



GREEN COMPUTING

JAYA ABARNA.S (abarna42000@gmail.com)

DHARINI.A (dhariniashokan.15@gmail.com)

JEEVA.M (jeeva892000@gmail.com)

UG Students in Sri Krishna Adithya College of Arts and Science, Coimbatore.

Bsc Information Technology, Department of Computer Science.

ABSTRACT:

Green computing is receiving more and more attention now-a-days. It is a latest movement in IT industry to operate computer systems to be energy proficient. It is a practice of using computers and related resources efficiently and effectively. Its main goal is to maximize energy effectiveness during the life time of the product. It offers many services through the internet. It also solves large computational problems by using various resources. Green technology focuses on reducing the environmental impact caused by the earth's growing population. It provides the society's needs in ways that do not damage or deplete natural resources. It benefits the environment by creating recyclable products, reducing pollution, proposing alternative technologies in various fields. It is environmentally responsible for the use of computers and related resources properly. Green computing is an emerging topic these days, not only because of rising energy costs and potential savings, but also due to its impact on the environment. Due to the large number of data centers throughout the world it increases the economic and the environmental cost. It is mainly due to the high consumption of energy by the data centers. Further the emission of co2 and other gases has paved the way for the growth of carbon footprint. These form the driving factors for green technology. Therefore this survey paper is helpful to aware the common man about the term green computing, need for green computing, recent implementation, and its advantages and disadvantages with the help of the survey performed.

KEYWORDS: Green IT, Eco-Friendly computing, Smart computing, E-waste, Hazardous materials.

INTRODUCTION

GREEN COMPUTING is also called as Green Information Technology (Green IT). It is an environmental friendly IT where the main objective is to reduce the

hazardous materials and to maximize the energy efficiency. It reduces the power consumption and thus reduces the global warming. Green computing is the practice of using computer resources efficiently. Basically, the efficient use of computers, servers with no impact on the environment is all about. It is the process of designing, manufacturing and disposing computers, servers with no impact on the environment. Its main aim is to reduce the negative impact of computing technology on our natural resources. The idea is to make computers from beginning to end a green product. The goals of green computing are quite similar to green chemistry which are to reduce the use of hazardous materials, maximize energy efficiency during the product's lifetime and to promote the recyclability or biodegradability of non-operational products and factory wastes. "Greening" your computing equipment is a low risk way for your business to not only help the environment but it also decrease your costs. It is one of the upward trends in today's business world. Making an appropriate decision to go green in the agency such as offices, not only improves the net profit of your trade, but also reduces carbon footprint and e-wastes. Many IT manufacturers and vendors are continuously investing in designing energy-efficient computing devices, reducing the use of dangerous materials and encouraging the recyclability of digital devices.

HISTORY

In 1992, the U.S. Environmental Protection Agency launched Energy Star. [2] Energy star is a program of label awarded to computers and other electronic devices. It is basically used to minimize the use of the energy and maximize the efficiency of the device/product. This labeling program is designed to promote and recognize the energy efficiency in monitors, climate control equipment and other technologies. This technique increases the adoption of "sleep mode" among consumer's electronics. This mode was the first success of green computing. Concurrently, the Swedish organization

TCO development launched the TCO certification program to promote low magnetic and electrical emissions from CRT-based computer displays. This program was later extends to include criteria on energy consumption and use of hazardous material in construction. Wipro became the first Indian Company to launch environment-friendly range of desktops and laptops compliant with RoHS.

NEED FOR GREEN IT

Green computing is popular now days. By using the computer we save lot of time and efforts of humans. But the use of computers also increases the power consumption and it also generates more amount of heat. Great heat generation means greater emission of co2. The major needs for green computing are: [2]



- 1) **Lot of electricity is used:** [8] Most of the natural resources are being used to get the electricity that has some impact on the environment. To save the electricity we have to use the Green IT.
- 2) **Energy consumption:** Computer energy is often wasteful now-a-days. Leaving the computer on when not in use, this wastes lots of energy. According to Environmental Protection Agency around 30% to 40% of computers are kept ON during the weekends and even after office hours and around 90% of these computers remain idle. For that reason we have to use the Green Computing.
- 3) **Creates more toxic waste:** Most of us are updating our computers, throwing our outdated computer resources, peripherals and other hardware devices etc, these are the hazardous toxic waste it is damaging the environment now a days. Also due to the toxic chemicals that involved in the manufacturing. For that reason we have to use the Green Computing.
- 4) **Pollution:** Use of computer systems and IT services had made one's life easier and more comfortable. It increases the

processing speed and power consumption also. This large amount of power consumption increases the emission of green house gases and increases the pollution as well. It is also due to manufacturing, packaging, disposal techniques. For that reason we have to use Green Computing.

5) **Waste of Printing:** Printing is often wasteful now-a-days. How many of you print out your emails or meeting agendas. We are wasting our time, energy, electricity in printing the unwanted documents these days. For that reason we have to use the Green Computing.

I. COMPANIES GOING GREEN

The motivations to go green have not only increased many company's corporate social responsibility but it is also an aspect of remaining relevant in the future business environment.[12] There are more and more environmental concerns that can only be addressed through green initiatives in terms of production, servicing and manufacturing. Companies are seeking more innovative methods of promoting eco-friendly environment by integrating green practices in their business functions. The following are the top companies that are taking the lead in incorporating eco-friendly practices by going green. They are McDonald's, Dell, Google, Bank of America, Tesla Motors, Wal-Mart, Honda, United (Continental Airlines before the merger), Tesco, Brooks, S.C.Johnson, Coca-Cola, Starbucks, Toyota, Pratt & Whitney, HP (Hewlett Packard), Target.



II. RECENT IMPLEMENTATIONS

1) **Blackle:** Blackle is a search engine site powered by Google custom Search. Its aim is to save the energy consumed by the PC while working on the internet. It is based on the concept that, if a computer screen is WHITE, it consumes 74W of energy; if it is BLACK it consumes 59W. Based on this theory if everyone switched from Google to Blackle, mother earth would save 750MW each year.[11] The principle of blackle is on the fact that the display of different colors consumes different amounts of energy on computer monitors. It is one of

the good implementation of Green IT. Thus most of the companies have switched from GOOGLE to BLACKLE.



2) **Fit-PC:** It is tiny PC that draws only 5W of energy consuming in a day less power than a traditional PC consumes in 1 hour. It is fit enough to run Windows XP or Linux and its size will be the size of a paperback. It is designed to fit where a standard PC is too bulky, noisy and power hungry. You can also leave Fit-PC to work 24/7 without making a dent in your electric bill. If you ever wished for a PC to be compact, quite and green then Fit-PC is the perfect fit for you.



3) **Zonbu Computer:** It is a new, energy efficient PC. It consumes just one third of the power of a typical light bulb. The device runs the Linux operating system using a 1.2 gigahertz (GHz) processor and 512 mega bytes (MB) of RAM. It also contains no moving parts, and doesn't even contain a fan. You can get zonbu computer for as little as US \$99, but you need to sign up for a two-year subscription.



4) **Sunray thin client:** According to Subodh Bapat, "Thin clients like the Sun Ray consume far less electricity than conventional desktops". A Sun Ray on a desktop consumes only 4 to 8 watts of power. It is because most of the heavy computation is performed by a server. Sun says Sunrays are particularly well suited for cost-sensitive environments such as call centers, education, healthcare, service providers, and finance. PCs have more powerful processors as well as hard drives, something like thin clients don't have. Thus, traditional PCs invariably consume a larger amount of power. In the United States, desktops need to consume 50 watts or less in idle mode to qualify for new stringent Energy Star certification.



5) **The Asus Eee PC and Ultra Portables:** The "ultra-portable" class of personal computers is characterized by a small size, fairly low power CPU, compact screen, low cost and it uses flash memory for storage rather than hard drives with spinning platters. These factors combine to enable them to run more efficiently and use less power than a standard form factor laptop. The Asus Eee PC is one of the examples of an ultraportable. It is the size of a paperback, weighs less than a kilogram, has built-in Wi-Fi and uses flash memory instead of a hard drive. It runs Linux too.



DEVELOPING A GREEN MACHINE

Power management feature in computer system saves energy and money. [11] To make the computer environment friendly, SLEEP and HIBERNATE settings can be used. These functions can be activated either by manually or by power management settings of operating system

1) **Sleep Mode:** When a computer system is inactive for sometime then system automatically switches to lower power state. This state is called sleep mode or standby mode. This state preserves energy by cutting off power to the display, hard drive, and peripherals. When pressing any key from keyboard, sleep mode deactivate and system takes back to its previous state. This mode mainly conserves battery power in a laptop computer.

2) **Hibernate Mode:** When this mode is activated, first data moves to hard disk of system and then system is completely switched off. When the system is turn on, all files and documents appear as it is, as they were left previously. By making the system in hibernate mode, battery power can be saved a lot. It reduces wear and tear on your components.

3) **Shut down your computer:** when we are not using computer, we should switch off it because computer and its devices consume more power and the result is more CO₂ emission.

4) **Stop screensavers:** [2] keep your screensaver off because it also use's electricity even when computer is not in use.

III. STEPS TO MAKE GREEN COMPUTING MORE GREEN

Average computer users can employ the following tips to make their computing usage more green.

- Use flat-screen or LCD monitors, instead of conventional cathode ray tube (CRT) monitors as they are more power efficient.
- Turn off computers at the end of each day and when not in use, even if just for an hour.
- Turn off the monitor when not in use.
- Use hardware/software with the Energy Star Label.
- Reuse or recycle all electrical components.
- Don't print unless necessary and you are ready and refill printer cartridges, rather than buying new ones.
- Instead of purchasing a new computer, try recycling an existing device.
- Make proper arrangements for safe electronic waste disposal.
- Buy energy-efficient notebook computers, instead of desktop computers.

- Use the hibernate or sleep mode when away from a computer for extended periods. And also use power save mode and Activate the power management features for controlling energy consumption.

ADVANTAGES

It encourages the use of renewable resources and promotes effective utilization of natural resources.

- It reduces the amount of heat produced from the electronic devices and reduces the amount of pollutants in the surroundings.
- It reduces the risk existing in PC's due to chemicals that cause nerve damage in humans.
- [1] Reduce energy consumption of computing resources during peak operation and saves energy during idle operation.
- Use eco-friendly sources of energy.
- [11] Reduce harmful effects of computing resources and also reduces computing wastes.
- The major advantage of green computing is it reduces energy usage through green computing techniques that controls the carbon dioxide.
- Green computing uses less energy for electronic products during produce, use and dispose.
- It is a powerful approach to utilize resources such as computers, office space, heat, light, electrical power in an environmental friendly way.

IV. DISADVANTAGES

As the coin has two sides they also have some disadvantages too. They are listed below:

- Green computers could actually be quite costly. For eg...The greenest modern computers today are Mac books which are expensive enough.
- Not fascinating for children.
- Rapid technology change.
- Some computers that are green may be considered underpowered.

V. CONCLUSION

So far, consumers haven't cared about environmental impact when buying computers, they've cared only about speed and price. Devices use less power while renewable energy gets more and more portable and effective. New green materials are developed every year, and many toxic ones are already being replaced by them. "The greenest computer will not miraculously fall from the sky one day; it'll be the product of years of improvements". The features of green computing of tomorrow would be like: efficiency, manufacturing and materials, recyclability, service model, self-powering, and



other trends. Green computing will be one of the major contributions which will break down the 'digital divide', the electronic gulf that separates the information rich from the information poor. Green computing presents a responsible way to address the issue of global warming. save power and contribute your efforts in keeping this planet green.

Rina Mishra, Sonali Jain, Nirupama Kurmi

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