

# Protection of Environment By Green Computing: A Study

Deepak Verma, Lalit Kr. Saini

## I. Abstract

Green is the rising topic now days. In this research article, we present a overview of Green Computing. Green computing brings up supporting business critical computing needs with least possible amount of power or sustainable computing. This is a new prototype of designing the computer system which considers not only the processing performance but also the energy efficiency.

In the past, the main focus was on IT equipments, power consuming and associated equipment which includes infrastructure, power, and cooling and data center. The space which was always assumed as readily available and affordable. The driving force behind this alteration comes from the ever growing business computing needs, super fast growing burden of energy expense, growing awareness of global warming issues, and increasing sense of national energy security.

Here we also provide a review of how IT equipment power consumption across the industry is affecting the industry. It will focus on how equipment power intake impacts the overall power usage and total cost of ownership and deploy to meet their business needs. Paper will also briefly cover the general technological trends in the IT industry which are available in the race to meet green computing requirements.

## II. Introduction

A **green computer** or green IT system is one where the entire operation from design, manufacture, use, and disposal involves as little environmental impact as possible. A green initiative is taken in consideration of all facets of a computer's life, from invention to disposal.

In the design aspect, a green computer is created to perform without a negative environmental affect. Such design includes everything from materials and components to how the computer uses its power supply. Most of computers are built with a sleep or hibernate mode that allows them to power down when not in use and, therefore, save on energy affect.

A green computer will also take into account how it impacts the environment during its life and one way to make a green computer reduce its usage impact is to extend its longevity. The longer the computer lasts, the less impact it will have on the environment because disposal, normally the most significant green influence of the computer's cycle, will be delayed for a longer period of time. To increase a computer's longevity, paper suggests looking toward upgrades and modularity. For example, making a new computer from scratch produces a greater environmental effect than building a new RAM module for replacement in computing equipment.

Computer virtualization is helping to build large strides in **green computing** technology. Through the concept of virtualization, it is now possible to process two or more computers on the physical hardware of a single computer. In this manner, you could make the ultimate green computer; one that exists logically, but not have physically existence. The logical units use all the material components of the physical computer, but are devoid of physical structure themselves. This means that the environmental affect of logical computers is virtually eliminated. The ideal green computer, may lie in virtual green computing.

## III. History

One of the first manifestations of the green computing movement was the launch of the Energy Star program in 1992. Energy Star served as a type of voluntary label awarded to computing products that succeeded in minimizing use of energy while maximizing efficiency. Energy Star applied to products like monitors, television sets and temperature control devices like refrigerators, air conditioners, and similar goods. One of the first results of green computing was the Sleep mode function of computer monitors which places a consumer's electronic equipment on standby mode when a pre-set period of time when user activity is not identified. As the concept developed, green computing began to encompass thin client solutions, energy cost accounting, virtualization practices, eWaste, etc.

Currently, one of the popular green computing groups is tactical increment lists. This group applies and uses green computing concept mainly to save up on costs rather than save the environment. This green computing concept emerged naturally as businesses find themselves under pressure to maximize resources to compete effectively in the market. This movement arose mainly from economic sentiments rather than political pressure. Strategic Leaders take into account the social and environmental impacts of new and emerging technologies. Aside from costs cutting, this particular movement also takes into account other factors such as marketing and branding. Unlike the position held by tactical increment lists, strategic leaders recognize the want to some existing policies or structural makeup of the organization. This could be seen in recent efforts to make IT personnel directly responsible for managing, minimizing and ensuring efficient energy costs.

#### **IV. Need of green computing**

Computer is the basic need of every human. A computer is very useful in our life. It made our life easier and saves a much time and human efforts, but the use of computer needs lot of power consumption and also generates a large amount of heat. A lot of power consumption and greater heat generation means greater emission of green house gases like Carbon Dioxide (CO<sub>2</sub>) that has various harmful impacts on our environment and nature and this is because we are not aware about the harmful impacts of the use of computer on environment. Personal computers and data centers consume a lot of energy which use various old techniques and they don't have sufficient cooling systems. Resultant is the polluted environment. A typical desktop PC system is comprised of the computer itself (the CPU or the "box"), a monitor, and printer. A typical CPU may require approximately 200 watts of electrical power. Then, add 75-150 watts for a 17-19 inch monitor. The power requirements of conventional laser printers can be as much as 100 watts or more when printing though much less if idling in "sleep mode." Ink jet printers use as little as 12 watts while printing and 5 watts while idling [2]. How a user operates the computer also factors into energy costs. First take the worst case scenario of continuous operation. Assuming you operate 190 watt PC system day and night every day, direct annual electrical expenses would be over \$140.00. In contrast, if you process your system just during normal business hours, say 50 hours per week, the direct annual energy cost would be about \$30. This is not taking into

consideration the cost of additional ambient room cooling. Considering the pure benefits of computer use, neither of the above cost values may seem like much and think, what happens when these costs are multiplied by the many hundreds or thousands of computers in use. The loss of revenue due to energy uses and waste are astronomical. Manufacturing computers includes the use of cadmium, mercury, lead and other toxics in general. Usually, computers can contain 4 to 7 pounds of lead alone, according to green experts. It's no wonder that computers and other electronics make up two-fifths of all lead in landfills [3].

#### **Literature Review**

**Marguerite Reardon (2009)** discusses that the data centers consume a lot of energy, which costs operators like Google millions of dollars to run each year. And now as more digital information is "virtualized" and accessed in the cloud, centralized data centers are getting even bigger and are consuming even more energy. There is mounting pressure for big Internet companies to reduce their energy usage. Not only is it expensive, but these companies face pressure from governments and others concerned with the environment to reduce their carbon footprints.

**European Parliament (2003 has said,** as a first priority, the prevention of waste electrical and electronic equipment (WEEE), and in addition, the reuse, recycling and other forms of recovery of such wastes so as to reduce the disposal of waste. It also seeks to improve the environmental performance of all operators involved in the life cycle of electrical and electronic equipment, e.g. producers, distributors and consumers and in particular those operators directly involved in the treatment of waste electrical and electronic equipment.

**Tom Worthington (2011)** describes the points for studying of green technology strategies using computers and telecommunications in a way which maximizes positive environmental benefit and minimize the negative impact. The energy efficiency of operating equipment is a major concern of Green Technology Strategies. The embodied energy and lifecycle of the materials used in the design, manufacture and reuse and recycling of equipment and components are also concerns. Green Technology Strategies seeks to inform accepted management practices to achieve efficient and effective business interaction.

**Dr. Laneway, Prof. Sheikh (2010)** describes Green Computing and the impact of ICTs on the

environment. One of the earliest initiatives toward green computing in the United States was the voluntary labeling program known as Energy Star. It was conceived by the Environmental Protection Agency (EPA) in 1992 to promote energy efficiency in hardware of all kinds. The Energy Star label became a common sight, especially in notebook computers and displays. Similar programs have been adopted in Europe and Asia. Government regulation, however well-intentioned, is only part of an overall green computing philosophy. The work habits of computer users and businesses can be modified to minimize adverse impact on the global environment.

Green IT is the latest manifestation of sustainable business practices. The decision surrounding whether or not to implement Green IT strategies, policies, and tools provides compelling challenges for organizations. While practitioners have been highly interested in this topic for a while there is also a growing interest on this topic among academicians. In this paper, **Stoney Brooks, Wang, Sarker (2011)** conducts a comprehensive review of both the practitioner and academic literature surrounding Green IT. By presenting the overlaps and differences between both perspectives, they aim to identify noticeable gaps in the current literature.

## V. Few Steps to Implement Green Computing

Whether you're an individual or business, following are the some actions to be taken to ensure the green computer use:

**1. Energy Efficient Data Center Design** – The energy efficient data center design includes air management, heat recovery and electrical configuration of data centers in such a way that reduces the energy consumption to a great level. Modern data center design also includes on-site electricity generation and waste heat recycling.

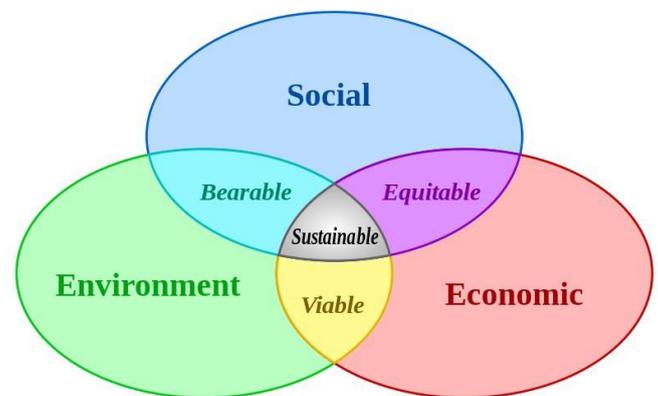
**2. Use of Energy Star Labeled Products** – Energy star label indicates the energy efficiency of the appliance such as TV, which goes between one and ten stars. The greater the number of stars the higher the efficiency. So you can *go green* by purchasing an appliance on the basis of energy star

**3. E-Waste Recycling** – E-waste recycling is the reuse or recycling of e-waste such as old computers, monitors etc. Instead of throwing it, always contribute to the non-profits and charities or submit it to the municipal or private recycling bodies.

**4. Telecommunication** – It is a work arrangement in which people work from home, making use of the internet, telephone and email. The terms teleconferencing, telework or telepresence are often used interchangeably and are used as a method to implement green computing. These technologies offer many advantages such as reduction of greenhouse gas emissions related to travel, more work satisfaction and lower costs for office space, heat and lighting.

## VI. Benefits of Green IT/ Green Computing

Technology has advanced to such an extent with the adoption of IT that it's possible to send files from our smart-phones to distant Computers in an instant. As much as we depend on IT to make our lives easy, IT has been contributing to environmental problems. Nowadays the safety of environment has become crucial, moreover an necessity for the society's well being. Hence, in order to conserve energy in all the possible ways, respective governments advises all the sectors to make use of eco-friendly products and methodologies in every possible way. The root cause that severely affects the environment is Global Warming, let's see how:



Computers run on electricity and electricity is produced by burning coal/oil. This process releases Co<sub>2</sub>, sulphur, methane and other such gases (termed as greenhouse gases) into the atmosphere. These greenhouse gases accumulate and result in Global Warming. They also cause respiratory diseases, acid rains etc. Another factor that is a major cause of concern to the environment is the disposal of computer peripherals like monitors which end up polluting land and water. Now the question arises what can WE do to prevent emissions of gases & in the process subside the effects of Global Warming?

The answer is what is being described as Green IT. Now, to understand what Green IT is, one can say that it refers to incorporating the "GO GREEN" slogan in the IT industry. Green IT can also be referred to as "Green Computing". It basically refers to the process of practicing environment friendly computing. This methodology is adopted in order to ensure that the **usage of energy is done efficiently, to promote the idea of recycling of waste products**. Businesses around the world have realized the importance of securing environment and how beneficial it can prove for them. As a result to this organizations have started taking active part in addressing the environmental issues. Businesses implement Green IT to reduce power consumption and thus lowering costs. Common people implement Green IT in order to sustain a healthy lifestyle. Data centres are an integral part of any IT firm. They are of upmost importance because they're the central repository where the data of any given organization is stored. Not just that, it also emits a large amount of CO<sub>2</sub> gas in the environment.

However, the problem is actually greater than the growth in power consumption by data centres. Much of the electricity that comes through the power cord of the computer is turned into heat and power conversion waste through the PC power supply. In order to encourage these good practices of conserving energy government has started to certify the data centres as Green.

Now talking about implementing Green IT in general, there are ways and means to conserve energy and thereby reducing the ill-effects on environment.

1) A little care while using our PC: We needlessly leave our personal computers on even if we're not using them, unaware that it still uses electricity and heats up which requires additional cooling. In an enterprise the cost of electricity for hundred such computers becomes enormous. Alternately, we can use the power saving methods like sleep mode, hibernation, and standby when computers aren't being used.

2) Screensavers: Blank screensavers reduce power consumption as compared to active ones.

3) Another famous concept is that of The 3 R's of going Green:

**Reuse**- we should throw old computer parts. We might reuse them or give them to someone who needs it. This will not only help that people, but also reduce landfills which cause environmental hazards.

**Replace**: Instead of buying a new computer, we should replace the old parts with new ones or buy refurbished hardware. This also helps in capital management as buying a new computer would be more expensive than buying individual parts.

**Recycle**: Sometimes computer parts are not in the condition to repair and need to be recycled. If we don't, they end up as e-waste. If we don't destroy them properly, the harmful chemicals/metals in them like lead, mercury, chromium might pollute water.

## VII. Conclusion:

Green IT is continuously interesting people and organizations all over the world, the main reason being larger financial returns on the investment made on green data center. Green computing has got a lot of importance due to rising energy costs and its impact on the environment and need to manufacture and store energy has increased mainly due to the volume of systems that the companies generally rely on. The power used by companies is a critical issue. The concept of using green computing is beneficial as it helps the organizations dispose their electronic waste in an effective way so that the environment is not hampered. This is also done to help reduce the CO<sub>2</sub> emissions from data centers that are responsible for global damage. The concept Green Computing with respect to data centers leads a lot of cost savings over time. Reduction in energy expense from servers, cooling and lightning helps any industry saves a lot on their budget on power.

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First Author:

Deepak Verma, Assistant Professor at JECRC UDML College of Engineering has published three paper in different journals. I have done M. Tech. in 2013 and have experience of six years.

Second Author:

Lalit Kumar Saini, Assistant Professor at JECRC UDML College of Engineering has published six papers in different journals. I have done M. Tech. in 2014 and experience of eight years.