

AN EXPLORATORY STUDY OF THE CHALLENGES AND BENEFITS OF GREEN IT SECURITY

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ABSTRACT

Information technology (IT) is the driving force behind managing the billions of bytes of data processed globally. IT equipment—including servers, storage, networks, and end-user computing devices—is estimated to use a massive 9.4% of the total amount of energy produced in the United States. Green IT is no longer a lofty concept or a passing fade. It is an inevitable path leads to future IT operations. This paper explores three organization's effort in achieving Green IT operations and cost saving through updating hardware or redesigning their business process. The contribution of this study is to shed some light on the challenges and benefit of identifying along with implementing sustainability Green IT practices.

INTRODUCTION

Information technology (IT) is the driving force behind managing the billions of bytes of data processed globally. IT equipment—including servers, storage, networks, and end-user computing devices—is estimated to use a massive 9.4% of the total amount of energy produced in the United States. Globally, these devices consume 5.3% of all of the energy produced [6]. The advent of information societies in both developed and developing countries including BRICs, is leading to increasing IT device/systems power consumption rapidly, becoming a global issue [5]. Of this consumption, today, public utilities and organizational infrastructure are challenged to meet the increasing demand. This growing concern opens the door for significant opportunities for the implementation of energy efficiencies in IT departments all over US.

Many companies are asking their IT department to finding ways to support the energy saving goals through identifying and implementing sustainability practices across corporation. The IT groups have embraced this challenge through innovations and leadership in Green IT. The following four key areas have been identified as the highlight of going Green IT [6]:

- Sustainable management of desktops, laptops, and associated peripherals
- Cloud computing and server virtualization
- Innovative technology such smart card or RFID
- Energy-efficient server rooms or data centers

This paper argues that Green IT is no longer a lofty concept or a passing fade. It is here to stay and it is achievable. This paper explores three IT department's effort in achieving Green IT operations and cost saving through updating hardware or redesigning their business process. The contribution of this study is to shed some light on the challenges and benefit of identifying along with implementing sustainability Green IT practices.

The organization of this paper is as follows: This paper will define what constitutes Green IT first,

followed by three case studies that document the decision making process and incredible effort of a US corporations and two government agencies in achieving Green IT. As conclusion, this paper emphasizes the message that Green IT is here to stay. By checking into IT operation once more, people will find ways to make IT greener.

THREE CASES

City of Glendale California going Green IT via virtualization

The IT department of City of Glendale California is about to embark on an exciting adventure. Imagine using a computer system without a computer, having ten servers combined into one with more efficiently and more energy saving. A new type of Information Technology that is taking over the industry is called Virtualization. Virtualization is a technique for hiding the physical characteristics of computing resources from other systems, applications, or end users and changing the way the interaction with those resources are managed. This includes making a single physical resource, such as a server, an operating system, an application, or storage device appear to function as multiple logical resources [3].

The old IT environment involved a room full of personal computers and a cold room full of servers. This type of environment is incredibly costly by taking up huge amounts of cost allocated to hardware, space resources, time and staff to manage the environments. Virtualization could combine all of the servers into one or two servers. This could free up all the hardware resources and all the costs associated with having them and maintaining them. Through virtualization IT department could setup a whole office building without a single PC. Instead a (thin client) workstation with simply a monitor, keyboard, mouse and a network connection will work. Having fewer machines on site means less daily power consumption from the workstations, servers themselves and the cooling systems. Once implemented, the cost saving from hardware and electricity could run in thousands of dollars (Table 1).

	Standalone	Virtualization	Savings
Hardware Cost	\$2,848K	\$550K	\$2,298K
Electricity Cost	\$180K/yr	\$8K/yr	\$172K/yr

Table 1. Comparison of hardware and electricity costs between standalone and virtualization servers [6]

This would also greatly enhance an organization's business agility. Businesses that employ these virtualization techniques create reusable pools of resources and are better positioned to respond to the changing demands of their business places. Virtualization offers the potential for a fundamental change in the way IT managers manage their IT resources.

Another added benefit is that virtualization is not only the necessity to consolidating servers, but it's becoming the wall of security that is needed to make the most secure IT environments that are out there today. Having the ability to simplify the processes of wide range tasks, from disaster recovery to forensic analysis. It also is the ally for security managers in setting up barriers for intrusion detection systems (IDS) and prevention. This is the next generation of the security evolution.

Pfizer kills two birds with one stone

In 2002, the IT department at Pfizer had two tough problems. For legal protection, Pfizer employees need to sign, witness and time stamp the lab notebooks at earliest possible date in case of patent questions. It is estimated that each wet signature cost \$30 including paper, scanning, storage and the time to track down the signer. If the signer is at an off site location, the lab notebooks has to be sent through FedEx. Then, the cost of acquiring a wet signature could run on the average \$125 per signature. With 14,000 signatures per month, Pfizer's IT department has to find a cost effective and sustainable solution to this problem [4].

On top of the signature problem, Pfizer's IT department also burdened with access control problem. Whenever Pfizer acquired a new company, it also acquired its building access-control systems, which are both expensive and difficult to change. With its rapid expansion to reach global market and wider pool of talent, Pfizer has been aggressively acquiring smaller companies. But the mishmash of access systems made IT management chores complex and it frustrated many Pfizer research employees who constantly move among sites.

Could they find a solution that will kill two birds with one stone?

Yes, they decide to use a smart card ID management system that would enable digital signature and standardize building access.

Pfizer rolled out the finished smart card badges across its research and development staff globally: That's 20,000 to 30,000 employees, plus a roughly equal number of contractors, Then Pfizer IT got an unexpected positive feedback. Pfizer employees work among many sites quite commonly; under the old system, they had to physically register at a visitor center before getting down to work. The smart cards let them simply use an online system to register to work at an alternate site. Once employees heard about that capability, they asked for the badge outside of R&D. There was a tipping point of such requests, and IT decided to roll out the smart cards across the corporation, to roughly 90,000 to 100,000 users.

Not only Pfizer research employees can digitally signing any lab notebooks using their smart cards as credential at anytime from anywhere, Pfizer employees have found more ways to save paper and time. Instead of using a sign-up sheet, Pfizer employees are using mobile smart card readers at the door of training classrooms to keep track of who attends classes. Training records are a big deal in the pharmaceutical industry since some training is mandated. Employees also use the cards and readers for sensitive offsite meetings, where leader can use the cards and reader to better control and track who attends.

Today, one smart card, with unlimited number of digital signatures, costs \$13 for the card and \$70 for a three-year license of high-assurance PKI credential. Pfizer's IT department has enabled company's core business, reduced cost, and at same time, reduced its impact to the environment through smart card application.

CRA debating the cost-benefit of being green

A community redevelopment agency (CRA) of City of Los Angeles has practiced its business routings in retaining business, recruiting new businesses, and providing affordable housing for Angelinos for many years without debate [2]. Like any other community redevelopment agency of a big metropolitan city, it is working with seven major project areas within the city, and having several satellite offices

throughout the city. Some of the most noticeable achievements are the Nokia Theatre and Staples Center, as well as renovating the Old Bank District in LA downtown into mixed-use housing and shopping complex.

Information technology is the backbone of CRA’s business process. Pertinent documents for a particular project such as development drawings, façade improvements, contract and lease documents, and other legal documentation are vital to a projects success. The users of CRA rely heavily on the reliability of their computer and CRA’s server to process, retrieve and store this data. Since the CRA is a public agency, which must adheres to government policies and all correspondence are considered public record. CRA’s information system has to provide the public with the ability to request copies of all public information retained by the CRA.

At the CRA, the IT department is responsible for maintaining, updating, and supporting 275 workstations of end user and IT stuff; 60 main servers which include exchange, blackberry, file storage, and application system servers; 15 backup redundant servers for disaster recovery purposes. In order to provide accurate and reliable information 24/7, it is absolutely critical for CRA to run daily backups to store all the changes have been made on workstations and run weekly backup on every Friday. To do so, the users must keep their workstations turned on at all times, including during the evenings and weekends.

Only recently, Green IT advocates have questioned this routing business practice. Green IT advocates saw the computers homing day and night, they think the energy used to keep all those workstations on at all times consumes too much electricity and criticizing IT department as being wasteful. IT staff, however, feel they have the obligation to provide users the best service by making sure all the document are properly stored. This has led to an ongoing debate between the IT staff and the Green IT advocates. There is also pressure from the mayor’s office that issued a 75% diversion goal by 2013 accompanied by a memo to all city agencies that computer equipment should be turned off at night to save electricity.

What should CRA do? Should they turn off all computers at night and skip daily backups? Should they continue do what they have been doing for years? Looking into the debate further, it is clear that the estimated cost of electricity for running backup each night is \$133 per day and \$47397 for the entire year. On the other hand, the files, prints and drawing that stored on the workstations or servers are very costly to reproduce.

	Number of devices	Electricity consumption per device (KW)	Hours used for backup per day	Electricity charge (\$/KWH)	Cost saving per day (\$)
Workstations	275	0.19	14	\$0.12	\$87.78
Servers	60	0.45	14	\$0.12	\$45.36
Total cost saving per day					\$133
Total cost saving per year					\$47397

Table 2. The estimated daily cost saving for backup workstations and servers [1,7]

Most documents are usually stored in a central imaging server, but most working documents with valuable notes and audit histories come directly from the end user's workstation. These documents are changed frequently once amendments to contracts and leasing agreements are sent out as well. Besides any legal requirement CRA has to retain documents, the end users themselves demand that there backups be available in case of hard drive failure. In addition, CRA has been sued in the past and need to retrieve documents that dated back several years. The cost of lose any document would be very costly. Without backup file comes handy, the cost of associated with anyone trying to recreate those lost documents, including the time spent away from his normal duties and responsibility, would have definitely added up to more than it costs to run the backups. As conclusion, the benefit of keep computers on during the night for running backup is out weight the savings of electricity cost. CRA has decided to continuously with its current practice and running daily/weekly backups. Meanwhile, this Green IT debate has prompted the CRA manager to search for alternative power switching technology that can regulate electricity usage more efficiently.

CRT has found other ways to be green. Its IT department has gone green by implementing duplex printing. The CRA's IT department maintains the position of only buying new printers with an automatic duplex printing feature. This function has been installed on all users and is configured as default. There was a duplex printing committee that helped to assess the entire agency's printing policies that analyzed the number of pages printed, the amount of toner used, and the capabilities of the printers. This committee implemented the configuration of default printing to double sided.

To be green, CRA also has done an excellent job of encouraging employees to work from home. Laptops are provided for check out and configured to the CRA network using a VPN connection. Users can log in remotely to the CRA network, check their email, and use the IT systems page to access proprietary systems. Users can also request for a long-term checkout laptop that is configured for VPN connection and users may opt to work from home on a more permanent basis then just occasionally to finish up work. All services available at the office is now available on the laptops so working from home is much more attractive.

CONCLUSION

As discussed, there are a number of ways an IT department can go green. From small changes that adds up like recycling used toner cartridges and enabling double-sided printing, to full scale changes to more energy efficient infrastructure. So long as the corporation continues to provide an open dialogue between the IT staff and the green conscious users, there should be a middle ground that is suitable for all parties. The IT staff can recognize the importance of Green IT policies and the ways they can improve the energy consumption of its equipment and the green advocates can recognize the need for practical solutions and accept that some practices require constant energy. This paper emphasizes the message that Green IT is here to stay. By checking into IT operation once more, people will find ways to make IT greener.

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