

# Approach for Environment Adequate Computing- Green Computing

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**Abstract**— Environmental issues are getting a lot of diligence from the government and business houses around world. Green environment has become a prerequisite option for the companies facing the new challenges in balancing the business condition with the environment resources. Green IT is composed of the step that reduces the energy used in the electronic gadgets and consumable. This includes energy efficient processors, servers and hardware. Many business houses have found that the Green IT initiatives offer costs savings benefits while reforming the organization, meeting stakeholder demands and complying with laws and regulations.

**Index Terms**— Global Warming, Green Computing, Virtualization, Energy efficiency, Best Practice

## I. INTRODUCTION

Over the last decade the concept of environment safety have come into existence that challenged our responsibility towards the critical issues that evolved from the global climate change and natural resource conservation. “Global warming”, “green house gasses” and “carbon footprint” have become common terms that can be heard daily on news. Still, these terms are not discussed in most of the company newsletters, announcement or at shareholders meetings, yet there are very few companies that had established an enterprise level green strategy.

In fact, tremendous progress has been made through legislation in many countries to reduce automobile exhaust emissions, lower pollution through the traded carbon credit program, and improve safety by eliminating the use of lead-based paint. The examples are numerous, and the credit for making these changes is spread across all of society’s stakeholders, from lawmakers to corporate executives and consumer advocates. However, with the evidence that science is showing us about the acceleration of global warming, there is a growing consensus that transformations to protect the environment should be more pervasive and larger steps are needed. There is also ongoing recognition that government regulation should play a role in achieving effective change, but that it is only one of many forces that will drive the needed change into the future. It is not difficult to predict that a time will come when the government, individual and private

organizations all will play an important role protecting the environment. We can say that in future we will have a “chief green officer” sitting at the table with a company’s CEO,

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CFO, CIO and COO. A green strategy fundamentally helps an enterprise make decisions that have a positive impact on the environment. The principles that form the basis of a green strategy should lead a business to make decisions based on solid business logic and make good business sense.

Those days are gone when one person shares one computer. Now we have laptops, handhelds, home office PCs etc., all of which incur a carbon footprint whether in use or rendered obsolete. The data center has become business central and bearing the energy burden in the process. Yet as the demand for energy increases, the supply is decreasing, with the planet and the power companies nearing the tipping point. Now companies are looking for ways to go green and reduce their carbon footprint. Every industry and human being is having the social responsibility towards saving the environment by using the alternate energy or by using renewable energy resources.

## II. STEPS TOWARDS GREEN COMPUTING

We can categorize Green IT into four different categories: Virtualization and Consolidation, Energy Efficiency, Travel Reduction and Asset Disposal.

### A. Virtualization & Consolidation

Instead of having one computer for each service or set of services, you can instead consolidate each server onto a larger virtualized system that uses its resources to full extent. This area includes server virtualization and consolidation, storage consolidation and desktop virtualization. This will improve cost and energy efficiency through optimized use of existing and new computing and storage capacity, electricity, cooling, ventilation and real estate.

### B. Energy Efficiency

This area includes server room upgrades and new builds, IT energy measurement, printer consolidation, and PC power management. These projects have energy efficiency or reduction as a major cost savings benefits.

### C. Travel Reduction

Initiatives in this area include remote conferencing & collaboration and telecommuting. These projects are typically associated with reductions in travel, fuel and commuting costs.

#### 1. Remote Conferencing & Collaboration

- Video-conferencing and teleconferencing implementations between facilities or between office and client sites.
- Online communication between departments and other resources.

#### 2. Telecommuting Strategy & Capabilities

- Virtual Private Network (VPN), remote access, and unified or voice communications capabilities to enable access from home and other remote locations.
- Policies and strategies allowing or encouraging employees to work from home.
- Policies allowing or enforcing employees to work “Four-Tens” (4 days a week, 10 hours a day).

D. Asset Disposal

IT equipment recycling is the lone initiative in this category. Organizations that got into the habit of equipment recycling are happy with their performance in responsible disposal, having dramatically reduced the amount of equipment they send to the dump.

III. GREEN COMPUTING RESULTS

There is much to learn from organizations implementing Green IT initiatives. No single piece of information, however, is more compelling than the level of success organizations have seen. The benefit most commonly realized by 68% of companies was the ability to increase features and functionality. This includes enhancements in computing or storage capacity, and meeting employee demands for features or environmental action.

Overall, 65% of companies successfully realized one of the major benefits of Green IT – a positive sign for companies considering these initiatives.

The chart below displays the main benefit realized by each initiative for the top four implementation drivers: decreasing energy costs, decreasing consumables used, increasing features and functionality, and decreasing other expenses or future investments.

Table 1: Benefits of Initiatives

| Main benefits of Initiatives   |                                       |                  |                       |                                      |   |
|--------------------------------|---------------------------------------|------------------|-----------------------|--------------------------------------|---|
|                                |                                       | Decreased Energy | Decreased Consumables | Increased features and functionality | Decrease other expenses/Future expenses |
| Virtualization & Consolidation | Storage Consolidation                 |                  |                       | Yes                                  | Yes                                     |
|                                | Server Virtualization & Consolidation |                  |                       | Yes                                  |   |
|                                | Desktop Virtualization                |                  |                       |                                      | Yes                                     |
| Energy Efficiency              | Existing Server Room Upgrades         |                  |                       | Yes                                  |   |
|                                | New Server Room Build                 |                  |                       |                                      | Yes                                     |
|                                | IT Energy Measurement                 |                  |                       | Yes                                  |   |
|                                | PC Power Management                   | Yes              |                       |                                      |   |
|                                | Printer                               | Yes              |                       |                                      |   |

|                  |  |  |     |  |  |
|------------------|--|--|-----|--|--|
|                  | Consolidation & Reduction              |  |     |  |  |
| Travel Reduction | Remote Conferencing & Collaboration    |  | Yes |  |  |
|                  | Tele Commute Strategies & Capabilities |  | Yes |  |  |
| Asset Disposal   | IT Equipments Recycling                |  | Yes |  |  |

IV. GREEN BUILDING: A GREEN APPROACH TOWARDS INFRASTRUCTURE

Green building refers to the practice of increasing the efficiency with which buildings use resources like energy, water and materials while reducing building impacts on human health and the environment during the building’s lifecycle, through better designs, construction, operations, maintenance and removal. Besides the efficient use of resources and protecting the health of the occupants, green building also aims to reduce waste, pollution and environmental degradation. There is a wide variety of technologies and practices in place to revolutionize the building industry and in the process, eliminate detrimental environment hazards. Some of the existing green technologies include passive solar designs, high-energy efficiency lighting and appliances, highly effective ventilation and cooling systems, solar water heaters, insulation materials and techniques, high-reflectivity building materials etc.

V. SIMPLE STEPS YOU CAN TAKE TO SAVE ENERGY AND RESOURCES

A. Screen Savers Does Not Save Energy

A screen saver that displays moving images consumes as much as electricity as it when it is in active mode.

B. Reduce the Computer’s Power And It’s Operating Costs

Computers should automatically go into standby mode after 1 hour of idle time. Using the “standby” mode saves almost as much energy as if you were to turn off your computer for the night.

Computers should not be turned off at night or unplugged so that automatic critical updates and security patches can be downloaded from the Internet.

Monitors do use zero energy when turned off. When you leave for the day, turn off your monitor, your printer and other peripherals.

*C. Reducing Paper Waste And Toner Usage*

Every industry wants to use paperless office to reduce cost and save energy. So it is the combined responsibility of the employer and an employee to take a challenge. There are some suggestions you can use to reduce paper cost:

Print as less as possible.

- Review and modify documents on the screen and use print preview.
- Minimize the number of hard copies and paper drafts you make.
- Avoid needless printing of email. Instead of printing, save information to pen drives.
- If you need to refer to a certain WebPages often, save the URL web address to your “Favorites” folder.
- Use a software application like Microsoft’s “OneNote” to keep electronically organized screen clippings and documents can be inserted into your notes for easy reference.
- Wireless bills, the Office telephone directory, and Training documentation should not be available in printed format.
- Encourage your employee to refer to the online documents of these materials.

Buy and use recycled paper in your printers and copiers. The higher the percentage of post consumer recycled content, the better. With the many choices of high quality recycled paper products available, buying paper made from pure virgin fiber is absolutely unnecessary.

Use email instead of faxes or send faxes directly from your computer to eliminate the need for a hard copy. When you fax using hard copies, save paper using a “sticky” fax address note and not a cover sheet. Reuse paper and recycle waste paper. Before recycling paper, which has print on only one side, use it as scrap paper or printing drafts.

Use double sided printing and copying. Use the multiple pages per sheet option on printer properties.

When general type of information documents is to be shared within an office, try circulating documents or use email instead of making an individual copy for each person.

Use smaller font sizes on larger documents to save paper. Print in “toner saving mode” to reduce toner usage.

**VI. BEST PRACTICES**

There are some of the best practices that can create a good culture of environmental awareness and supports a green strategy.

Some best practices are summarized in Table 1.

Table 2: Best Practices

| Best Practices            | Purpose  |
|---------------------------|--|
| Provide training          | Train the employee towards the global warming with necessary actions that employees can take to save the environment |
| Install appropriate tools | Place appropriate waste and recycling receptacles where they are most likely to be used.                             |
|                           | Provide videoconferencing or   |

|   |   |
|---|---|
|   | teleconferencing mechanism as an alternate method rather than face-to-face meetings that require travel   |
| Measure and report Performance                    | How many bottles were recycled from various facilities?<br>How much paper was recycled?<br>What newspaper articles have been written or local city officials have<br>Recognized the community contribution from employees                                     |
| Make it everyone’s responsibility                 | Senior executives establish priorities, guiding principles and governance<br>Managers apply guiding principles to make operational decisions aligned with the green strategy.<br><br>Practitioners complete projects with a greater degree of green benefits. |
| Create a communication and Change management plan | Communicate successes early and often, build a knowledge portal and<br>share lessons learned.<br>Have support available to answer questions and provide facts Anticipate<br><br>organizational needs  |

**VII. REGULATIONS AROUND THE WORLD**

Kyoto Protocol: Environmental speedy developed by the United Nations and ratified by several countries (excluding the US who declined ratification). Sets goals for countries to decrease greenhouse gas discharge. Waste Electrical and Electronic Equipment (WEEE) Directive introduced in 2002, and enforced in February 2003 for all EU member states. Restricts the use of dangerous material in electronics and promotes proper recycling. Energy Conservation Act was introduced in India in 2001 to encourage energy efficiency. The Bureau of Energy Efficiency will enforce strict policies for energy consumption and supply. National Greenhouse and Energy Reporting Act introduced in 2007, and enforced as of July 2008 in Australia. This law requires all corporations to produce reports on their greenhouse gas discharge, and energy production and consumption.

**VIII. CONCLUSION**

Businesses all around the globe have been discovered that has going through green isn’t just good for the planet; it’s good for their bottom lines also. Many companies have already made significant progress with initiatives that fit within the scope of an enterprise-level green strategy. It is the responsibility of every citizen to adopt green strategy to save our country, our universe so that the effect of Global Warming

can be reduced. By adopting the green computing techniques every human can reduce the percentage of carbon emitted from the electronic equipments and can protect the most discussed environmental issue like global warming.

### REFERENCES

- [1] IBM Data Center technology helps solar-powered web hosting firm AISO.Net build on its 'green' commitment to customers'', press release, June 18, 2007.
- [2] IBM and APC partner to create energy efficient green data center for Bryant University.
- [3] Green Office Buildings: A Practical Guide to Development, The Urban Land Institute, Washington, DC.
- [4] Mujtaba Talebi, Computer Power Consumption Benchmarking For Green Computing. Master's Thesis, Villanova University, Department of Computing Sciences, 2008.
- [5] <http://www.fullerton.edu/it/services/Hardware/FAQ/powermgmt.asp>
- [6] Mujtaba Talebi & Thomas Way, Methods, Metrics and Motivation for a Green Computer Science Program.



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