

Green Computing: Eco Friendly Technology

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Abstract— Green computing is the study and practice of efficient and eco-friendly computing. Green computing is also called as green technology. The principle behind energy efficient coding is to save power by getting software to make less use of the hardware, rather than continuing to run the same code on hardware that uses less power. Green computing is the environmentally responsible use of computers and related resources. Such practices include the implementation of energy-efficient central processing units (CPUs), servers and peripherals as well as reduced resource consumption and proper disposal of electronic waste (e-waste). Green computing is also necessary for the future generation also. This work includes the use of green computing in today's world and how the environment problems can be reduced using green computing and how to protect the future by using the green technology.

Keywords— green computing, energy star, approaches towards green computing, implementation of green computing and future of green computing.

INTRODUCTION

Green computing is also known as green information technology (green IT). Green computing is the environmentally responsible and eco-friendly use of computers and their resources ^[1]. In broader terms, it is also defined as the study of designing, manufacturing/engineering, using and disposing of computing devices in a way that reduces their environmental impact. It is the study and practice of environmentally sustainable computing or IT ^[2]. San Murugesan states that this can include "designing, manufacturing, using, and disposing of computers, servers, and associated subsystems—such as monitors, printers, storage devices, networking and communications systems — efficiently and effectively with minimal or no impact on the environment. The goals of green computing are similar to green chemistry: reduce the use of hazardous materials, maximize energy efficiency during the product's lifetime, and promote the recyclability or biodegradability of defunct products and factory waste. It was primarily addressed by enhanced research and development efforts to reduce power usage, heat transmission, cooling needs of hardware devices, in particular processor chips using extensive hardware controls. Green computing is important for all classes of systems, ranging from handheld systems to large-scale data centers.

ORIGIN

In 1992, the U.S. Environmental Protection Agency launched Energy Star, a voluntary labelling program that is designed to promote and recognize energy-efficiency in monitors, climate control equipment, and other technologies ^[10]. This resulted in the widespread adoption of sleep mode among consumer electronics. 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 expanded to include criteria on energy consumption, ergonomics and the use of hazardous materials in construction.

WHY GREEN COMPUTING?

Green computing whose goals are to reduce the use of hazardous materials, maximize energy efficiency during the product's lifetime, and promote the recyclability or biodegradability of defunct products and factory waste. We use Green Computing for following benefits:-

- 1) Using ENERGY STAR qualified products help in energy conservation.
- 2) The Climate Savers Computing Initiative (CSCI) catalogue can be used for choosing green products.
- 3) Organic light-emitting diodes should be used instead of the regular monitors ^[5].
- 4) Surge protectors offer the benefit of green computing by cutting off the power supply to peripheral devices when the computer is turned off.
- 5) Donating your old computers and other peripherals can reduce the rate of e-waste creation ^[8].
- 6) It was expected that computers would help reduce paper wastage. However, even today wastage of paper is a serious issue in industries ^[10].
- 7) Use the device only if it is necessary.
- 8) The manufacturing of disks and boxes needed for video games takes up a lot of resources. Video game manufacturers can offer their games online for download, leading to reduction in e-waste. This move can cut down on the transportation/shipping cost.
- 9) Use of 'Local Cooling' software can help in monitoring and thereby, bringing down the energy consumed by computer. This 'Windows' program makes adjustments to the power options of computer and helps in minimizing energy consumption ^[12].

APPROACHES TOWARDS GREEN COMPUTING

I. Virtualizing

Computer virtualization refers to the abstraction of computer resources, such as the process of running two or more logical computer systems on one set of physical hardware. The concept originated with the IBM mainframe operating systems of the 1960s, but was commercialized for x86-compatible computers only in the 1990s ^[3]. With virtualization, a system administrator could combine several physical systems into virtual machines on one single, powerful system, thereby unplugging the original hardware and reducing power and cooling consumption. Virtualization can assist in distributing work, so that servers are either busy or put in a low-power sleep state.

II. Terminal Servers

Terminal servers have also been used in green computing. When using the system, users at a terminal connect to a central server; all of the actual computing is done on the server, but the end user experiences the operating system on the terminal. These can be combined with thin clients, which use up to 1/8 the amount of energy of a normal workstation, resulting in decrease of energy cost and consumption.

III. Power Supply

Desktop computer power supplies (PSUs) are in general 70–75% efficient, dissipating the remaining energy as heat. A certification program called 80 plus certifies PSUs that are at least 80% efficient; typically these models are drop-in replacements for older, less efficient PSUs of the same form factor. As of July 20, 2007, all new Energy Star 4.0-certified desktop PSUs must be at least 80% efficient.

IV. Video Card

A fast GPU may be the largest power consumer in a computer.

Energy-efficient display options include:

- No video card - use a shared terminal, shared thin client, or desktop sharing software if display required.
- Use motherboard video output - typically low 3D performance and low power.
- Select a GPU based on low idle power, average wattage, or performance per watt.

V. Display

CRT monitors typically use more power than LCD monitors. They also contain significant amounts of lead. LCD monitors typically use a cold-cathode fluorescent bulb to provide light for the display. Some newer displays use an array of light-emitting diodes (LEDs) in place of the fluorescent bulb, which reduces the amount of electricity used by the display. Fluorescent back-lights also contain mercury, whereas LED back-lights do not.

VI. Cloud Computing

Cloud computing addresses two major ICT challenges related to Green Computing – energy usage and resource consumption. Virtualization, Dynamic provisioning environment, multi-tenancy, green data center approaches are enabling cloud computing to lower carbon emissions and energy usage up to a great extent ^[14]. Large enterprises and small businesses can reduce their direct energy consumption and carbon emissions by up to 30% and 90% respectively by moving certain on-premises applications to cloud.

IMPLEMENTATION OF GREEN COMPUTING

i. Blackle

Blackle is a search-engine site powered by Google Search. Blackle came into being based on the concept that when a computer screen is white, presenting an empty word or the Google home your computer consumes 74W ^[9]. When the screen is black it consumes only 59W. Based on this theory, if everyone switched from Google to Blackle, mother earth would save 750MW each year. This was a really good implementation of Green Computing. The principle behind Blackle is based on the fact that the display of different colours consumes different amounts of energy on computer monitors.

ii. Zonbu Computer

The Zonbu is a new, very energy efficient PC. The Zonbu consumes just one third of the power of a typical light bulb. The device runs the Linux operating system using a 1.2 gigahertz processor and 512 MB of RAM. It also contains no moving parts, and does even contain a fan ^[13].

iii. Sunray Thin Client

Sun Microsystems is reporting increased customer interest in its Sun Ray, a thin desktop client, as electricity prices climb. Thin clients like the Sun Ray consume far less electricity than conventional desktops.

Future of Green Computing

As 21st century belongs to computers, gizmos and electronic items, energy issues will get a serious ring in the coming days, as the public debate on carbon emissions, global warming and climate change gets hotter ^[6]. The plan towards green IT should include new electronic products and services with optimum efficiency and all possible options towards energy savings. Companies are laying emphasis on moving towards eco-friendly components in computers. The use of eco-friendly sustainable components will become the norm rather than the exception in future ^[7]. Taking into consideration the popular use of information technology industry, it has to lead a revolution of sorts by turning green in a manner, no industry has ever done before. Opportunities in green technology lie like never before in history and organizations are seeing it as a way to create new profit centers while trying to help the environmental cause. The plan towards green IT should include new electronic products and services with optimum efficiency and all possible options towards energy savings ^[4]. Faster processors historically use more power. Power supplies are notoriously bad, generally as little as 47% efficient. And since everything in a computer runs off the power supply, nothing can be efficient without a good power supply. Recent inventions of power supply are helping fix this by running at 80% efficiency or more.

CONCLUSION

The green technology doesn't include green computing only but also focuses on the components used in the computer. As, energy star is used nowadays focuses on the computer does not affect the environment. Sustainable computing should be considered. Green computing represents a responsible way to address the issue of global warming. By adopting green computing practices, business leaders can contribute positively to environmental stewardship and protect the environment while also reducing energy and paper costs. Nowadays, every computer manufacturing company is focusing on the green IT concept. It can be seen that people are moving towards the green technology day by day. New green materials are developed every year and many toxic ones are already being replaced by them. Environmentally it is not a good thing that most PCs -- especially in companies -- have typically entered a landfill after only a few years of service. However, this reality does at least mean that a widespread mind set already exists for both adapting to and paying money for new computer hardware on a regular basis.

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