<td>Comply with government regulations and...</td>
<td>29%</td>
<td>22%</td>
</tr>
<tr>
<td>Address rising competition for your...</td>
<td>35%</td>
<td>14%</td>
</tr>
<tr>
<td>Manage brand consistency globally</td>
<td>29%</td>
<td>11%</td>
</tr>
<tr>
<td>Improve/simplify our supply chain</td>
<td>27%</td>
<td>11%</td>
</tr>
<tr>
<td>Improve corporate environmental sustainability...</td>
<td>24%</td>
<td>8%</td>
</tr>
</tbody>
</table>
So why should you care about green at all?
Leading companies embrace green

Green *can* improve risk, cost, revenue and shareholder value.

- **Mitigate risk**
  - Department of Energy & Climate Change

- **Reduce cost**
  - UPS

- **Grow revenue**
  - IBM
  - Schneider Electric
  - Deloitte

- **Deliver shareholder value**
  - Dow Jones Sustainability Indexes

The UK’s Carbon Reduction Commitment requires businesses to baseline energy and CO2 footprint.

**UPS’s** package flow software eliminated left-hand turns to save $8.4m in gas and 32k tons of CO2 emissions.

Vendors and consultants like IBM, Schneider and Deloitte compete in the ~$10b market for green IT services.

**Dow Jones Sustainability Indexes** track the financial performance of sustainable investments for asset managers.
Why is green important to your data center?
The scope of green IT is broad
The data center plays a critical role in Green IT 1.0 and 2.0.

**Green IT 1.0: “Green for IT”**
- Data center and facilities
  - Data center consolidation
  - Data center power and cooling
  - Server efficiency
  - Storage efficiency
  - Network efficiency
  - Application rationalization
- Distributed IT
  - PC efficiency
  - Printer efficiency
  - Printer resource management
  - Telephony device management
  - Wireless device management

**Green IT 2.0: “IT for Green”**
- Business operations and policy
  - Virtual meetings
  - Virtual office
  - Paperless business
  - Building energy management
  - Green power
  - Green supply chain
  - Green products and services
- Public policy and infrastructure
  - Smart grid
  - Smart transportation
  - Green cities
  - Climate change policies
Data centers are expensive
Data centers are expensive whether you build or collocate.

In millions of $US:
Power and cooling costs are high

Power and cooling consumes significant CAPEX and OPEX.

Forrester estimates that:

69% of the costs to build a data center go to power and cooling infrastructure.

49% of the costs to operate a data center go to power and cooling usage.
Power and cooling is higher than IT

Power and cooling often consumes more energy than your IT.

70% of data center energy often consumed by power and cooling ‘overhead’ – not IT infrastructure.
IT operational costs are too high
Green IT activities can reduce your IT OPEX and CAPEX.

72% of IT spend goes to operations – not new, innovative projects.

<table>
<thead>
<tr>
<th>OPEX</th>
<th>CAPEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease ongoing costs by reducing...</td>
<td>Avoid purchasing new by increasing...</td>
</tr>
<tr>
<td>Power costs</td>
<td>Data center power capacity</td>
</tr>
<tr>
<td>Data center cooling costs</td>
<td>Data center cooling capacity</td>
</tr>
<tr>
<td>Hardware license fees</td>
<td>Asset’s useful life</td>
</tr>
<tr>
<td>Staffing costs</td>
<td>Data center space</td>
</tr>
<tr>
<td>Asset utilization</td>
<td></td>
</tr>
</tbody>
</table>

**Consolidation tactics**

| Decommission “dead” servers |  ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ |
| Consolidate and virtualize servers | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ | ✔️ |
IT asset efficiency is too low

Green IT activities increase IT utilization and efficiency.

30% of servers of servers are “dead” with peak and average utilization rates below 3%.

Dead servers still draw electricity – while consuming space and cooling capacity.
IT resiliency will be challenged
Green IT can free up data center space, power and cooling.

Data centers are running out of space, power and cooling.

- **Space**
  - 33% within 12-24 months
  - 22% within 24-60 months

- **Power**
  - 42% within 12-24 months
  - 23% within 24-60 months

- **Cooling**
  - 39% within 12-24 months
  - 21% within 24-60 months
What **green** data center **best practices** should you follow?
Green IT for the average enterprise
The importance of energy efficiency in enterprise IT in 2013.

“How important are the following when selecting data center and IT hardware?”

<table>
<thead>
<tr>
<th>Feature</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliability</td>
<td>96%</td>
</tr>
<tr>
<td>Support</td>
<td>90%</td>
</tr>
<tr>
<td>Purchase price</td>
<td>89%</td>
</tr>
<tr>
<td>Product features</td>
<td>83%</td>
</tr>
<tr>
<td>Warranty</td>
<td>77%</td>
</tr>
<tr>
<td>Strength of ecosystem and support network</td>
<td>65%</td>
</tr>
<tr>
<td>Ability to purchase from a single manufacturer</td>
<td>62%</td>
</tr>
<tr>
<td>Energy efficiency</td>
<td>60%</td>
</tr>
<tr>
<td>Vendor's management of our account</td>
<td>59%</td>
</tr>
<tr>
<td>Value-add services</td>
<td>58%</td>
</tr>
<tr>
<td>Breadth of product portfolio</td>
<td>45%</td>
</tr>
<tr>
<td>Product style</td>
<td>28%</td>
</tr>
</tbody>
</table>

25% cite improved power and cooling efficiency as “very important” to their decision to virtualize x86 servers.

20% cite improved power and cooling efficiency as “very important” to their decision to adopt cloud computing.

* Q3 2013, global enterprise IT decision makers
Green data center best practices
Based on the cloud, web, colocation and enterprise giants.

**Cloud, Web and Colocation Giants**
- Amazon
- Microsoft
- Google
- Facebook
- SoftLayer
- Digital Realty

**Enterprises Giants**
- Salesforce
- Rackspace
- Sprint
- Goldman Sachs
- RBC
- Nestlé
Green IT technologies abound
There is no shortage of green IT technologies to implement.

Key technologies:
• Recycling
• Virtualization
• Storage Optimization
• IT Energy Management
• Outsource
• Colocation
• Cloud
• Clean Energy
Green IT processes abound
There is no shortage of green IT processes to implement.

Key processes:
- Consolidation
- Energy Management
- Energy Baseline
- Executive Sponsorship
- Assigned Ownership
- Budget for Energy
- Cloud Migration
Green data center strategy is broad
Green data center strategy from your facilities to applications.

- Apps?
- IT Infrastructure?
- Power & Cooling?
- Location & Facility Design?

Categories:
- People
- Process
- Technology

Brands:
- Oracle
- Salesforce
- NetSuite
- SAP
- Microsoft
- IBM
Location: Green power and cooling
Access to green power and cooling reduces your carbon impact.

Green Power
Wind, Solar, Hydo, Thermal

100% of Iceland is powered by renewable energy.

Green Cooling
Outside Air or ‘Free’ Cooling

Most of Europe has 8,000 hours of free cooling per year.
Design: Green facility certifications
Reduce energy, water and other environmental impacts.

- LEED Platinum
  - $232m, 230,000 (sq sf)
  - 25% more energy efficient
  - Save 46.5m liters (90% rainwater)

- LEED Gold
  - $50m, 50,000 (sq sf)
  - Efficient IT hardware and virtualization
  - “Free” cooling, heat capture, white roof

- LEED Platinum
  - $232m, 247,000 (sq sf)
  - Save $1.7m in energy costs in 5 years
  - Save 23m gallons of water

**LEED, BREEAM, CEEDA and ENERGY STAR.**

> Financial benefits of LEED:
- Decrease operating costs by 8-9%
- Increase building value by 7.5%
- Improve ROI by 6.6%
- Increase occupancy ration by 3.5%
- Increase rent ratio by 3%

> Comparing LEED to others:
- 26% less energy consumption
- 13% lower maintenance costs
- 27% higher occupant satisfaction
- 33% less GhG emissions
Power & Cooling: Efficient + Optimize
Efficient architectures plus optimization software and processes.

Efficient Architectures
- Modular power and cooling
- Efficient PDUs, UPSs and VSDs
- Hot or cold aisle containment

Modular builds
conserves energy by allowing you to scale power and cooling overtime.

Optimization Software
- Data center infrastructure management (DCIM) software

- Extend data center life
- Lower power and cooling
- Manage carbon footprint

Optimization Process
- Plug “holes” with plastic baffles, temporary walls, blanking panels
- Turn up the temperature

12.7% savings
in energy when KPMG increased the temperature to 20°C degrees from 23°C.
IT Infrastructure: Efficiency + Optimize
Efficient architectures plus optimization software and processes.

**Efficient Architectures**
- Efficient power supplies
- Converged infrastructure
- Solid-state disk

- 70% less **space**
- 30%-40% less **heat**
- 40% less **power**

**Optimization Software**
- Virtualization
- Deduplication
- Thin provisioning

- Increase **consolidation**
- Reclaim **capacity**
- Increase **utilization**

**Optimization Process**
- Increase virtualization ratios
- Increase VM-to-host ratios
- Increase CPU ratios

65% savings on energy costs by maximizing server virtualization ratios.
# Apps: Rationalize for consolidation

Rationalizing apps leads to significant infrastructure consolidation.

<table>
<thead>
<tr>
<th>Sprint</th>
<th>Green IT Tactic</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apps</td>
<td>- Rationalization</td>
<td>- Removed 127 apps</td>
</tr>
<tr>
<td></td>
<td>- Removing “dead” servers</td>
<td>- Decommissioned 1,889</td>
</tr>
<tr>
<td></td>
<td>- Consolidation</td>
<td>- Redeployed 350</td>
</tr>
<tr>
<td></td>
<td>- Virtualization</td>
<td></td>
</tr>
<tr>
<td>Servers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td>- Data deduplication</td>
<td>- Reclaimed 291,000 GB</td>
</tr>
<tr>
<td></td>
<td>- Virtualization, thin provision</td>
<td>- 30% to 60% utilization</td>
</tr>
<tr>
<td></td>
<td>- Improved ILM</td>
<td>- 80% on low-end storage</td>
</tr>
<tr>
<td>Facility</td>
<td>- Consolidation</td>
<td>- 6 to 1 data center facilities</td>
</tr>
</tbody>
</table>

= Results

**CAPEX:** $28 million of re-deployable assets

**OPEX:** $20 million reduction in operating costs

**CO₂:** Reduced data center CO₂ by 10,450 metric tons
Colocation, outsourcing and cloud

Benefit from the expertise, scale and economics of providers.

► EvoSwitch’s facility uses 99% renewable energy.
► Digital Realty Trust standardizes on modular buildouts and variable speed drives.
Colocation, outsourcing and cloud
Benefit from the expertise, scale and economics of providers.

► IBM’s 80k sq. ft. “sustainable” data center dedicated to customer outsourcing is 42% more energy efficient than the average data center.
Infrastructure-as-a-service

► IaaS providers are known for running server infrastructure at 60% to 100% utilization rates — compared with enterprises where 30% of servers run at only 3% utilization rates.
Colocation, outsourcing and cloud
Benefit from the expertise, scale and economics of providers.

NetSuite’s SaaS offering saves customers $10.3k/year in energy and $100k/year in opex (software, hardware, maintenance, personnel, and occupancy costs).
How to prioritize green data center investments?
Get inspired by the green IT leaders
The leaders in green data centers show you what’s possible.

**Colt + Verne Global**
Operates a data center in Iceland that is carbon-neutral, using **100% renewal energy**.

**Microsoft**
Operates its 550,000 sq ft data center in Dublin with no chillers relying on **free cooling**.

**Google**
Customizes its servers for efficiency that are use **25% less energy** than off-the-shelf models.
Be practical when prioritizing green IT
Start with your green objectives before focusing on the tactics.

1. Develop your objectives

Focus objectives on business priorities:

- Energy
- Carbon emissions
- Electronic waste
- Water
- OPEX or CAPEX
- Asset efficiency
- Resiliency
- Security
Be practical when prioritizing green IT
Start with your green objectives before focusing on the tactics.

1. Develop your objectives

2. Measure your baseline

Focus measurements on your objectives:

- Green measurements: Energy, Carbon emissions, Electronic Waste, Water...
- Financial measurements: OPEX savings, CAPEX savings, Efficiency, Resiliency...
- Invest in Data Center Infrastructure Management.
Be practical when prioritizing green IT
Start with your green objectives before focusing on the tactics.

1. Develop your objectives
2. Measure your baseline
3. Develop your metrics

Develop metrics that support objectives:

For energy efficiency:
Power Usage Effectiveness (PUE)

For carbon efficiency:
Carbon Usage Effectiveness (CUE)

For IT efficiency:
Virtualization and CPU ratios
Be practical when prioritizing green IT
Start with your green objectives before focusing on the tactics.

1. Develop your objectives
2. Measure your baseline
3. Develop your metrics
4. Set your targets

Set accurate targets with baseline data:

For energy efficiency:
World class PUE = 1.00-1.20

For IT efficiency:
World class virtualization ratios:

- 76-100% virtualized
- +60% CPU ratio
- +30 VMs-to-physical host
Be practical when prioritizing green IT
Start with your green objectives before focusing on the tactics.

1. Develop your **objectives**
2. Measure your **baseline**
3. Develop your **metrics**
4. Set your **targets**
5. Decide on your **tactics**

**Let objectives, metrics and targets guide your tactics:**

First, focus on people and process improvements that yield high results at low cost.

Then, evaluate more expensive investments in efficient assets, renewable energy or models.