

The True Value of Green IT – An EMA Research Report

An ENTERPRISE MANAGEMENT ASSOCIATES® (EMA™) Research Report
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Table of Contents

Executive Summary	1
Workstation Power Consumption	1
Data Center Power Consumption	1
Green IT Deployments.....	1
Introduction	2
The Value of Green IT	2
Green IT Solutions	4
Automated Power Management.....	4
Consolidate Servers	4
Virtualization.....	4
Replace Hardware with More Power Efficient Platforms.....	5
CPU Power Throttling.....	5
Utilizing Thin Clients	5
Power Consumption on Client Workstations	6
Energy Efficiency in the Data Center	12
Green IT Deployments.....	16
EMA Perspective.....	22
About Kaseya.....	23
Appendix A: Calculations for Determining Workstation Consumption.....	24
Assumptions	24
Variables.....	24
Formulas	25
Appendix B: Methodologies and Demographics.....	27

Executive Summary

In July of 2008, the ENTERPRISE MANAGEMENT ASSOCIATES® (EMATM) analyst team conducted primary research into the Information technology (IT) power consumption and reduction practices of businesses, government bodies and other professional organization. 250 respondents provided details of their workstation utilization habits. 108 knowledgeable IT professionals contributed information about data center configurations, server power consumptions and Green IT deployments. Key findings include:

Workstation Power Consumption

Desktops and laptops were each indicated as being used by 79% of respondents (though not necessarily the same individuals), with thin clients and diskless clients respectively identified 39% and 31% of the time. 69% of all respondents utilized two or more workstation types in the regular function of their jobs. On average, with systems that had power saving features enabled, monitors were automatically set to turn off after 30 minutes of inactivity and system standby would occur after 46 minutes of inactivity. An average of 34% of respondents had their system standby variable set to “Never,” 21% of respondents set “turned off monitors” to “Never” and 50% of respondents set “turned off hard disks to “Never.” 24% of respondents kept desktops fully operational 100% of the time, and desktops were reported as being kept powered on 43% of total non-work hours (i.e., evenings and weekends). The average annual cost for desktop power consumption is US\$149.10, but only US\$23.26 for laptop power consumption.

Data Center Power Consumption

Forty-seven percent of respondents identified greater than 70% of servers as “business critical.” On average, 52% of servers were reported to be kept fully operational 100% of the time and 82% were kept fully operational greater than 75% of the time. The overall average amount of time servers are kept fully operational is 88%. Eighty-one percent of respondents indicated that the reason servers are kept operational during evening and weekend hours was to support a 24x7 business production environment. Servers account for 31% of total data center power consumption and environmental units (HVAC) accounted for 17%.

Green IT Deployments

Fifty-seven percent of surveyed IT professionals indicated that their organization had implemented a Green IT initiative. 82% of respondents indicated “cost reduction” as a primary driver for implementing a Green IT solution. The top three Green IT disciplines that have been implemented are “consolidating servers” (79%), “replacing hardware with more power efficient platforms” (73%), and Virtualization (69%). Respondents indicated an average 19% reduction in energy costs since implementing a Green IT solution. The largest power reductions reported ranged between 51% and 60%. On average, the greatest power reductions reported were from respondents that implemented thin clients (22.53% reduction), CPU power throttling platforms (21.44% reduction) and automated power management (20.50% reduction). 42% of respondents claimed implementation of a Green IT solution took less than a week to complete and 50% indicated deployment time of greater than a month. One hundred percent of knowledgeable IT professionals indicated intent to introduce new Green IT initiative during the coming year.

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Introduction

During July of 2008, EMA conducted primary research into the IT power consumption and reduction practices of businesses, government bodies and other professional organizations. To collect accurate data, a Web-based survey was crafted independently by EMA expert analysts.

In order to be comprehensive in scope, the study was partitioned into two distinct sections. The first investigated the common workstation (including desktops, laptops, thin clients and diskless workstations) power utilization from a broad range of professionals across a wide spectrum of industries. This section of the survey netted 250 individuals that regularly utilize a workstation as a part of their job function. The second section surveyed only IT professionals with a working knowledge of IT operations including data centers and critical servers. 108 respondents provided details about server utilization and power consumption along with specific data regarding Green IT initiatives both implemented and planned. Companies represented for both sections include all sizes, from small and medium businesses to large and very large enterprises, across different industry types. The majority of respondents (84%) were located in North America. A complete description of the survey methodology and demographics can be found in Appendix B: Methodology and Demographics.

This EMA Research Report evaluates this primary data, and provides expert insight and analysis, in order to answer key questions such as:

- What are the actual energy costs associated with traditional computing models, both in the data center and on end-user workstations?
- How much cost savings can be achieved by reducing power consumption through Green IT initiatives?
- Which Green IT initiatives provide the greatest ROI in today's dynamic IT infrastructures?
- How much business interest is there in deploying Green IT solutions?
- How well do Green IT solutions scale with organizational types and sizes?

It should be noted that although Green IT encompasses a wide scope of topics – including reducing electronic waste, eliminating unnecessary travel, and green power generation – the focus of this research has been on achieving energy efficiency. To this end, the intent of this report is to identify the actual value of Green IT by comparing the scope of energy efficiency requirements with the actual value achieved from implementing today's most popular solutions in order to identify areas of quantifiable return on investment.

The Value of Green IT

Green IT, or Green Computing, traces its origins back to the early 1990s when the U.S. Environmental Protection Agency (EPA) launched the “Energy Star” program intended to identify and promote energy-efficient products. At the time, the focus was on reducing greenhouse gas emissions and so the phraseology around

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“Green IT” grew to be principally associated with environmentalism. Businesses took little notice of IT power consumption issues back then since they only constituted a relatively small percentage of overall operational costs. In fact, real breakthroughs in IT energy efficiency didn’t occur until the popularity of laptops increased and led to the introduction of power reduction tools, such as sleep modes and hibernation, which were developed to increase battery life.

In the last decade or so, the vast expansion of business requirements for IT solutions needed to drive profitability and achieve organizational goals has led to significant increases in overall IT power consumption. According to a 2007 EPA report, the collective national data center energy utilization doubled between years 2000 and 2006 to a total of 61 billion kilowatt-hours (KwH) of power, or about 1.5 percent of all U.S. electricity consumption. To put this in perspective, that’s almost twice as much power as consumed by all the nations color televisions combined and more than half as much consumed by all U.S. household lighting. Worse – the report concluded – if trends continue, there’s every indication that this power utilization will nearly double again by 2011, resulting in a whopping \$7.4 billion dollars in annual electricity costs. And that’s just for data centers, which (according to EMA primary research) accounts for only 10% of total commercial computing deployments.

This growing need for energy to support business IT has also become a burden on the power industry. According to the EPA, business data center power requirements currently reach a peak load on the power grid of an estimated 7 gigawatts, or approximately the output of 15 baseload power plants. By 2011, however, the increased power demand could rise to as much as 12 gigawatts, requiring the addition of 10 new power plants nationwide just to support data center requirements. From an environment standpoint, this represents a significant increase in greenhouse and pollutant emissions if the majority of this power is generated by traditional fossil fuel plants, as is likely. From a business economic standpoint, management of additional power plants and increased fossil fuel demand will likely result in even further significant price increases for electric power.

Increased fuel costs and social concerns over the environment are not the only motivators driving businesses to find ways to reduce consumption. Some businesses have reached the maximum power allotment available for their facilities. In order to expand IT operations to support new projects and organizational growth, these enterprises must either reduce existing consumption or face the cost and challenges of building new remote facilities that can support the increased power requirements. Additionally, governments, industries and business units have instituted regulatory compliance initiatives around power consumption. As an alternative, many of these same entities have developed energy reduction incentives, such as “white certificates commodities” which allow carbon reduction points to be traded on an open market, actually generating revenue for many businesses. Finally, the marketing value from instituting energy reduction practices should not be overlooked. Not only does it promote an organization through non-conventional news and media outlets, but publicly traded companies become more attractive to investors and fund managers looking for environmentally friendly and fiscally responsible businesses to add to their portfolios.

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The past few years have seen significant growth in both the adoption of power reduction solutions and the development of new energy efficient technologies, and the future of Green IT practices promises to further improve cost savings and IT efficiency for the broader global IT community.

Green IT Solutions

Included below are descriptions of the most popular modern approaches to achieving energy efficiency. In addition to those listed, 5.5% of respondents identified the following Green IT initiatives in their organizations:

- Reduced cooling initiatives in the data center
- Monitors set to automatically turn off out of hours (while system remain active)
- All non-essential systems are shut down out of hours (including both computing and non-computing equipment)

The survey results identify these collectively as “other.”

Automated Power Management

Some systems management and automation software are able to force system shutdowns during hours of inactivity (primarily evenings and weekends). The more advanced of these solutions can take advantage of today’s intelligent chip sets, such as the Intel® vPRO™ technology, to also force system startups. By utilizing both remote shutdown and startup procedures, very intricate schedules can be created to work around out-of-hours backups, production times and maintenance windows. Additionally, software-based solutions can enforce organizational policies regarding the use of power saving features (turn off monitor, turn off hard drive, put system in sleep mode) so that power consumption will be minimized during operational hours.

Consolidate Servers

Servers are rarely utilized to their full capacity. By reallocating resources so that a smaller number of servers are being utilized but at greater capacity, the unused systems can be retired along with their associated power consumption. Taking that concept a step further, a large number of systems can consolidate their processes onto especially large capacity servers, such as Blade Servers and Mainframes, which are designed to draw proportionally less power and operate with greater efficiency. IT operations can also take advantage of grid or “cloud” computing technologies to maximize existing resources and further facilitate server consolidation.

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Virtualization

Computer virtualization expands on the concept of server consolidation by allowing a single physical system to host multiple logical systems. Here again, multiple servers can be consolidated onto a single or only a few large servers to take advantage of their improved power utilization features. Also, by sharing system resources and performing advanced memory management functions, virtualization solutions can significantly increase the overall computing efficiency of IT components.

Replace Hardware with More Power Efficient Platforms

Upgrading technology can provide significant opportunities for reducing power consumption. Hard disks, chip sets, power supplies, and cooling systems are continually being redesigned to achieve greater standards in energy efficiency. Some effective solutions included here would be deploying “Energy Star” certified units, replacing desktops with laptops, utilizing smaller “form factor” hard drives or solid-state drives, swapping tube monitors with LCD displays, and removing or trimming back unnecessary graphics processing units (GPUs).

CPU Power Throttling

Also referred to as “Dynamic Frequency Scaling,” CPU throttling techniques allow processors to be slowed down during times of low use or when high performance is deemed unnecessary. Not only does this directly reduce power consumed by the CPU, it also reduces the heat generated by the chips and thereby reduces the amount of power-consuming cooling required.

Utilizing Thin Clients

Thin clients are workstations with minimal hardware configurations. They can be either completely diskless or contain a minimal local storage capability, and they are typically designed with only rudimentary processing and memory functionality. Services, such as desktops, Web and applications are hosted on a central server and then transmitted to the thin client via a proprietary network communication process or virtualization implementation. The purpose of a thin client is essentially to just act as a simple terminal – sending and displaying data back and forth to the central server where the real processing and data storage takes place. This solution takes advantage of both energy efficient hardware on the desktop and system consolidation in the data center. Also, since thin clients do not necessarily require a full operating system in order to function, the central server can maximize data storage and processing power by only providing the services necessary for the end user’s job function.

Power Consumption on Client Workstations

The more popular of today's Green IT implementations focus primarily on data center power consumption, but the importance of also bringing these same concepts to end-user workstations should not be overlooked. Certainly, a typical server will draw considerably more power than an individual workstation, both because of the scale of the architecture and because high availability demands require servers to operate a greater percentage of time, but the sheer number of workstations deployed in most organizations can easily outweigh server utilization in terms of total energy consumption. In fact, EMA research has concluded that, on average, workstations account for nearly 90% of all deployed systems. Even small reductions in power usage by client workstation can rapidly multiply into significant savings if implemented across the enterprise.

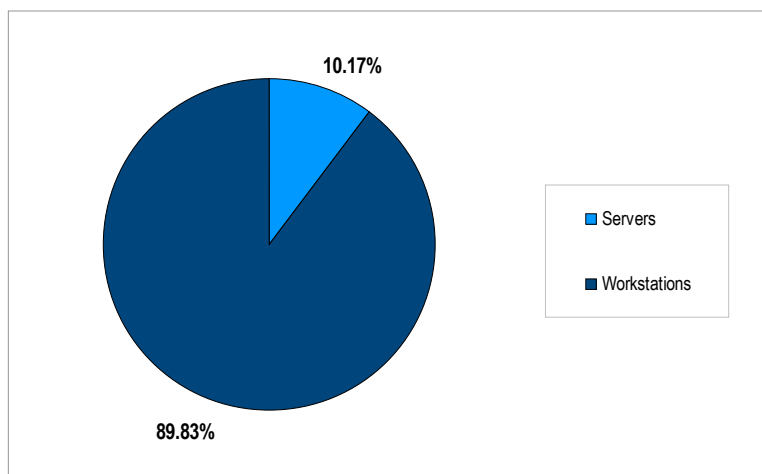


Figure 1: Average enterprise system type distribution. (Servers vs. workstations)

Naturally, there are a variety of different types of end-user workstations. An open definition of a workstation as “any computing device utilized by personnel in the performance of their regular job function” would include a broad scope of devices from small personal digital assistants (PDAs) to large server-equivalent computer systems. For the purposes of this study, EMA has limited the scope of workstations to four categories:

- **Desktops** – Non-portable self-contained computing unit consisting of, at minimum, a CPU, memory, a monitor, and a hard disk drive.
- **Laptops** – Portable self-contained computing units including, at minimum, a CPU, memory, an LCD display, and a hard disk drive.
- **Thin Clients** – Non-portable computing units with minimal hardware configuration intended for use as a terminal for accessing services and data from a centralized server. For the purpose of this study, the “thin client” category only includes units with local storage devices (hard disk drives, solid state drives, etc.)
- **Diskless Clients** – Defined the same as thin clients, but without the inclusion of a local storage device.

The EMA survey asked respondents to list each type of workstation they regularly use as part of their job responsibilities. Desktops and laptops were each indicated as being used by 79% of respondents (though not necessarily by the same individuals), with thin clients and diskless clients respectively identified 39% and 31% of the time. This revealed that at least 69% of all respondents utilized two or more workstation types in the regular function of their jobs. A clear opportunity for energy saving is presented here – by reducing the number of physical units utilized by each employee, a proportional reduction in power costs (as well as hardware costs, application costs, maintenance costs, etc.) can be achieved. Some methods for achieving this would be to deploy docking stations for laptops (eliminating the need for a redundant desktop) or to implement virtualization solutions that will provide access to multiple resources from a single terminal.

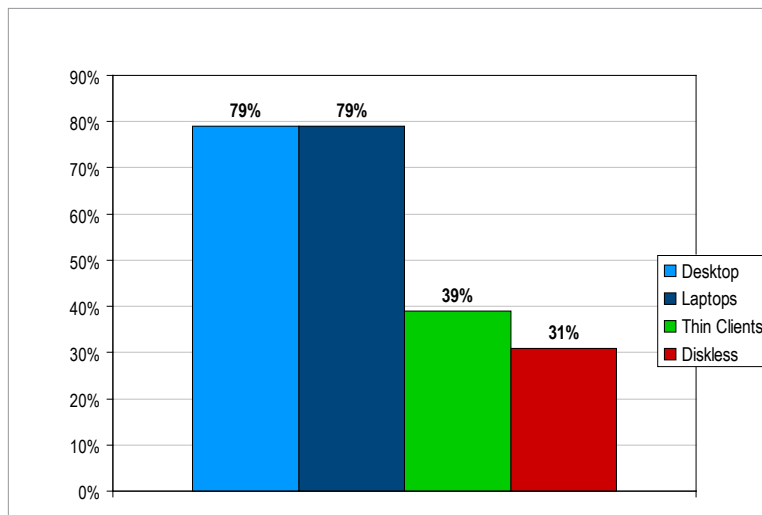


Figure 2: Percentage of workstation types regularly utilized as part of job function. (Multiple selections allowed)

To further examine the actual utilization of these workstation types, the EMA study determined the average percentage of time respondents powered on their equipment during an average workday and the percentage of time the workstations were actively being used. Desktops showed the widest discrepancy between the two, indicating a 16% active but non-use time. Assuming an 8 hour work day, this would account for about 77 minutes, or slightly longer than a typical 1 hour lunch break. Laptops were powered on less often during an average work day, only 60% of the time or just under 5 hours out of an 8 hour workday. This likely is accounted for by the ease in which most laptops can be placed in hibernation – simply by shutting the lid – and due to the practice of utilizing multiple workstations (i.e., desktops are used more often in the office than laptops).

Interestingly, the data also showed that thin clients and diskless clients were powered on a relatively short period of time – respectively, on average, 24% and 12% (approximately, 2 hours and 1 hour out of an 8 hour workday). This implies that these workstation types are not commonly used as primary resources, but are only utilized for specific and limited tasks. Given the significant cost savings that can be gained by replacing desktops with thin and diskless clients, there is real opportunity suggested by this data for improving the value of these systems by enabling broader utilization.

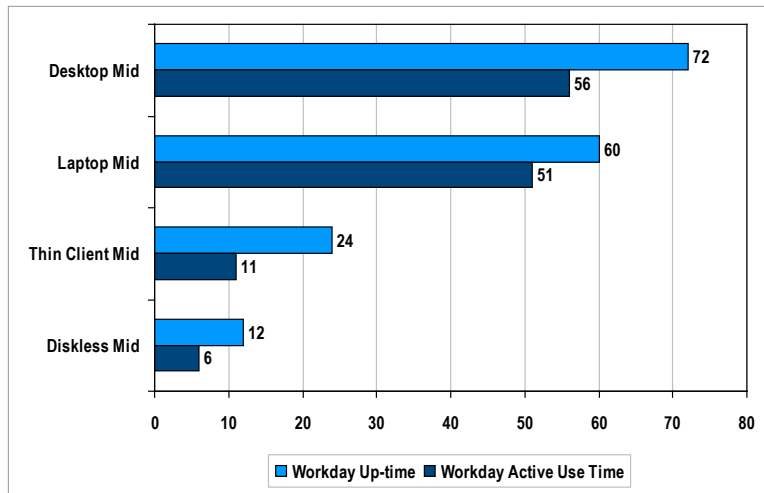


Figure 3: During an average workday (i.e. only the hours you are actually in the office), what is the percentage of time that each of the following client workstation types is powered on and actively being used?

Power savings features – such as monitor and disk power downs as well as system standby – can show appreciable energy cost reduction on systems which are kept powered on but unused for significant periods of time. However, end users are sometimes uncomfortable with utilizing these features as they can reduce the responsiveness of the system when they are active. Fortunately, most workstation types can be set to delay initiating a power savings feature until a specified period of system inactivity has occurred. The challenge for IT administrators and end users is setting these variables for optimal response. If the inactivity time period is set too short, the process could be a business impacting nuisance to the user. On the other hand, if the threshold is set to be too long or deactivated, energy savings is not achieved.

EMA research found that, for those systems that had power saving features enabled, monitors were automatically set to turn off after 30 minutes of inactivity and system standby would occur after 46 minutes of inactivity. To maximize energy savings, the EPA recommends setting computers to enter system standby after 30 to 60 minutes and monitors to enter sleep mode after 5 to 20 minutes. Although system standby is, on average, at the midpoint of the EPA’s recommendation, it should be remembered that the lower the setting the more energy is saved, and it is likely this average can be reduced without severely impacting end user productivity. Monitors, on the other hand, are clearly being kept active far longer than necessary. This is particularly true of LCD displays where recovering from sleep mode is nearly instantaneous and cannot be considered much of a nuisance.

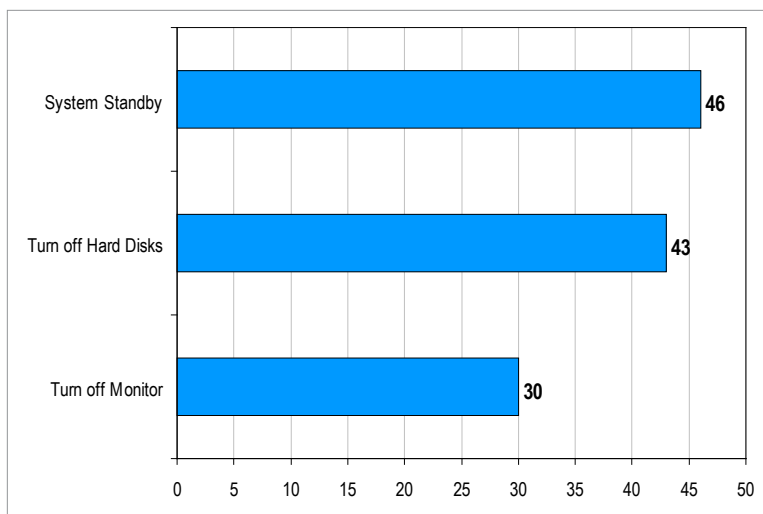


Figure 4: Please indicate what time is set for each of the following power management features (power options) on your primary workstation. After how much time is the power saving feature initiated?

Of course, the challenge from a management perspective is enforcing power savings policies across an organization. End users are not all likely to take the initiative (and may not even have the knowledge necessary) to make the configuration changes. In fact, the EMA study showed an average of 34% of respondents had their system standby variable set to “Never,” indicating their systems would never enter sleep mode regardless of how long they were active. 21% of respondents never turned off their monitors and fully half of respondents never turned off their hard disks (though this last is excusable since hard disks commonly draw very little power). Certainly, this is an area where systems management and automation solutions can be of great value. Organizational power savings policies can be enforced by software designed to automatically update system configurations and/or report on any out of compliance systems.

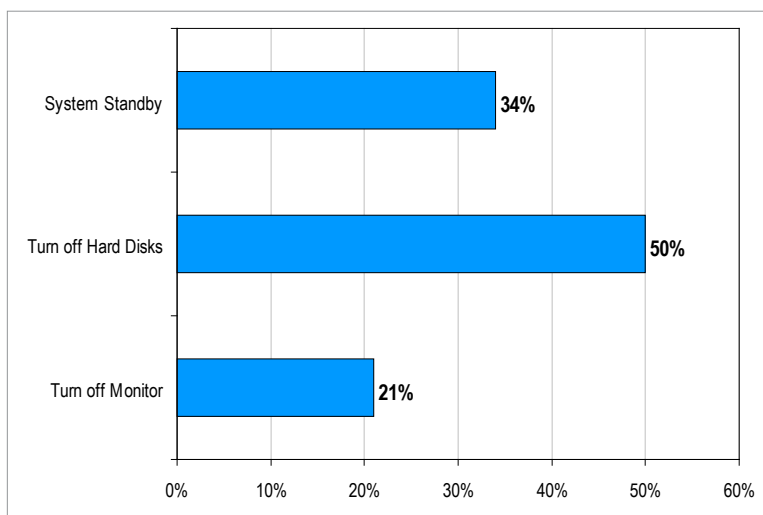


Figure 5: Average percentage of time each power saving feature was set to “Never”.

Power savings features become particularly critical for systems that are left fully operational out of regular work hours. EMA research indicated an astonishing 24% of respondents kept desktops fully operational 100% of the time. What’s more, on average, desktops were reported as being kept powered on 43% of non-work hours. After subtracting the common 40 hour work week from a standard week, this means desktops are kept operational but unused, on average, 55 hours each week. If these systems are not using power savings features, this equates to an unnecessary annual electricity cost of about US\$73 per desktop. For organizations with a large number of desktops, this quickly adds up to a considerable expense which would be significantly reduced by enforcing power savings features or completely eliminated by forcing out-of-hours client system shut downs.

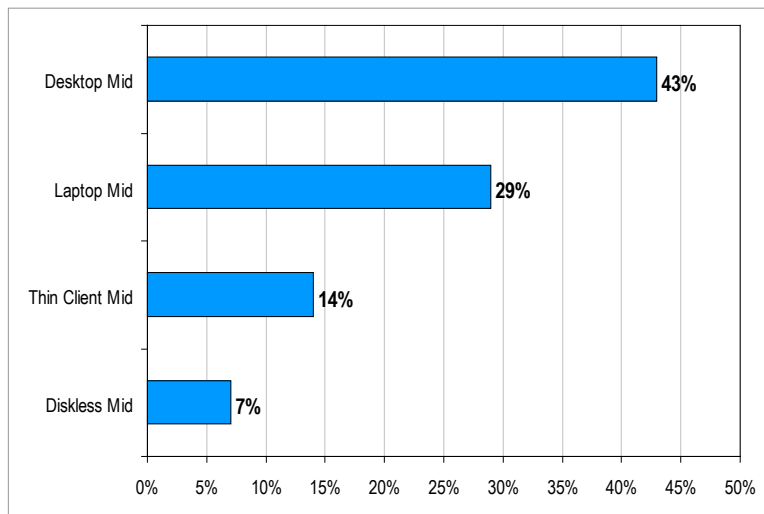


Figure 6: What percentage of time are each of the following client workstation types kept powered on during non-work hours (i.e. evenings and weekends)?

By incorporating EMA research data on actual workstation up-time, active use time, and power savings settings (see Appendix A for formulas and calculation methodologies) it can be determined that the average annual cost for desktop power consumption is US\$149.10. Collectively, this can add up to very significant energy costs and the larger the business, the greater the expense. Organizations with 10,000 deployed desktops will pay nearly one and a half million dollars annually to power them. Fortunately, this “force multiplier” also applies to cost savings that can be achieved through energy efficient solutions. Even small reductions in power consumption can add up to significant overall cost savings if applied to a large number of systems.

An excellent example of the cost savings potential is seen in the power consumption reduction achieved by replacing desktops with laptops which, as previously mentioned, are inherently designed to be more energy efficient. Applying the same calculations used for desktops to common practice data collected for laptops, the average annual cost for laptop power consumption is US\$23.26 or about 16% the energy cost of a desktop. An organization requiring 10,000 workstations would save nearly 1.26 million dollars annually simply by deploying laptops rather than desktops.

Number of Workstations	100	250	500	1000	5000	10000	50000	100000
Desktops	\$14,910	\$37,275	\$74,550	\$149,100	\$745,500	\$1,491,000	\$7,455,000	\$14,910,000
Laptops	\$2,326	\$5,815	\$11,630	\$23,260	\$116,300	\$232,600	\$1,163,000	\$2,326,000

Figure 7: Average annual power consumption costs (in US\$) by number of workstations

Obviously, every organization is different, and managers will need to balance cost savings with business requirements to ensure the solution provides optimal value to the enterprise. Still, it is evident that some specific organization types would be particularly well served by implementing energy efficient solutions. When average desktop power consumption is broken down by industry, government agencies clearly distinguish themselves as the least efficient. With a weekly power usage of 46.31 Kwh, this translates into a whopping US\$229.00 annual energy cost or roughly a third the cost of the desktop itself. High technology businesses, by contrast, show less than half the weekly desktop power consumption drawing only 21.07 Kwh. The indication here is that high technology organizations are more likely to have implemented power saving policies than government institutions.

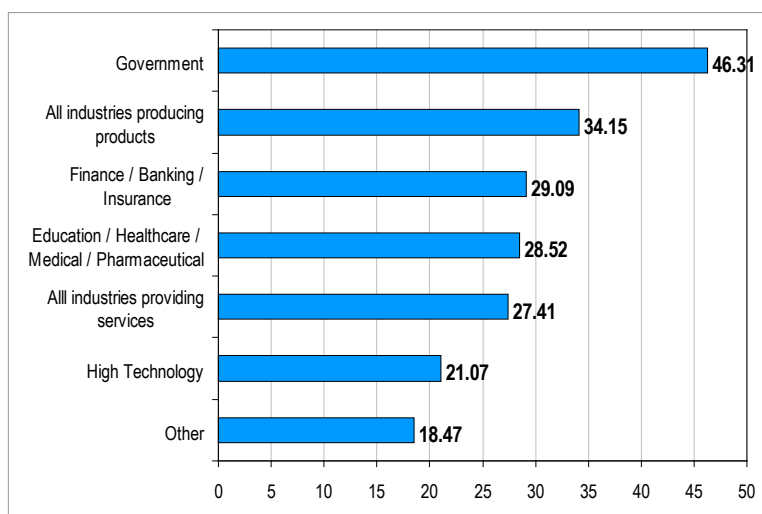


Figure 8: Weekly desktop power consumption (Kwh) by industry.

Organizational size also seems to affect the likelihood of power management policy introduction. Businesses with revenues greater than US\$100 million per year are spending 25% less in energy costs than businesses with smaller revenues. This shows a greater willingness of larger enterprises to implement energy reduction policies than small- and medium-sized businesses (SMBs) that are, ironically, more budget constrained and tend to focus more on specific business projects rather than operational improvements. By implementing some simple energy efficient solutions, however, SMBs can reduce operational costs so that they are better positioned to compete with larger businesses in their industry.

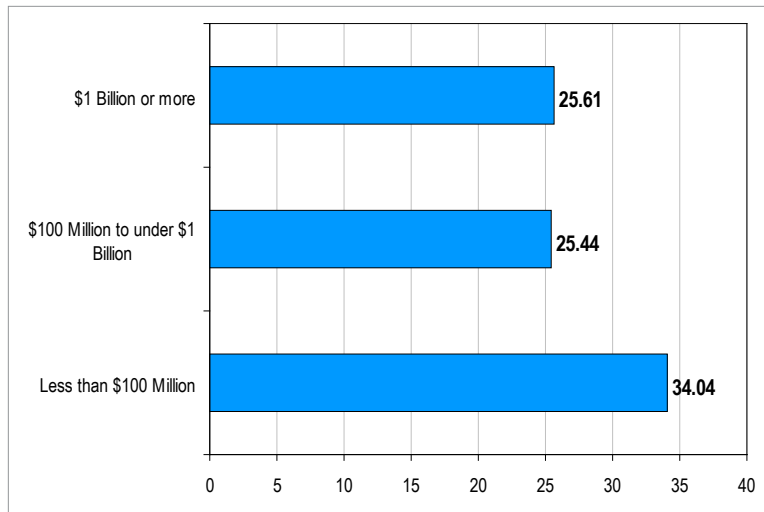


Figure 9: Weekly desktop power consumption (KwH) by revenue.

Energy Efficiency in the Data Center

For many organizations, data centers are the heart of their operations and the principle driver for achieving goals and profitability, so it should not be surprising that nearly half (47%) of respondents indicated greater than 70% of servers as “business critical.” This is even more applicable to SMBs as 25% of respondents from organizations with less than 2500 employees reporting greater than 90% of all servers are “business critical.” Clearly, smaller organizations have fewer resources and thereby maintain a greater reliance on existing systems. Larger organization, on the other hand, often silo projects and are less likely to maximize utilization by sharing resources across departments.

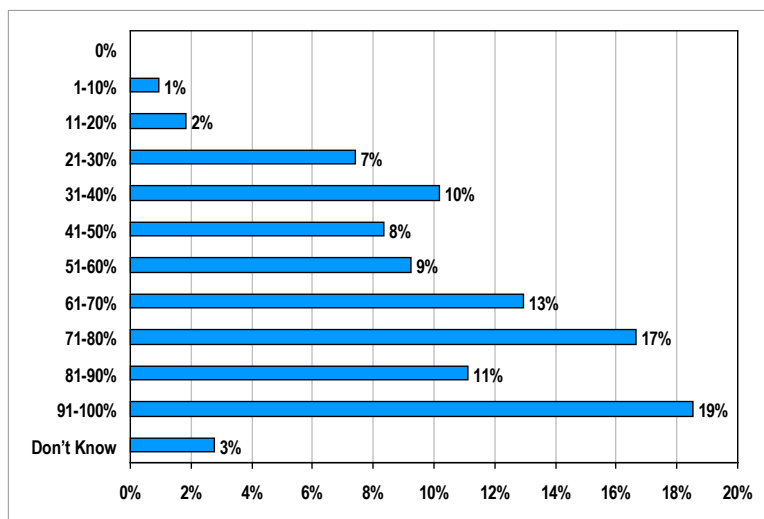


Figure 10: Approximately, what percentage of servers (by CPU) would be considered “business critical”?

From a Green IT perspective this poses two of the most significant challenges. IT operations need to maintain high-availability of critical systems while reducing power consumption. They also need to implement solutions that better utilize existing resources while dealing within the confines of organizational structures. The EMA study strongly indicated the need to overcome both these challenges in determining server utilization. On average, 52% of servers were reported to be kept fully operational 100% of the time and 82% were kept fully operational greater than 75% of the time. These numbers are exceptionally high considering the standard 40 hour work week only accounts for 24% of a total week, indicating that a large portion of server up-time is occurring during evening and weekend hours.

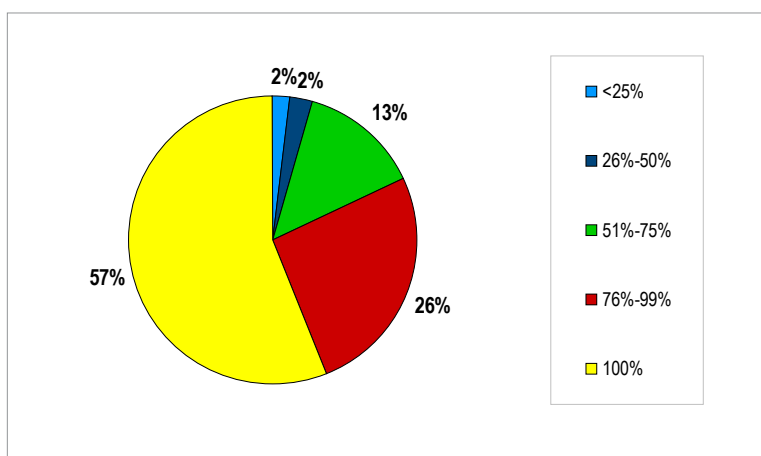


Figure 11: Please estimate the average percentage of time servers are kept fully operational?

Looking at this data another way, the average percentage of time servers are kept fully operational is 88%. This is the equivalent of 6.16 days out of a week. Interestingly, the same data indicated that 2/3 of the time servers are actually powered down they are placed in hibernation mode. Hibernation is the process of saving memory contents to hard disk prior to a shutdown of the most power consuming system components, such as monitor, hard disc and/or CPU. Although hibernation typically draws only a very minute amount of power when active, the feature is principally used in place of a full shutdown to accommodate faster boot times and to ensure active transactions are not lost during shutdown. Laptops often automatically use this feature to save data when a system reaches a low battery threshold, but it appears the technique is a fairly commonplace alternative to a full power-down on data center servers as a method to improve system availability.

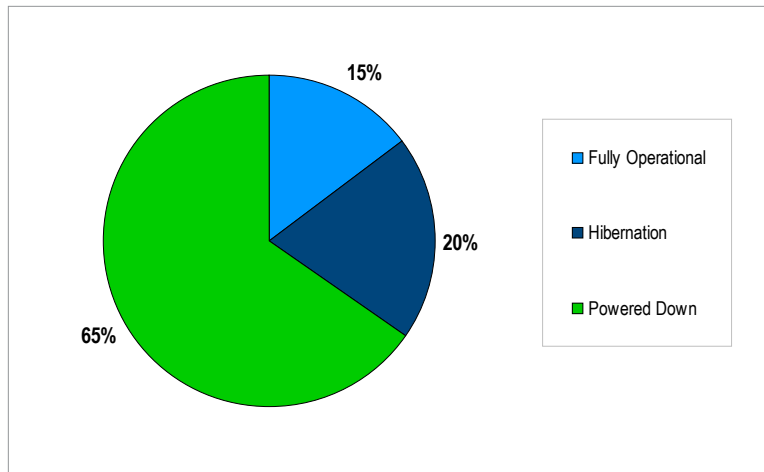


Figure 12: Please estimate the average percentage of time servers are kept in each of the following states.

Further supporting the assertion that data center servers are critical to business operations, the EMA study showed 81% of respondents indicated that the reason servers are kept operational during evening and weekend hours is to support a 24x7 business production environment. The indication here is that automated power management solutions alone will provide little improvement for reduction of power in the data center since the opportunity for down time is relatively small. Organizations alternatively encumbered by the second and third motivations for out-of-hours system activity – respectively, “to perform backups” and “to accommodate maintenance windows” – would definitely find value in an automated power management solution, but the majority of data center environments would more likely see greater value in improved system efficiency solutions such as server consolidation and virtualization.

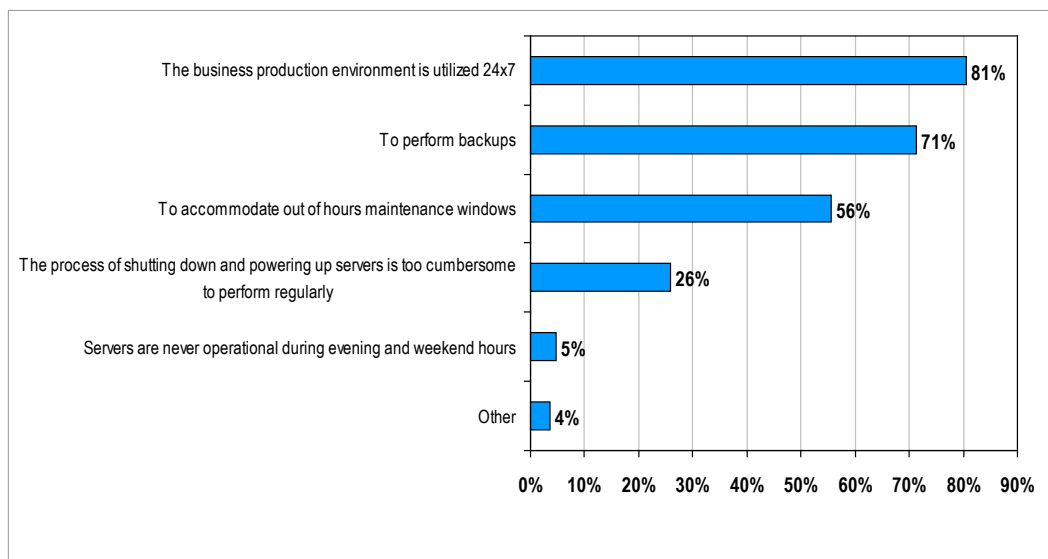


Figure 13: What are the primary reasons servers are kept operational during evenings and weekend hours. Select all that apply.

The survey further identified power consumption in the data center by determining percentage of power consumption by IT component. Not surprisingly, standard servers collectively constitute the most energy consuming portion (31%) of average data centers' configurations. Independent servers are still the most common resources supporting siloed approaches to IT management favored by traditional businesses that segment IT departments and projects with separate budgets and IT requirements. In this approach, servers can be purchased and implemented as needed by each independent business unit. This is a simple management process, but not very conducive to achieving energy efficiency – or cost effectiveness, for that matter.

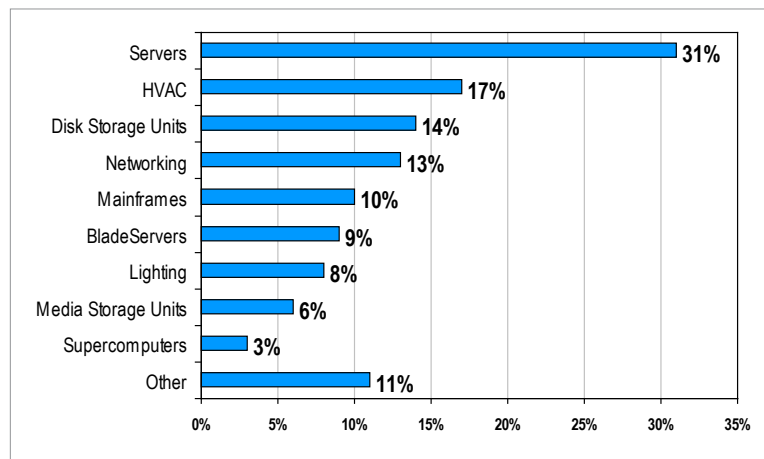


Figure 14: What is the estimated percentage of total power utilization for each element in your data center?

Large organizations are starting to understand this message. When power consumption is correlated with organization size, it becomes apparent that larger institutions (those with greater than 10,000 employees) have proportionally smaller energy utilization from independent servers. The reason for this can be accounted for in a sharp increase in mainframes, blade servers and supercomputers. Certainly, large organizations are in a better position to take advantage of server consolidation solutions since they typically see a proportionally larger requirement for computing resources, but this shouldn't detract from the value small- and mid-sized businesses can also achieve from these techniques if they can overcome the challenge of siloed departments so that large, energy efficient resources can be utilized across the entire IT infrastructure.

Second to servers, HVAC (heating, ventilation and air conditioning units) constitute, on average, the second most power consuming component in data centers. This often over-looked facilities requirement has a significant (17%) impact on overall data center energy utilization. Reducing HVAC power consumption does not necessarily mean raising temperature settings on cooling units, but more effectively involves reducing heat dissipation from IT components. This can be achieved by upgrading existing hardware to more heat efficient systems or by consolidating servers so that the number of heat producing equipment can be reduced. Careful planning of a data center configuration can also eliminate "hot spots" by reallocating hardware and improving air flow. An even heat distribution makes it easier for cooling units to achieve optimal temperatures throughout the data center.

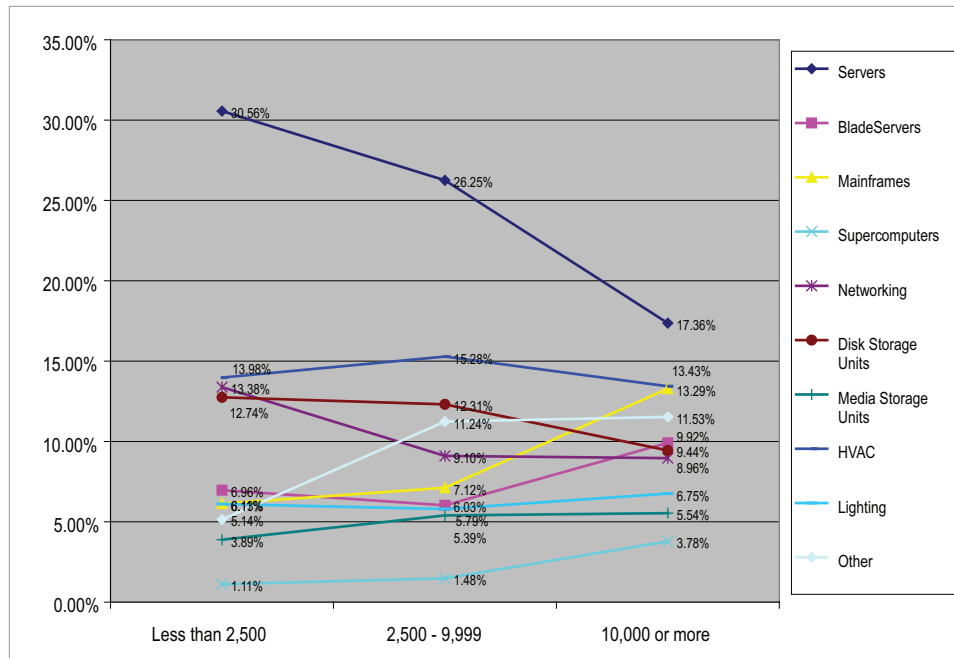


Figure 15: Power consumption by organization size. (Number of employees)

Green IT Deployments

As energy consumption continues to increase, the opportunity for greater power efficiencies also increases. Indeed, recent years have seen a greater focus on Green IT solutions focused specifically on improving energy efficiency. In fact, 57% of surveyed IT professionals indicated that their organization has implemented a Green IT initiative focused on improved power performance. What's more, the larger an organization, the greater the likelihood they have deployed a Green IT solution. 73% of institutions with 10,000 or more employees have implemented Green IT projects versus only 39% of organizations with less than 2,500 employees. Cost is likely a critical factor for smaller businesses in determining whether to deploy a Green IT solution. Although quantifiable return on investment can be achieved, implementation time and up-front budget necessary to deploy a solution is less accessible to smaller institutions.

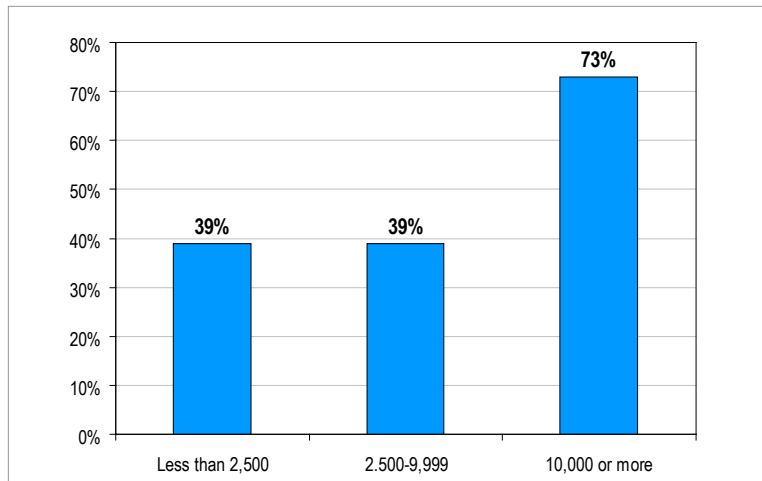


Figure 16: Percent of organizations (grouped by number of employees) that have implemented Green IT solutions.

Organizations implement Green IT solutions for a variety of reasons, but chief among them (not surprisingly) is “Reducing Energy Costs.” Eighty-two percent of respondents to the EMA survey indicated cost reduction as very important or extremely important to their enterprise. “Social Responsibility” was noted as the second greatest motivator with 56% indicating it as very or extremely important. Note that this is a completely different category from “marketing exposure” and indicates a more altruistic set of goals. Marketing, in fact, rated among the least important, ahead of only “white certificates commodity trading” (which is a relatively rare and location specific program).

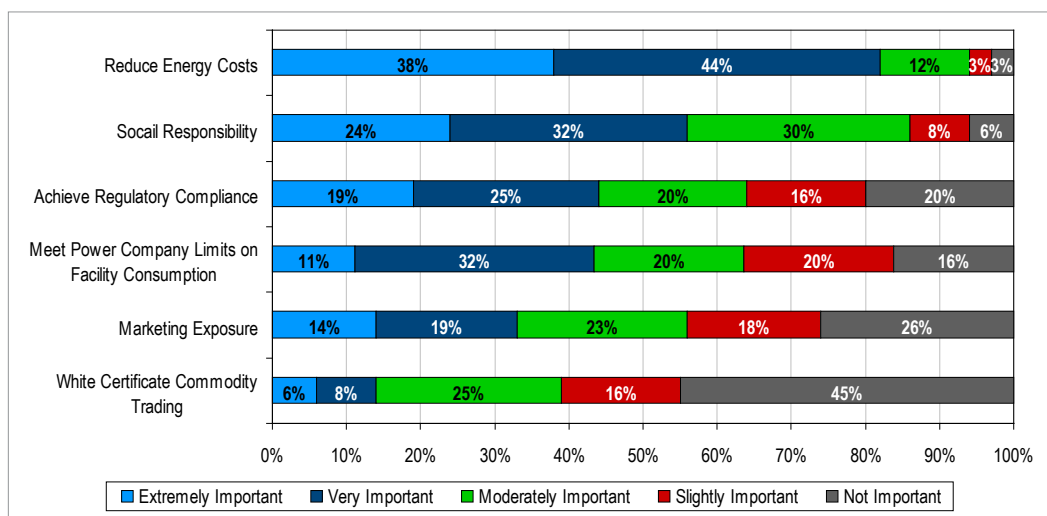


Figure 17: Motivators for implementing Green IT solutions by level of importance.

The top three Green IT disciplines that have been implemented, according the EMA primary research data, are all principally focused on reducing power consumption in the data center. “Consolidating servers” leads the pack with 79% of respondents indicating this as having been performed in their IT environment. This is not particularly surprising as basic server consolidation can be one of the easiest Green IT processes to implement – simply move data and services from one low use server to another

and retire the now redundant system. Upgrading hardware and virtualization solutions fall close behind server consolidation in the popularity ranking. Both of these can involve costly and time consuming implementation processes, but their value in improving computing efficiency continues well beyond the scope of Green IT.

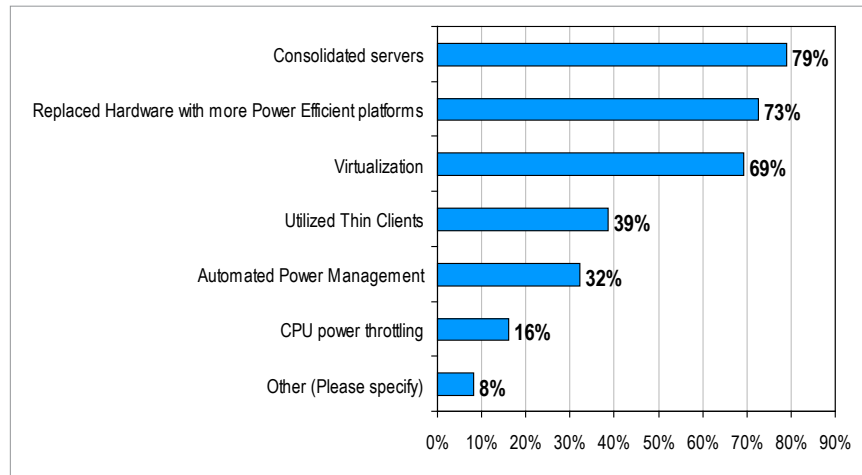


Figure 18: Which of the following Green IT initiatives has your company implemented? Select all that apply.

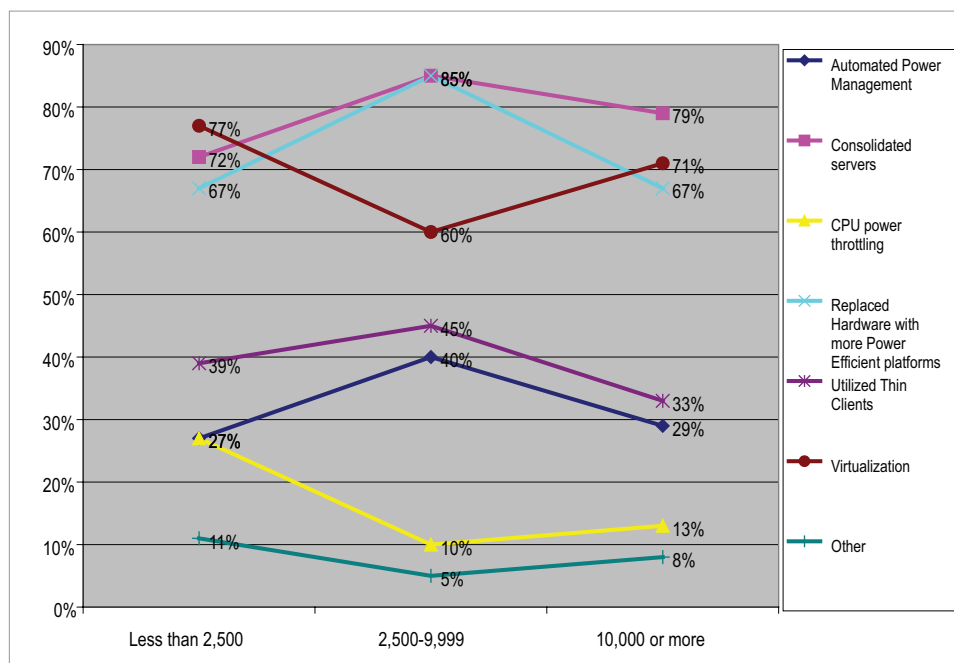


Figure 19: Popularity of Green IT solutions grouped by organizational size. (Number of employees)

Interestingly, the popularity of Green IT solutions remains fairly consistent across organization sizes. Even though a fewer number of small organizations are implementing Green IT initiatives, those that are place as much attention on the top three solutions as large enterprises.

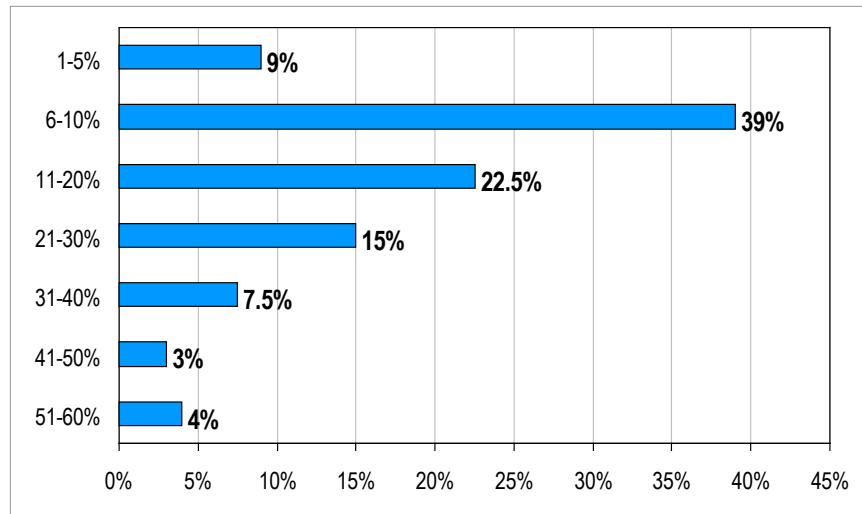


Figure 20: Approximately, how much of a reduction in power costs has been achieved since your company has implemented their Green IT solutions?

Naturally, managers of any size organization are apt to be concerned about achieving return on investment (ROI) for their implementation. Data from the EMA study offers a great deal of optimism in this regard. On average, respondents indicated a 19% reduction in energy costs since implementing a Green IT solution. The greatest power reductions reported were between 51% and 60%. This is encouraging in two ways. First, organizations considering implementing a Green IT solution can generally anticipate a 19% decrease in total energy costs. Given that monthly data center electricity bills alone are often five digits in size, a 19% decrease shows significant savings and justifiable ROI for most Green IT deployment. The second implication is that organizations which have already instituted a Green IT solution are likely to have potential for significantly improving energy use reduction. Enterprises currently seeing only a 10% reduction since implementing a solution could possibly achieve 60% total reduction (or even greater, if some claims are to be believed).

By breaking out power consumption averages by Green IT discipline, ROI opportunities become clearer. The top three most beneficial Green IT solutions – respectively, utilizing thin clients, CPU power throttling, and automated power management – were the least commonly deployed solutions. Two of the three (thin clients and automated power management) achieve their superior energy efficiency by taking advantage of the vastly greater numbers desktops have over data center servers. CPU power throttling shows great promise for improved power efficiency, but the technology is currently only really utilized on large (and somewhat expensive) data center servers – hence the reason only 14% of respondents have deployed this solution.

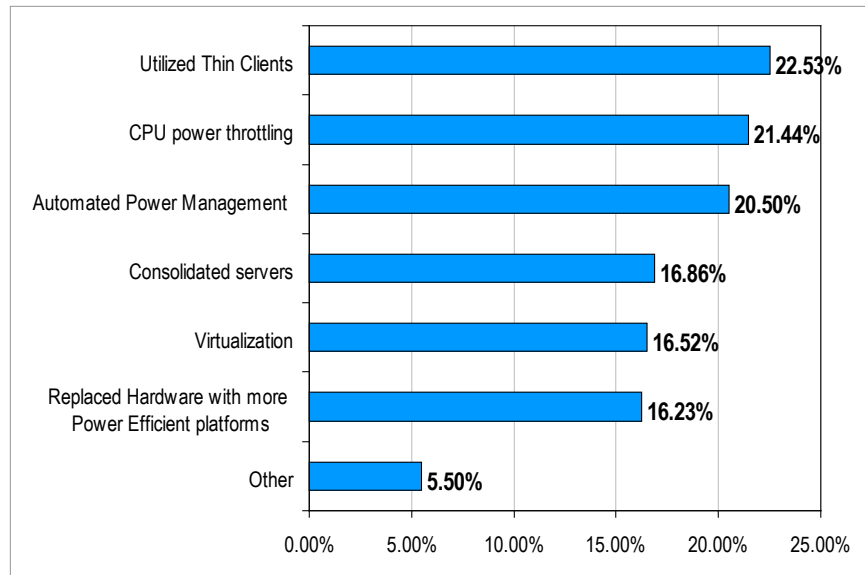


Figure 21: Mean percentage of cost reduction by Green IT solution.

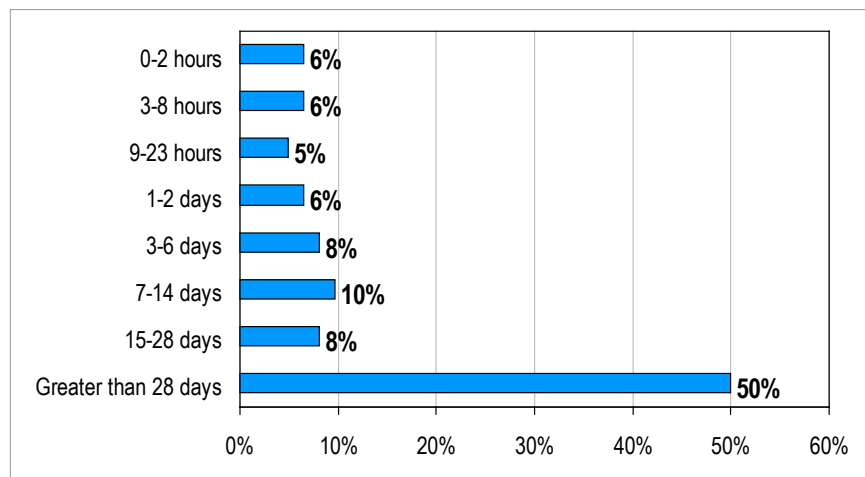


Figure 22: How much employee time was spent implementing your company's Green IT solutions?

Among the greatest challenges faced when implementing a Green IT initiative is designating the deployment time necessary to fully complete a process installation. According to the EMA study, fully half of respondents indicated implementation times took more than a month to complete. On the other hand, 42% stated that they completed deployment within a week.

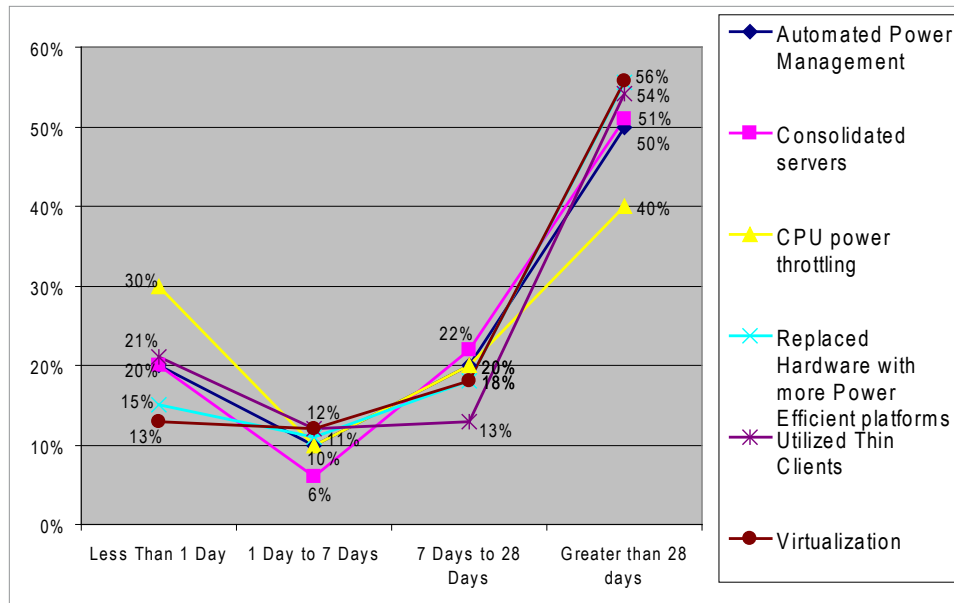


Figure 23: Green IT implementation times by solution.

When implementation times are broken out by Green IT solution, they indicate only subtle differences. On average, virtualization and hardware upgrades apparently take the longest to complete, but only slightly more so than utilizing thin clients and server consolidation, which are likely still relatively high on the list because of the hardware installations involved. Automated power management shows a very slight overall improvement, probably because it is a software based solution. Deploying servers that can perform CPU power throttling appears to be the least time consuming to implement, but this will likely be dependent on whether this is a new system being deployed or an existing system that is simply having the feature activated.

The future of Green IT looks very bright as 100% of all knowledgeable IT respondents indicated plans for their organization to implement solutions in the coming year. Virtualization in particular shows increased popularity with hardware upgrades and server consolidation still maintaining strong positions. Automated Power Management, however, shows a significant increase over present implementations, and, among larger organizations (with greater than 10,000 employees) CPU power throttling sees a huge increase in popularity, with 42% of those surveyed indicated the intent to implement over the next year.

It is certainly encouraging to see strong commitments to achieving energy efficiency. As new technologies are developed and the value of existing solutions continues to grow in acceptance, adoption rates of Green IT initiatives are sure to increase, improving the value of IT investments for a broader community and helping to achieve long-term global energy sustainability.

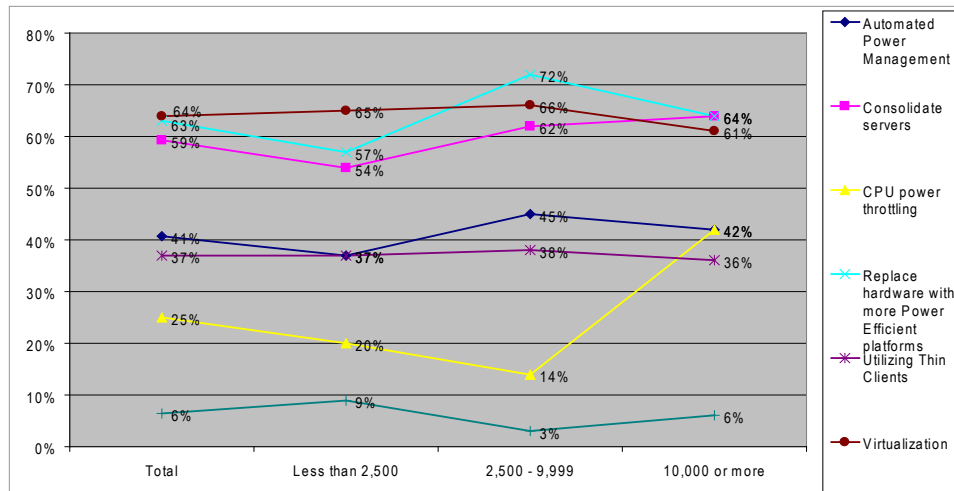


Figure 24: Planned Green IT implementations by company size. (Number of employees)

EMA Perspective

In recent days, there has been a good deal of confusion over the true value of Green IT solutions. On the one hand, vendors are claiming their solutions have facilitated as much as 80% or even greater energy reduction in some installations. Many business managers, however, are rather skeptical whether there is any true return on investment (ROI) that could be achieved by potentially costly Green IT solutions. The reality, as is often the case, lies somewhere in the middle of these presumptions. Even though the average reduction in energy cost of 19%, as determined in the EMA study, doesn't approach the claims of 80% or greater cost savings, this still indicates organizations are achieving appreciable ROI. Given that the average large business data center typically has a five digit monthly electric bill, a 19% saving is still quite significant and easily covers implementation costs for most solutions in a very short period of time.

But exactly which of the Green IT solutions actually provides the greatest ROI? Certainly every organization is going to have its own set of requirements and should judge the value of the existing solutions based on which best fits its business model. As a general rule, however, consider that of the three disciplines the study indicated provide the largest reduction in energy costs, two of them (deploying thin clients and upgrading servers to utilize power throttling) involve significant up-front hardware investment. Only automated power management achieves substantial cost reduction with relatively little up-front investment and with an average implementation time that just edges out over most of the other solutions as easiest to deploy.

To achieve higher percentages of energy efficiency across an IT infrastructure, a holistic approach involving multiple Green IT disciplines should be adopted. The solutions should be implemented across the enterprise to ensure all departments and projects are optimally utilizing IT investments. Many organizations have successfully established Green IT Governance bodies that can coordinate the various IT and facilities management teams so that they can share energy efficient equipment and utilize common power reduction services. This maximizes ROI both with the Green IT solution and the IT investment itself.

Green IT solutions do indeed bring quantifiable value to IT implementations. It is simple numbers – the more power consumption is reduced, the greater the financial savings to the organization. Primary EMA research has indicated the potential for significant improvements. Only 57% of respondents indicated Green IT initiatives have been implemented and even those to only a limited extent. With so much potential for new deployments, it is assured that Green IT implementations will grow in both popularity and value over the next few years. EMA recommends all enterprises implement energy efficient Green IT solutions both in the data center and on end-user workstations to reduce operational costs, meet organizational goals and achieve long-term sustainability. It's just good business sense.

About Kaseya

Kaseya is a global provider of IT automation software for IT Solution Providers and Public and Private Sector IT organizations. Kaseya's IT Automation Framework allows IT Professionals to proactively monitor, manage and maintain distributed IT infrastructure remotely, easily and efficiently with one integrated Web based platform. Kaseya's technology is licensed on over three million machines in over 25 countries around the world. For more information please visit www.kaseya.com.

Appendix A: Calculations for Determining Workstation Consumption

To calculate annual power consumption of desktops and laptops based on data collected as part of the EMA Green IT primary research on real-world workstation utilization and practices, the following data, formulas and methodology was utilized:

Assumptions

The following data was reported by the U.S. Department of Energy (DoE):

- Desktop Power Consumption
Source: DoE web-site; “A Consumer’s Guide to energy Efficiency and Renewable Energy – Estimating Energy Use”
 - CPU – awake / asleep = .120 / .030
 - Monitor – awake / asleep = .150 / .030
 - Hard Disk - .002
- Laptop Power Consumption
Source: DoE web-site; “A Consumer’s Guide to energy Efficiency and Renewable Energy – Estimating Energy Use”
 - CPU – awake / asleep = .020 / .015
 - Monitor – awake / asleep = .030 / .020
 - Hard Disk - .002
- US National Average Electricity Cost
Source: Energy Information Administration web-site; “Average Retail Price of Electricity to Ultimate Customers by End-Use Sector”
 - As reported for the commercial sector for the month of April 2008: 9.51 cents/KwH

Variables

The following variables were taken from the EMA Green IT primary research data. Mean averages were used to determine common workstation practices.

- **Variable_A** = Average percentage of time that workstation is actually powered on
- **Variable_B** = Percentage of average workday spent actively using workstation
- **Variable_C** = Percentage of time workstation is kept powered on during non-work hours (i.e., evenings and weekends)
- **Variable_D** = Percentage of time workstation is kept in hibernation mode during an average week day (including both work and non-work hours)
- **Variable_E** = Percentage of respondents that indicate “Never” setting for “Turn off Monitor”
- **Variable_F** = Percentage of respondents that indicate “Never” setting for “Turn off Hard Disk”

- **Variable_G** = Percentage of respondents that indicate “Never” setting for “System Standby”
- **Variable_H** = Average system inactivity time (in minutes) prior to initiating “Turn off Monitor”
- **Variable_I** = Average system inactivity time (in minutes) prior to initiating “Turn off Hard Disk”
- **Variable_J** = Average system inactivity time (in minutes) prior to initiating “System Standby”

Formulas

Formulas were developed using standard Microsoft Excel nomenclature.

- **Formula_A** = $Variable_A = Variable_B$
- **Formula_B** = $(Variable_C \times .762) + (Variable_A \times .238)$
- **Formula_C** = $[(Variable_C \times .762) + (Variable_A \times .238)] = Variable_B$
- **Formula_D** = $(Variable_D / 100) \times 168$
- **Formula_E** = $MAX(Variable_H:Variable_J)$
- **Formula_F** = $IF(Variable_H < Variable_J, Variable_H, Variable_J)$
- **Formula_G** = $IF(Variable_I < Variable_J, Variable_I, Variable_J)$
- **Formula_H** = $IF(Formula_E > Formula_A, Formula_E, Formula_A)$
- **Formula_I** = $IF(Variable_E < Variable_G, Variable_E, Variable_G)$
- **Formula_J** = $IF(Variable_F < Variable_G, Variable_F, Variable_G)$
- **Formula_K** = $MAX(Variable_E:Variable_G)$
- **Formula_L** (Weekly Desktop Power Consumption in Kwh) =

$$\begin{aligned} & [(Variable_A/100 \times 40) \times .27] + \\ & <\{[Variable_H - (Variable_H - Formula_F)] / 60\} \times .15 \times 5> + \\ & <\{[(Formula_E - Variable_H) + (Variable_H - Formula_F)]/60\} \times .03 \times 5> + \\ & <\{[Variable_I - (Variable_H - Formula_G)] / 60\} \times .12 \times 5> + \\ & <\{[(Formula_E - Variable_I) + (Variable_I - Formula_G)]/60\} \times .002 \times 5> + \\ & \{[(Variable_I - Formula_G)/60] \times .028 \times 5\} + \\ & \{[(Formula_E - Formula_G)/60] \times .028 \times 5\} + \\ & <[(Formula_A - Formula_H)/100 \times 40] \times \{[100 - (Variable_E - Formula_J)]/100 \times .03\}> + \\ & <[(Formula_A - Formula_H)/100 \times 40] \times \{[100 - (Variable_F - Formula_J)]/100 \times .002\}> + \\ & \{[(Formula_A - Formula_H)/100 \times 40] \times [(100 - Variable_G)/100 \times .06]\} + \\ & \{[128 \times (Variable_C/100)] \times [(100 - Variable_E)/100 \times .03]\} + \\ & \{[128 \times (Variable_C/100)] \times [(Variable_E)/100 \times .15]\} + \end{aligned}$$

$$\begin{aligned} & \{[128 \times (Variable_C/100)] \times [(100 - Variable_F)/100 \times .002]\} + \\ & \{[128 \times (Variable_C/100)] \times [(Variable_F)/100 \times .12]\} + \\ & \{[128 \times (Variable_C/100)] \times [(Variable_G - Formula_I)/100] \times .03\} + \\ & \{[128 \times (Variable_C/100)] \times [(Variable_G - Formula_J)/100] \times .03\} + \\ & <[128 \times (Variable_C/100)] \times \{[Variable_G - (Variable_G - Formula_J)]/100\} \times .028> + \\ & \{[128 \times (Variable_C/100)] \times [(100 - Variable_K)/100] \times .27\} \end{aligned}$$

- **Formula_M** (Weekly Laptop Power Consumption in KwH) =

$$\begin{aligned} & [(Variable_A/100 \times 40) \times .05] + \\ & <\{[Variable_H - (Variable_H - Formula_F)] / 60\} \times .02 \times 5> + \\ & <\{[(Formula_E - Variable_H) + (Variable_H - Formula_F)]/60\} \times .015 \times 5> + \\ & <\{[Variable_I - (Variable_H - Formula_G)] / 60\} \times .02 \times 5> + \\ & <\{[(Formula_E - Variable_I) + (Variable_I - Formula_G)]/60\} \times .002 \times 5> + \\ & \{[(Variable_I - Formula_G)/60] \times .018 \times 5\} + \\ & \{[(Formula_E - Formula_G)/60] \times .018 \times 5\} + \\ & <[(Formula_A - Formula_H)/100 \times 40] \times \{[100 - (Variable_E - Formula_J)]/100 \times .02\}> + \\ & <[(Formula_A - Formula_H)/100 \times 40] \times \{[100 - (Variable_F - Formula_I)]/100 \times .002\}> + \\ & \{[(Formula_A - Formula_H)/100 \times 40] \times [(100 - Variable_G)/100 \times .035]\} + \\ & \{[128 \times (Variable_C/100)] \times [(100 - Variable_E)/100 \times .02]\} + \\ & \{[128 \times (Variable_C/100)] \times [(Variable_E)/100 \times .015]\} + \\ & \{[128 \times (Variable_C/100)] \times [(100 - Variable_F)/100 \times .002]\} + \\ & \{[128 \times (Variable_C/100)] \times [(Variable_F)/100 \times .02]\} + \\ & \{[128 \times (Variable_C/100)] \times [(Variable_G - Formula_I)/100] \times .02\} + \\ & \{[128 \times (Variable_C/100)] \times [(Variable_G - Formula_J)/100] \times .015\} + \\ & <[128 \times (Variable_C/100)] \times \{[Variable_G - (Variable_G - Formula_J)]/100\} \times .018> + \\ & \{[128 \times (Variable_C/100)] \times [(100 - Variable_K)/100] \times .05\} \end{aligned}$$

- **Average Annual Power Costs Per Desktop** = $(Formula_L \times .0951) \times 52$
- **Average Annual Power Costs Per Laptop** = $(Formula_M \times .0951) \times 52$

Appendix B: Methodologies and Demographics

For this research, EMA hosted an extensive Web-based survey crafted independently by EMA expert analysts in the Systems Management practice. The survey was divided into two distinct sections. The first, targeting end-user workstation practices, was opened to all business professionals across all industry sectors and was limited by only one qualifying question:

- Do you use a computer workstation (desktop, laptop, thin client or diskless client) as part of your regular job function?

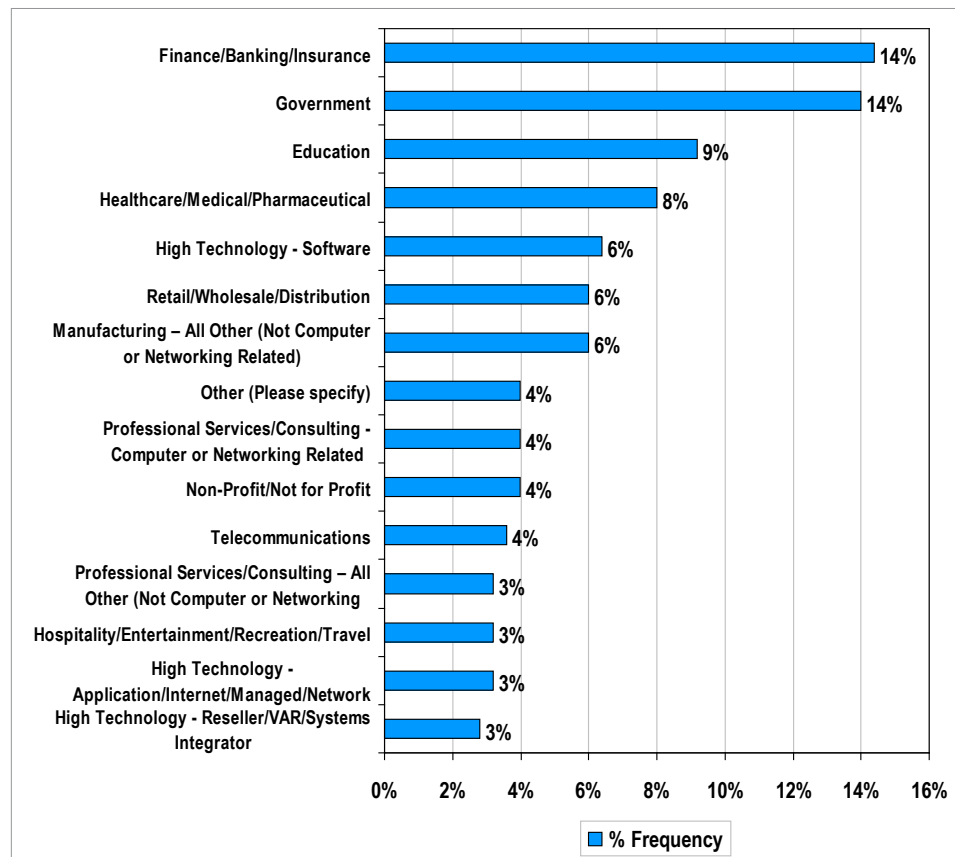
Respondents that answered “No” to the initial qualifying question were rejected. Those that answered “Yes” were issued all questions related to workstation utilization and then given the opportunity to participate in the second section. The second section focused on practices in the data center and invited knowledgeable IT professionals to provide details of server power consumption, system utilization and Green IT initiatives. Qualifying respondents indicated affirmative to the following question:

- Do you have working knowledge of your company’s IT operations; including the system and power usage of your company’s data center and business critical servers?

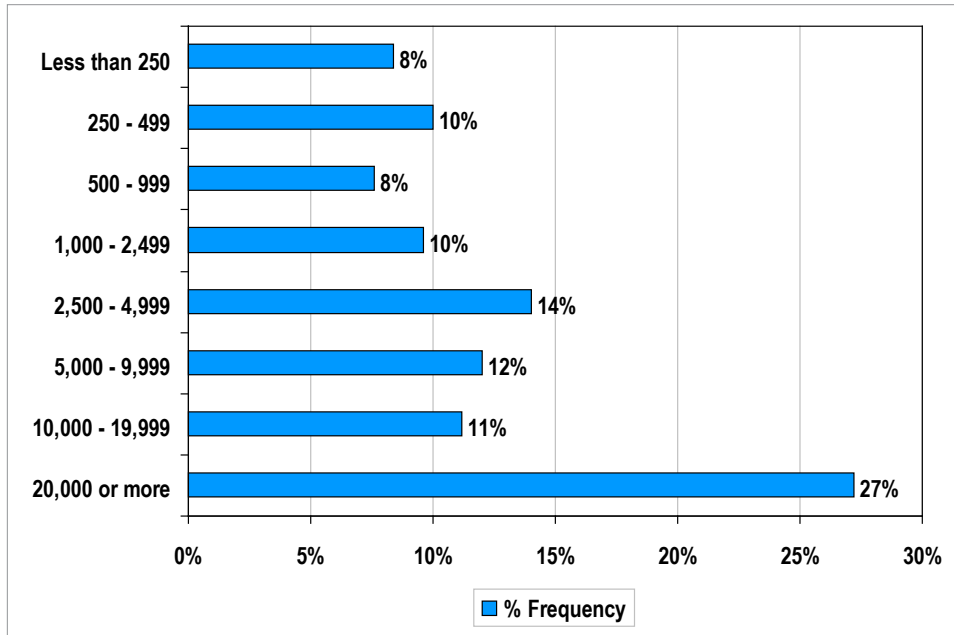
In total, section 1 netted 250 responses, 108 of which continued on to complete section 2. Sponsors had no direct involvement in or influence on the survey creation or execution, nor in any of the subsequent evaluation and analysis of the results.

Full demographic details are included below:

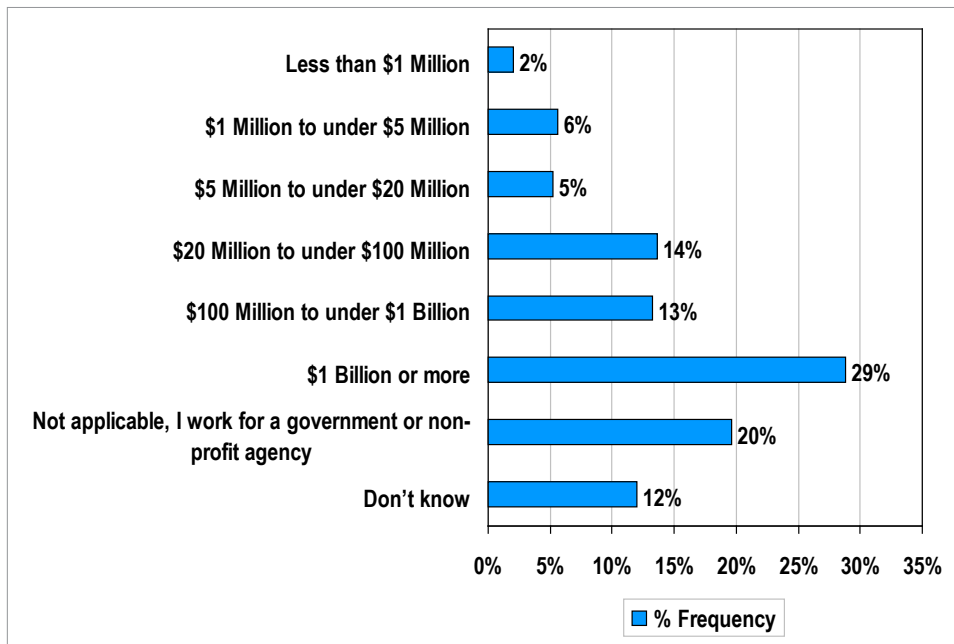
Which of the following best describes your company’s primary industry?



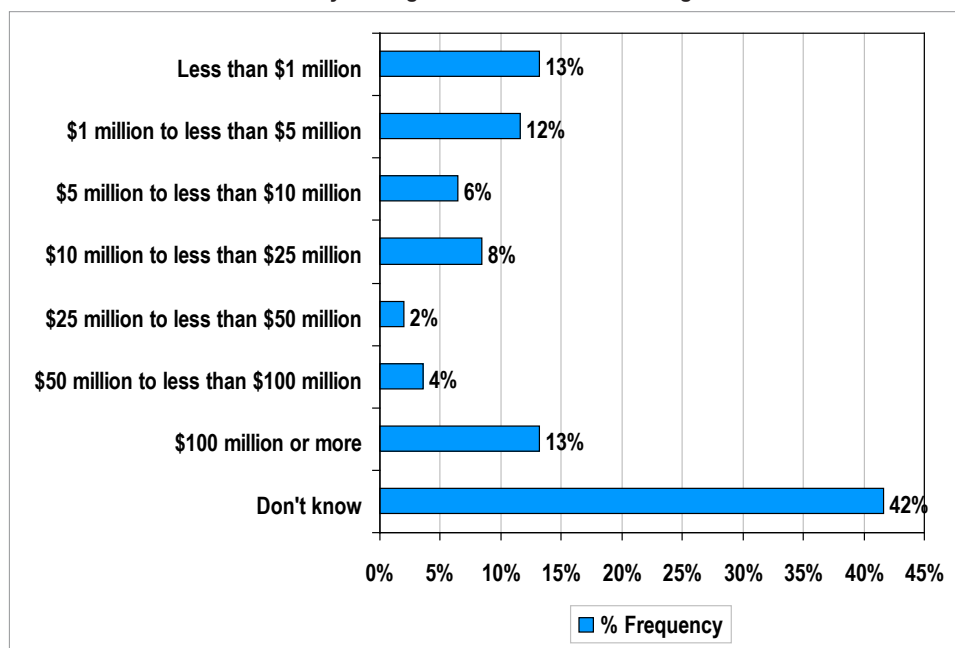
How many employees are in your company worldwide?



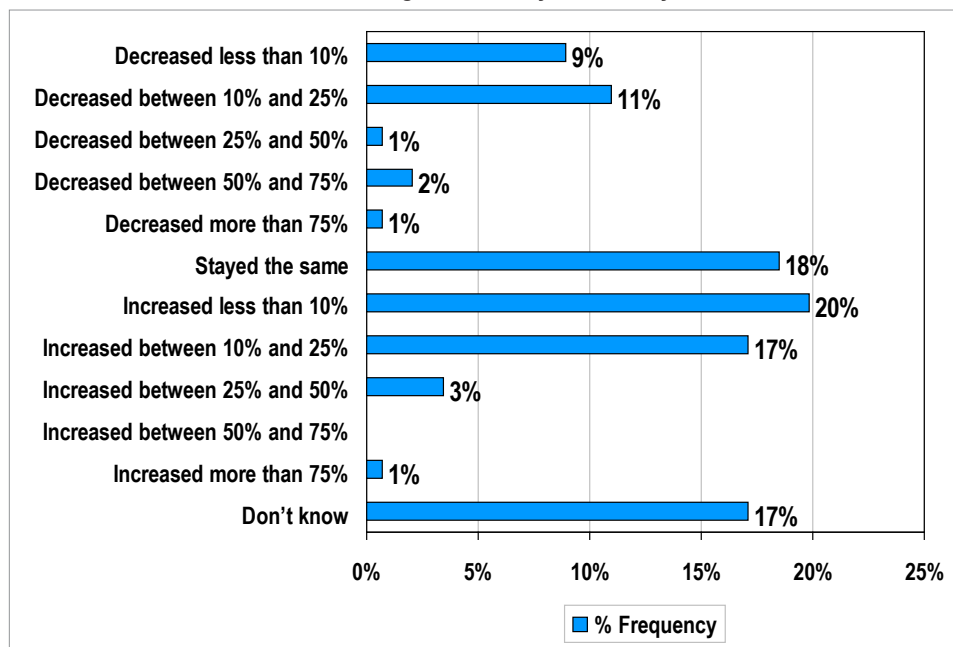
What is your organization's annual revenue?



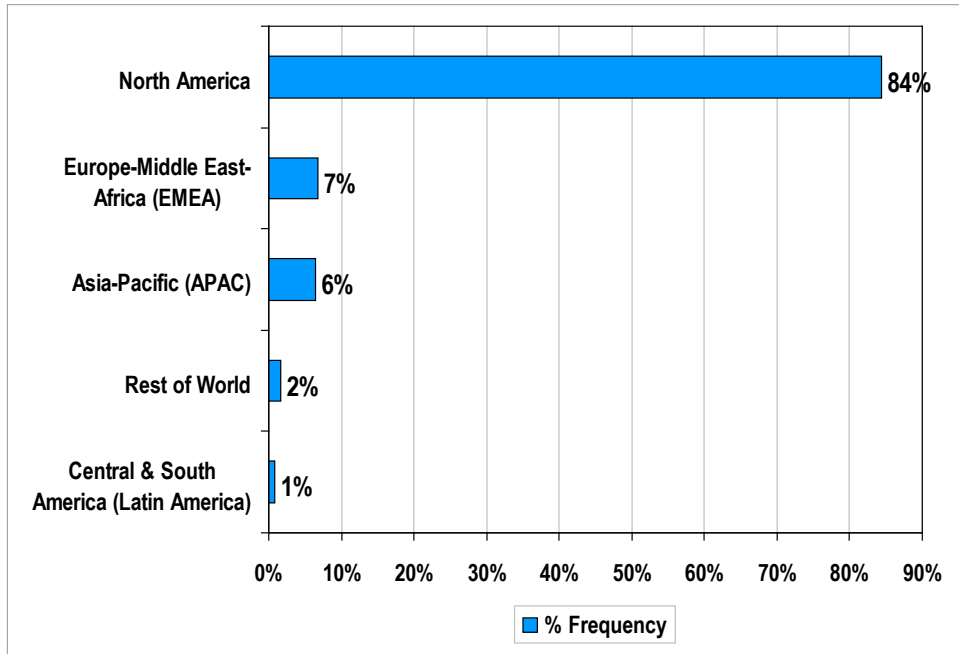
What is your organization's annual IT budget?



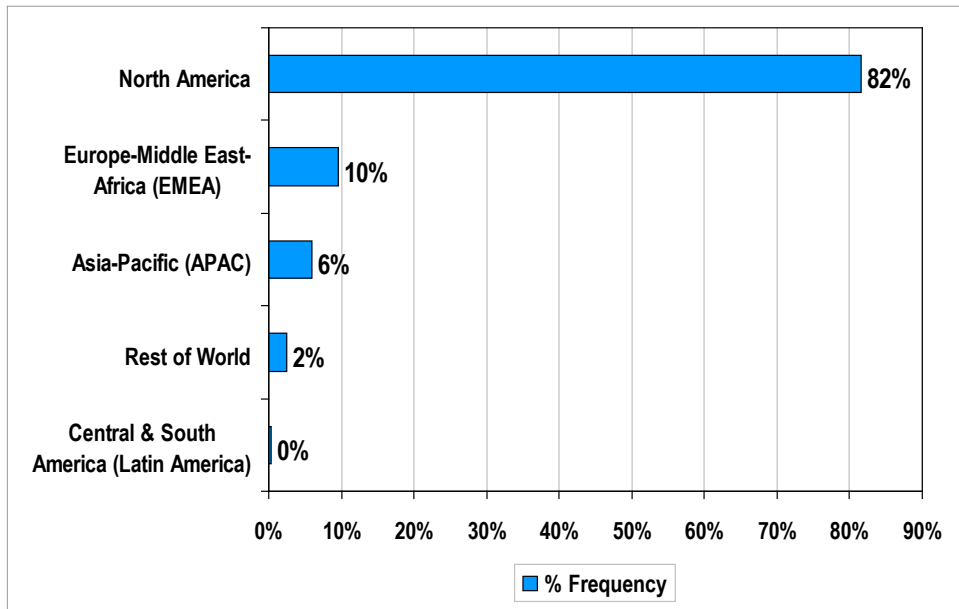
What was the percentage increase or decrease of your organization's annual IT budget from last year to this year?



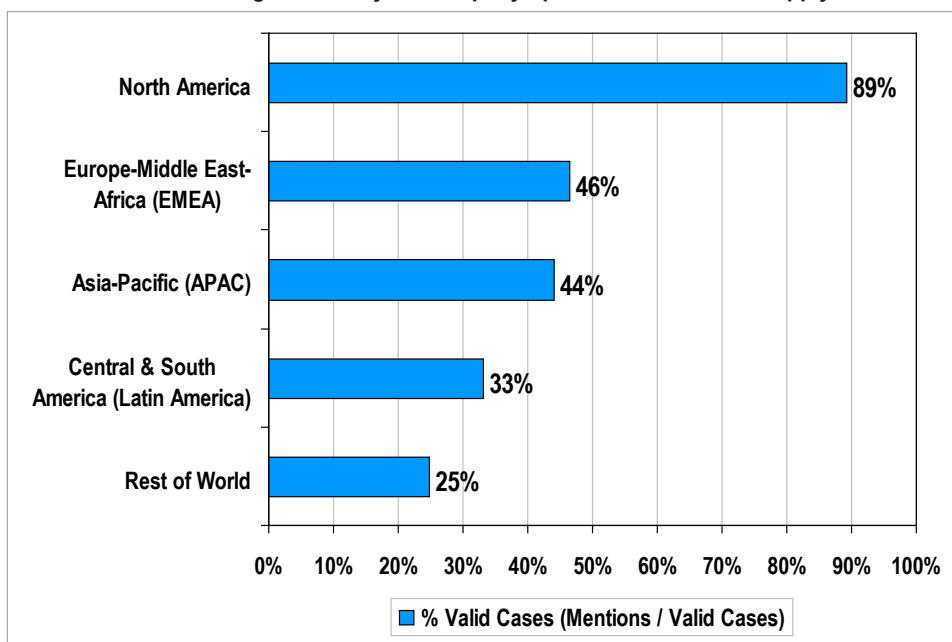
In which region is your corporate headquarters located?



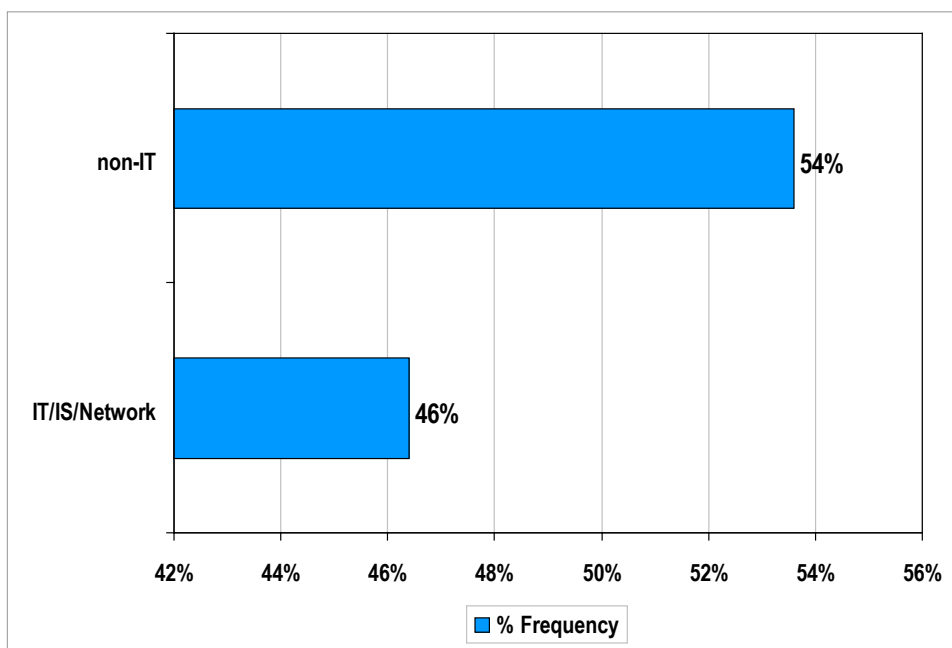
In which region are you located?



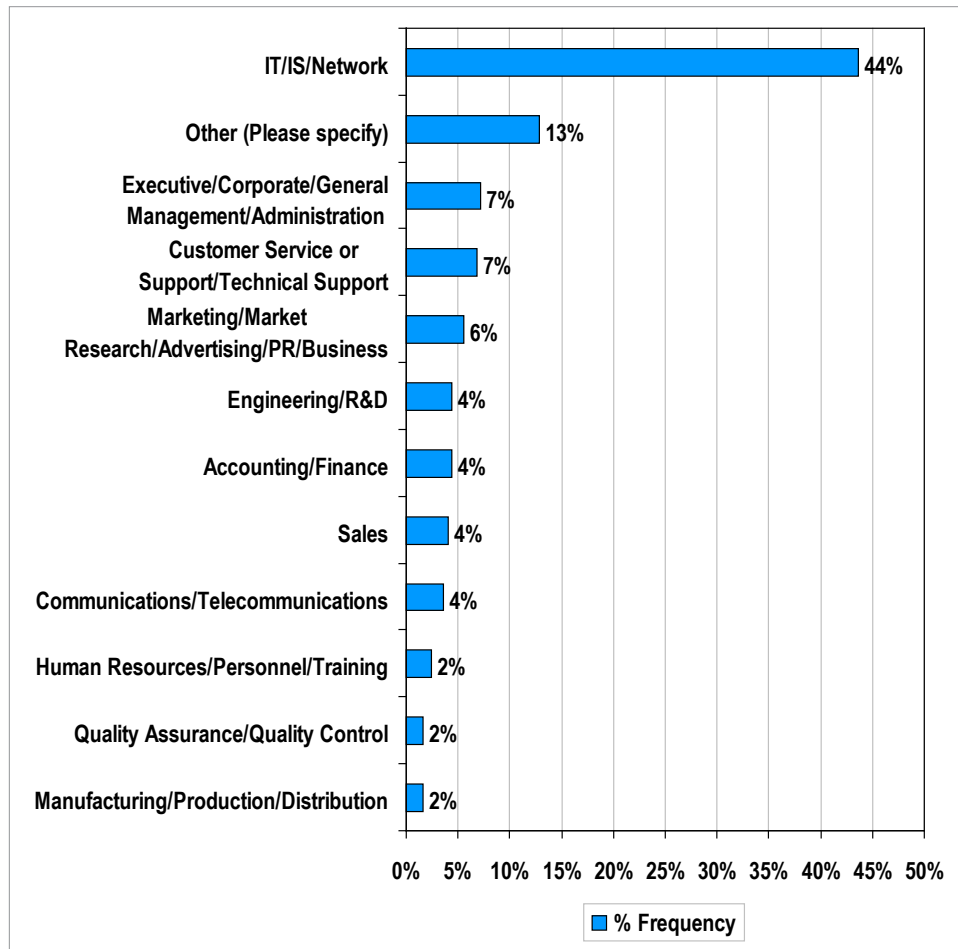
In which regions does your company operate? Select all that apply.



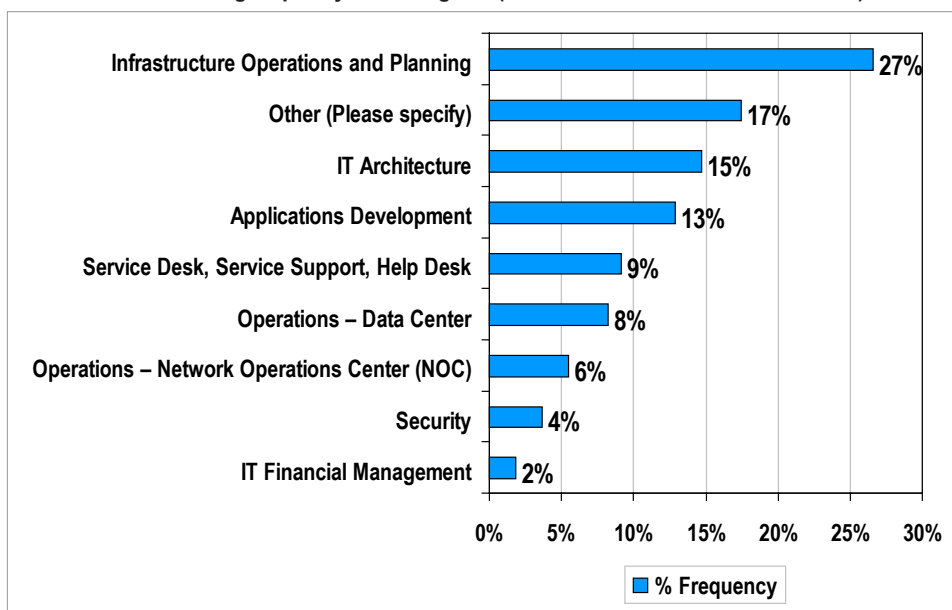
Non IT vs IT/IS/Network



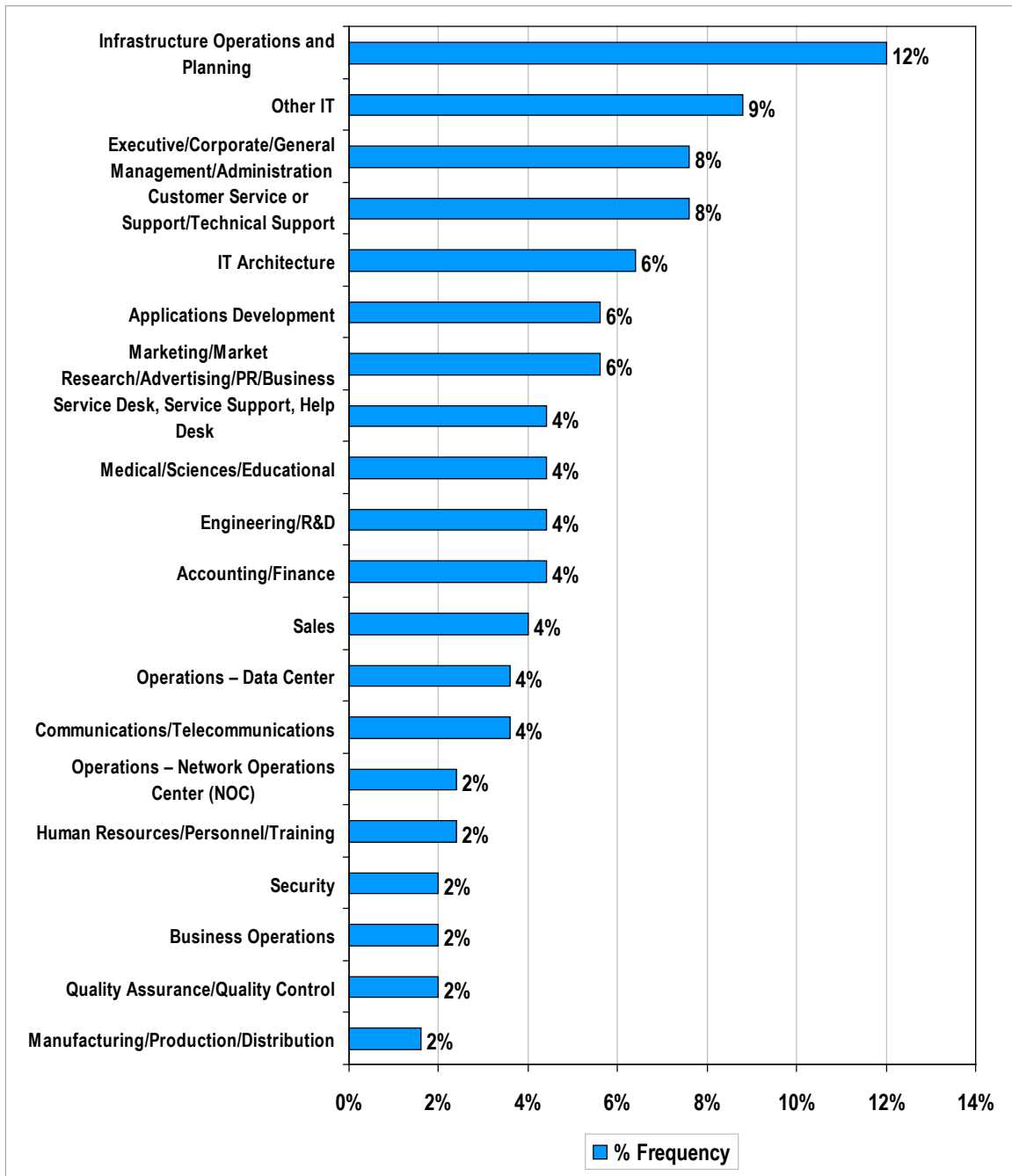
Which of the following best describes the department or functional area in which you work?



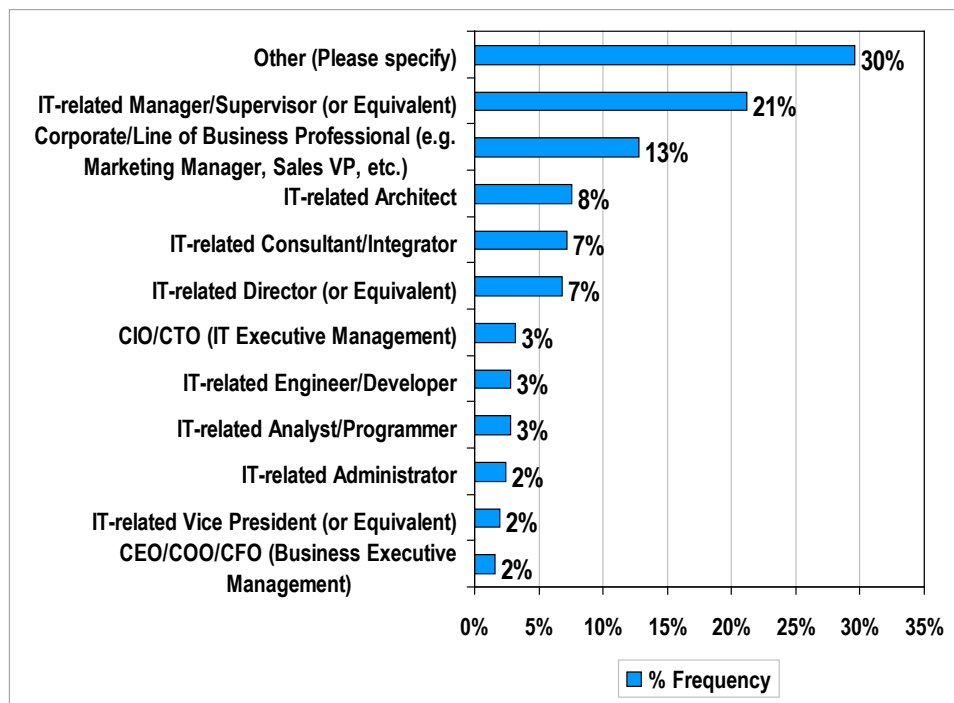
You have indicated that IT/IS/Network best describes the department or area in which you work. Within this area, which group do you belong to? (Choose the most relevant answer.)



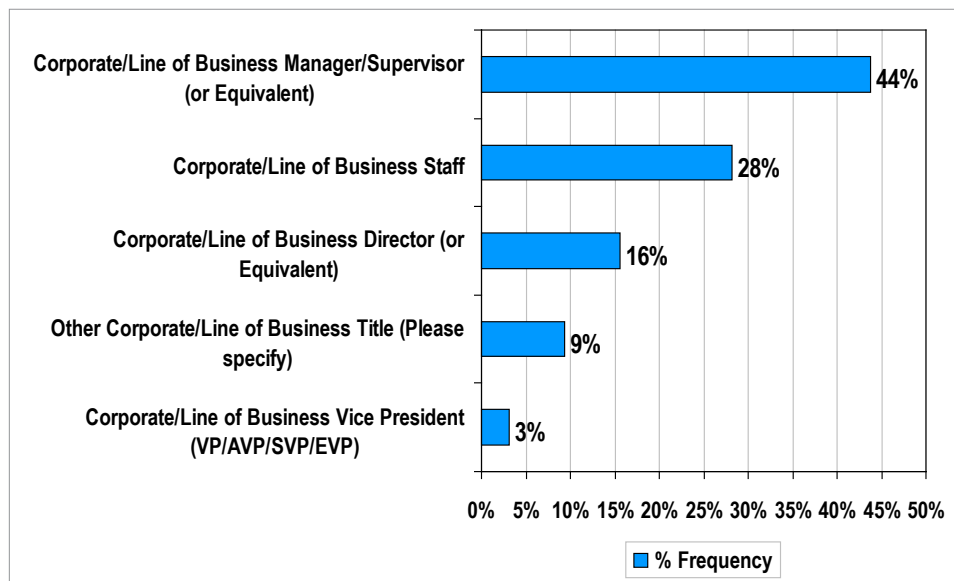
Department Recorded



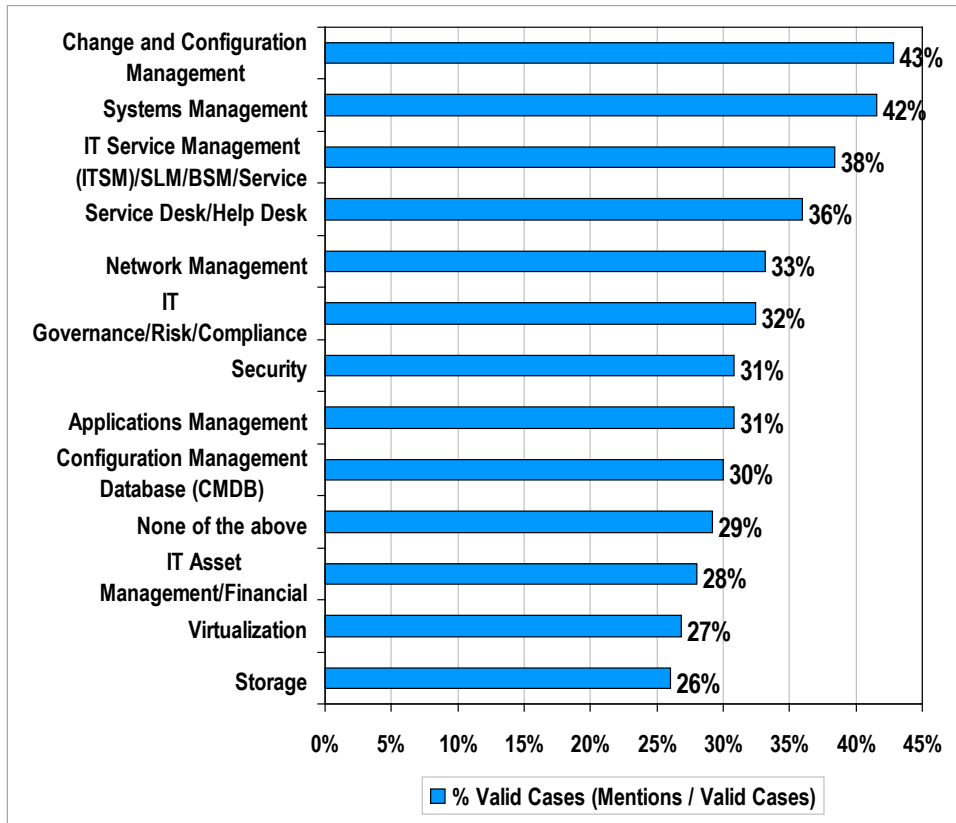
Which of the following best describes your role in the organization?



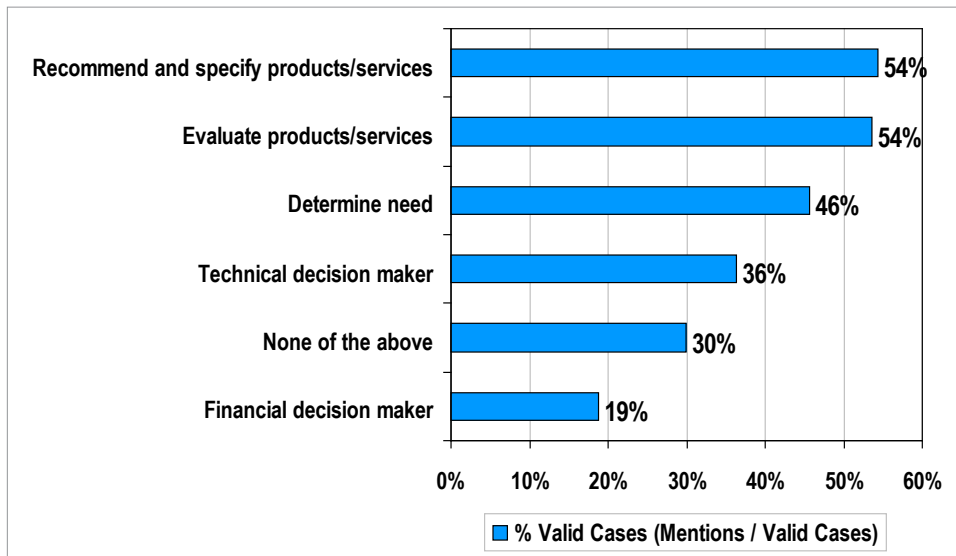
You have indicated that Corporate/Line of Business Professional best describes your role in the organization. Please indicate which of the following best describes your title?



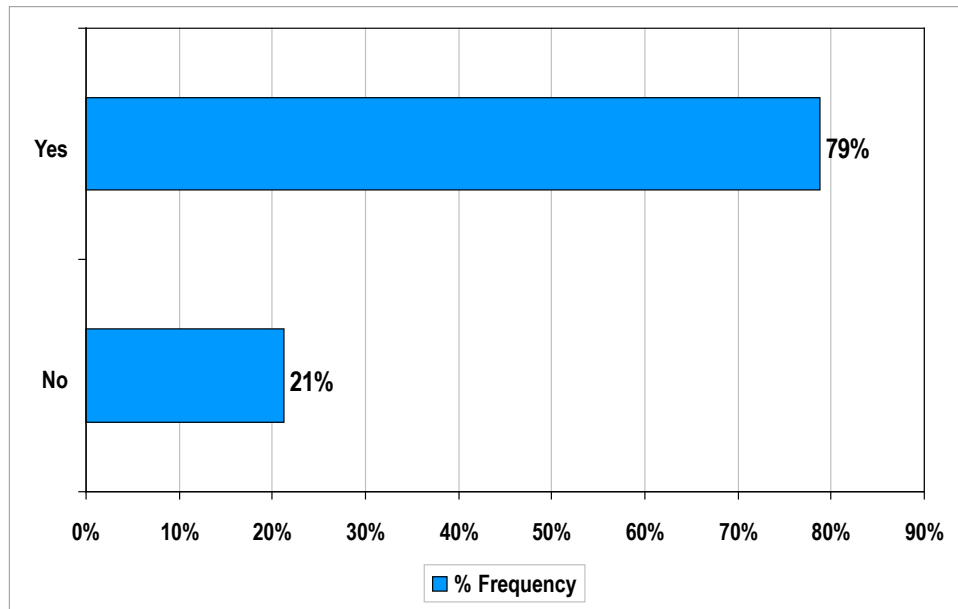
For which IT technologies or initiatives do you have direct involvement in or a working knowledge of at your organization?



For IT-related issues in your organization, which of the following activities are you involved in?



Q14 Uses Desktop



About Enterprise Management Associates, Inc.

Founded in 1996, Enterprise Management Associates (EMA) is a leading industry analyst and consulting firm dedicated to the IT management market. The firm provides IT vendors and enterprise IT professionals with objective insight into the real-world business value of long-established and emerging technologies, ranging from security, storage and IT Service Management (ITSM) to the Configuration Management Database (CMDB), virtualization and service-oriented architecture (SOA). Even with its rapid growth, EMA has never lost sight of the client, and continues to offer personalized support and convenient access to its analysts. For more information on the firm's extensive library of IT management research, free online IT Management Solutions Center and IT consulting offerings, visit www.enterprisemanagement.com.

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