SERVER ENERGY AND EFFICIENCY REPORT

2009

ALLIANCE TO
SAVE ENERGY
Creating an Energy-Efficient World

1E

1E Server Energy and Efficiency Report 2009

Each server costs several thousand dollars to run every year. It's not just hardware; each needs software licences, operational support and of course energy. Wouldn't you like each and every one to be useful? The chances are that one sixth of your servers are unproductive for your organization, one of the startling findings from this study amongst many others. The potential savings are large, globally $3.8 billion in energy costs alone and $24.7 billion in the total cost of running non-productive servers[i]. If this concerns you, read on.

Since its inception 11 years ago, 1E has been committed to helping our customers cut operating costs while reducing their environmental footprint. 1E pioneered PC power management and continues as the global market leader with its flagship product, NightWatchman®. Today, NightWatchman is deployed on 4 million PCs worldwide. Since its launch over 9 years ago, it has cumulatively saved organizations over USD $360 million[ii] in energy costs. This reduction in energy usage has prevented 2.7 million metric tonnes of carbon dioxide[iii] from entering the atmosphere - this is the equivalent to the annual greenhouse gas emissions of half a million passenger vehicles[iv].

The trends toward internet based services, cloud computing and more and more data being saved centrally mean server numbers are increasing, as is electricity use and therefore carbon dioxide emissions. In fact, U.S. data centers used 61 billion kWh of electricity in 2006, representing 1.5% of all U.S. electricity consumption and double the amount consumed in 2000[v]. We can no longer deny that server energy consumption is a problem, and one that's only getting worse. The good news is that organizations want to do something about it.

In partnership with the Alliance to Save Energy (ASE), 1E commissioned independent research into the awareness and behavior of server administrators in the world's largest companies. Overall, the survey found that IT staff tasked with server management know that a significant proportion of their servers are not doing any useful work but they do not have the tools to identify them. They overwhelmingly want better knowledge of power utilization and efficiency of their server estates. Surprisingly the majority are also concerned with or doing something about virtual server sprawl, an uncontrolled rise in virtual servers, which in turn increases overall IT costs.

That's where 1E comes in. We have always innovated based on research rather than traditional wisdom. Our latest solution, NightWatchman® Server Edition, helps differentiate which servers are doing useful work and when, so that decisions such as decommissioning wasteful servers are made much simpler; even with productive servers energy savings can be further enhanced with our Drowsy Server® technology, and finally just using a software solution we can provide accurate analysis of the energy and efficiency of each and every server.

I encourage you to read the following report and if you would like to take the next step in reducing your company's energy use, please do come and talk to us.

Kind Regards,
Sumir Karayi
CEO, 1E

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Money Is Easily Wasted

Every large organization has a long list of IT demands and corresponding operating costs. But in leaner times, how does one balance user needs with the need to conserve costs? Together with the Alliance to Save Energy, 1E commissioned Kelton Research to conduct a survey among 100 IT professionals who work with servers at global companies with 10,000 employees or more[vi].

The 1E / ASE survey finds IT departments are currently wasting money and energy running unused servers. More than 15% of servers are simply not doing anything useful. Instead they are being run 24/7, managed and upgraded without being actively used on a daily basis. We estimate that at least 4.7 million servers[vii] needlessly costing IT departments over four thousand dollars per server per year in operational costs[viii], a primary concern for all organizations.

Some analysts estimate that about 15% of the average Company's servers run 24/7 without being actively used on a daily basis. Based on this projection and what you currently know, how would you say that your Company compares when it comes to unused servers?

About 15%
24%

I don't know
3%

Less than 15%
25%

More than 15%
48%
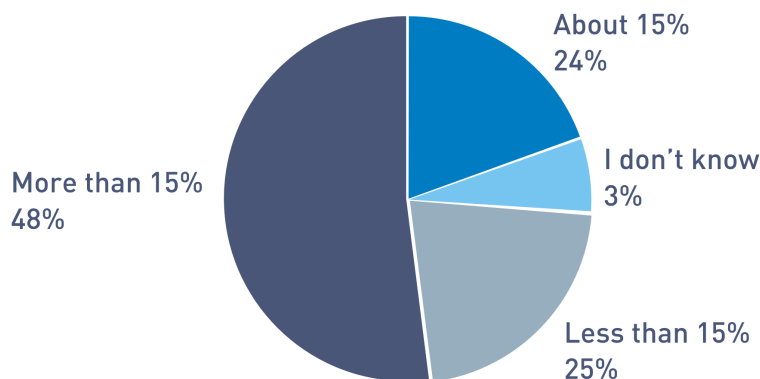
Though virtualization has held its promise of reducing data center power consumption, the operational costs associated with running a server are many times that of the energy cost. The ease of provisioning virtualized servers commonly leads to uncontrolled growth and more unused servers. This is known as virtual server sprawl and is starting to become a real concern. In fact 84% of IT professionals said they are experiencing or are concerned about virtual server sprawl. There are also inefficiencies in the virtualization process itself as 65% of IT professionals say they have virtualized an unused server.

$24.7 billion is wasted each year on hardware, maintenance, management, energy and cooling for unused servers. This is roughly equal to the cost of the 13 year Apollo space program[xviii]

Servers Have a Powerful Impact

Let's take a moment to look at the energy and environmental costs of servers. The world's 44 million servers[ix] are consuming a growing portion of the global electricity supply due to growing demand for the services they provide. The U.S. government is taking note. For the first time the Environmental Protection Agency (EPA) and the U.S. Department of Energy (DoE) will operate a national data center efficiency program to develop protocols, metrics and Energy Star specifications for the 11.8 million servers[x] across the country.

According to the EPA and DoE[xi]:

• U.S. data centers used 61 billion kWh of electricity in 2006, representing 1.5% of all U.S. electricity consumption and double the amount consumed in 2000

• Based on current trends, the EPA estimates that energy consumed by data centers will continue to grow by 12% per year

Since a significant portion of the world's 44 million servers[xii] are not used, it's clear that a large amount of energy is being wasted. Supposing for a moment that the world's servers were deployed in a similar fashion to a large company – and that the world paid U.S. utility rates, which tend to rest in the middle on a pricing scale with other markets[xiii] – the resulting waste per year comes to 11.8 million tons of carbon dioxide – the equivalent of 2.1 million cars[xiv]. In the U.S. alone, this comes to 3.17 million tons of carbon dioxide, or 580,678 cars[xv].
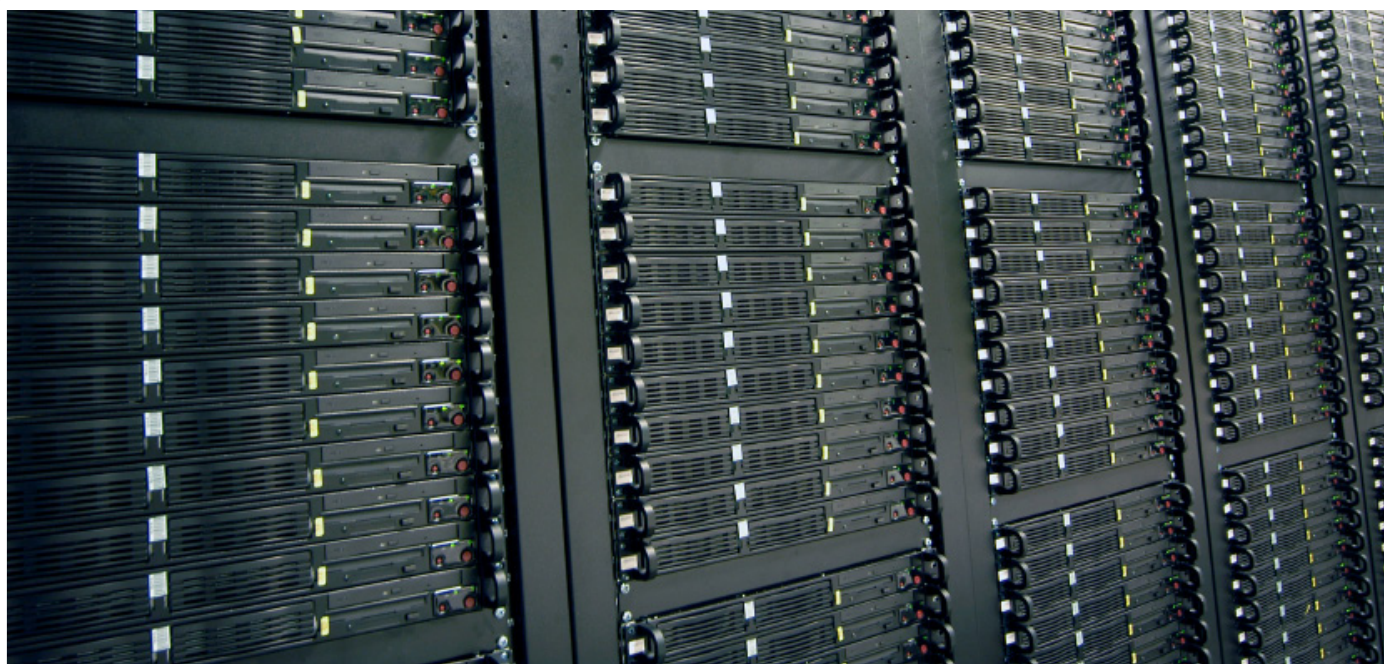
Understand then Manage: A Case for Useful Work

Faced with rising energy prices, budget cuts and new EPA data center programs, organizations are rightfully trying to determine if their servers are being used productively; that is running applications that are actually being used, as opposed to running redundant applications which have fulfilled a historic need or whose users have migrated onto a new server.

An overwhelming 83% of IT Professionals admit they would benefit from a better grasp of their overall server utilization. But utilization itself means very little, it measures overall usage but does not reveal if the server is doing 'Useful Work'. A server may appear to be busy at times when in fact it is only running management and maintenance processes.

The survey finds that organizations are not measuring – or do not have the tools to measure – server efficiency. Nearly three quarters (72%) reported using CPU utilization as a measure.

> **Useful Work:** (noun) -- The service provided by a server when business applications are actually being used, as opposed to redundant applications which have fulfilled a historic need or whose users have migrated onto a new server.

> **4.7 million servers are not doing any Useful Work**

What's more, their systems for identifying servers to decommission or reallocate are not systematic or automatic. According to the chart below, less than four in ten (37%) use an automated reporting tool to search for low utilization, while others are more likely to carry out manual assessments (28%) or wait for something to go wrong (19%).

Most of the time, which of the following best describes your company's primary approach to discovering servers that could be decommissioned or re-allocated?	
We use an automated reporting tool, such as one that looks for a general level of low average utilization	37%
We periodically carry out manual assessments, such as asking users if a software program is still being actively used	28%
We consider decommissioning or re-allocating when we see signs of server hardware performance degradation	19%
Decommissioning or re-allocating usually gets postponed in favor of higher priority issues	9%
Active trial and error, for example, switching the server off to see if users complain	7%

As well as not measuring, three out of four (75%) have responded that their company's mandate to deliver high levels of IT service gets in the way of making their servers more efficient. It seems that employees may be expecting their IT tools to work all the time with no exception and as a result, IT staff must spend time achieving so-called perfect service, rather than implementing changes that may improve efficiency.

Keep Energy and IT Costs Under Control with NightWatchman Server Edition

NightWatchman Server Edition is the first power and efficiency management solution to analyze whether servers are providing Useful Work and deliver actionable data that allows IT administrators to ensure that data centers are as efficient as they can be, reducing infrastructure and spending.

NightWatchman Server Edition understands the difference between productive and non-productive workloads, enabling IT to report usage and cost in terms of actual business value, as well as energy and CO_2. By deploying NightWatchman Server Edition, an organization can confidently power down or decommission unused servers, saving 100% of the energy costs and several thousands of dollars per server per year in ongoing maintenance, management and licensing. In fact, if all of the unused servers were decommissioned, it would save over $24 billion[xvi].

Removing unused servers should not be seen as a one-off process though. In addition there are significant ongoing benefits from controlling sprawl and server power management. For servers which are providing a service (i.e. Useful Work), NightWatchman Server Edition applies Drowsy Server®, a sophisticated form of dynamic power management which applies power management when a server is not performing Useful Work. This feature is designed to lower server power consumption by around 12% without powering down the server. This is significant because, according to the EPA, a 10% decrease in server power consumption would amount to energy savings of 10.7 billion kilowatt-hours per year – an equivalent to the electricity consumed by one million U.S. households and valued at about USD $740 million[xvii].

> "The strict policy of Uptime Institute is to not endorse products. However, it also believes that power productivity and efficiency of servers and data centers are now critically important to manage. Automation is key to success. 1E NightWatchman Server Edition, as well as other offerings in this class, should help server managers take the next giant step in saving potentially hundreds of thousands of dollars in annual IT power costs."
>
> -- Bruce Taylor, Chair, Uptime Institute Research Symposium.

By tackling data center power management at the server and intelligently automating policies that reduce power only when a server is idle or executing non-productive work, NightWatchman Server Edition allows IT to:

- Easily identify unused servers and decommission them with confidence

- Ensure only used servers are migrated to a virtualized environment and growth of virtualized servers is controlled, guaranteeing the most effective use of virtualization

Carbon and price costs for servers are at an all-time high, and only getting higher. Reducing the number of unnecessary servers running is no longer an option, but an imperative in the face of climate change and a global economic downturn. NightWatchman Server Edition from 1E gives server administrators the tools they need to easily and efficiently rationalize and power manage their servers. There is no need to continue worrying about what you don't know. With automated power management for servers, IT departments can preserve service levels while transforming power-hogging servers into smarter, leaner, and greener data centers.

65% of Server Managers have at some point virtualized a server that was not being used.

Appendix

[i] Summarised calculation from report contents and references
$4,400 x 4.75M unused servers = $20.9 bn
(operational costs for unused servers)
$5,323,760.64 x 365 days in 1 year = $1.9bn x 2
(energy cost for running unused servers continuously for a year + cooling cost for running unused servers continuously for a year assuming a Power Usage Effectiveness value of 2, according to EPA average PUE at time of writing is 2.04)

[ii] Cumulative saving from 4 million licenses to date, average saving of $36 per PC per year

[iii] 381 kWh is approx saving per PC per year. MWh * 1.54 = thousands of pounds of CO_2 (2007 emissions factor: EPA's Climate Change Action Plan (CCAP) number for 2007)

[iv] One car produces 5.46 metric tonnes of CO_2 emissions. See:
http://www.epa.gov/cleanenergy/energy-resources/refs.html#vehicles

[v] "Report to Congress on Server and Data Center Energy Efficiency", Public Law 109-431, U.S. Environmental Protection Agency, ENERGY STAR Program, August 2, 2007 and U.S. Department of Energy (DOE). 2007. "Annual Energy Outlook 2007," Energy Information Administration. Report DOE/EIA-0383(2007)

[vi] The 1E/Alliance to Save Energy Survey was conducted by Kelton Research between September 17th and September 23rd, 2009 using an email invitation and an online survey, among 100 IT professionals who work with servers at global companies with 10,000 employees or more. Survey results are available upon request

- Results of any sample are subject to sampling variation. The magnitude of the variation is measurable and is affected by the number of interviews and the level of the percentages expressing the results.

- In this particular study, the chances are 95 in 100 that a survey result does not vary, plus or minus, by more than 9.8 percentage points from the result that would be obtained if interviews had been conducted with all persons in the universe represented by the sample.

[vii] Volume of applicable world's servers (if all the world's servers were part of large companies)
44,000,000 servers x 72%* = 31,680,000 total servers that belong to IT departments that estimate minimum 15% waste (44M = Total number of servers in world is according to McKinsey report referenced above: "Data centers: How to cut carbon emissions and costs," McKinsey, Nov.1, 2008) 44,000,000 servers x 72% x 15% = 4.75M unused servers (*Kelton finds that 72% of worldwide servers managed by IT departments that estimate minimum of 15% wasted servers)

[viii] $145,000M / 33,000,000 servers = $4,400 per server
(In 2008, approximately $145,000M was spent on new server spending and management and administration of 33M servers, according to IDC report: "Optimizing Infrastructure and Server Management in Tough Economic Times")

[ix] "Data centers: How to cut carbon emissions and costs," McKinsey, Nov.1, 2008

[x] "Worldwide and U.S. Enterprise Server 2007-2011 Forecast Update by Vertical Market and Company Size," IDC, June 2008

[xi] "Report to Congress on Server and Data Center Energy Efficiency", Public Law 109-431, U.S. Environmental Protection Agency, ENERGY STAR Program, August 2, 2007 and U.S. Department of Energy (DOE). 2007. "Annual Energy Outlook 2007," Energy Information Administration. Report DOE/EIA-0383(2007)

[xii] "Data centers: How to cut carbon emissions and costs," McKinsey, Nov.1, 2008

[xiii] Electricity Prices for Industry," Energy Information Administration (EIA), August 18, 2008. This report is the most recent estimate from the EIA and indicates that U.S. utility prices fall into a relatively average position when compared with other global markets: http://www.eia.doe.gov/emeu/international/elecprii.html. This data is corroborated by a second source: "International Electricity Report and Cost Survey 2006-2007," NUS Consulting Group, July 2007, which lists U.S. as #8 among the 14 selected market indicators: http://pepei.pennnet.com/articles/enlarge_image.cfm?IMAGE_ID=256287&SITE_ID=PEI

[xiv] Equivalent in cars over 1 year (worldwide servers)

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(*Kelton finds that 72% of worldwide servers managed by IT departments that estimate minimum of 15% wasted servers)

World's waste in one day (if world paid U.S. utility rates which are generally lower than ROW)
400 (Watts/server) x 31,680,000 (total servers that belong to IT departments that estimate minimum 15% waste)
 = 12,672,000,000 watts

(400 watts/server is according to Gartner study referenced above: "U.S. Data Center Conference Focuses on How to Do More With Less," Gartner, June 2, 2009)
12,672,000,000 watts x 15% of unused servers = 1,900,800,000 wasted watts or 1,900,800 wasted kilowatts
1,900,800 wasted kilowatts x 24 hours of disuse = 45,619,200 wasted kWh
45,619,200 wasted kWh x $0.1167 = $5,323,760.64 daily

(U.S. utility rates: http://www.eia.doe.gov/steo)
(0.71 x 45619200) / 1000 = 32389.632 wasted tons of CO_2 daily

(To calculate GHG emissions based on kWh used: in the U.S. there are .71 metric tons/1000 kWh according to http://www.epa.gov/cleanenergy/energy-resources/calculator")

32389.632 Wasted server CO_2 (tons/day) x 365 days in 1 year = 11822215.68 wasted server CO_2 (tons/year)
11822215.68 / 5.46 = 2,165,241 wasted server equivalent (number of cars)

(One car produces 5.46 metric tons of CO_2 emissions. see:
http://www.epa.gov/cleanenergy/energy-resources/refs.html#vehicles)

[xv] U.S. waste in one day

400 (Watts/server) x 8,496,000 (total servers that belong to U.S. IT departments that estimate minimum 15% waste) = 3,398,400,000

(400 watts/server is according to Gartner study referenced above: "U.S. Data Center Conference Focuses on How to Do More With Less," Gartner, June 2, 2009)

3,398,400,000X 15% of unused servers = 509,760,000 wasted watts or 509,760 wasted kilowatts

509,760 wasted kilowatts x 24 hours of disuse = 12,234,240 wasted kWh daily

12,234,240 wasted kWh x $0.1167 = $1,427,736 daily

(U.S. utility rates: http://www.eia.doe.gov/steo)

(0.71 x 12,234,240) / 1000 = 8,686.31 metric tons CO_2 per day (To calculate GHG emissions based on kWh used: in the U.S. there are .71 metric tons/1000 kWh according to http://www.epa.gov/cleanenergy/energy-resources/calculator")

Equivalent in cars over 1 year (US servers)

8,686.31 wasted server CO_2 (tons/day) x 365 days in 1 year = 3,170,503 wasted server CO_2 (tons/year)

3,170,503 / 5.46 = 580,678 wasted server equivalent (number of cars)

(One car produces 5.46 metric tons of CO_2 emissions. see: http://www.epa.gov/cleanenergy/energy-resources/refs.html#vehicles)

[xvi] $145,000M / 33,000,000 servers = $4,400 per server

(In 2008, approximately $145,000M was spent on new server spending and management and administration of 33M servers, according to IDC report: "Optimizing Infrastructure and Server Management in Tough Economic Times")

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[xvii] "Report to Congress on Server and Data Center Energy Efficiency", Public Law 109-431, U.S. Environmental Protection Agency, ENERGY STAR Program, August 2, 2007 and U.S. Department of Energy (DOE). 2007. "Annual Energy Outlook 2007," Energy Information Administration. Report DOE/EIA-0383(2007)

[xviii] Apollo program costing $25.4 billion. See: http://history.nasa.gov/Apollomon/Apollo.html (cost not adjusted for 2009)