A Conceptual Viewpoint of Green Computing to Save Energy, Money and Resources

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Abstract

Green computing is not only computing technology but also it is the way of using resources, energy and money in an efficient manner. Green computing, green IT or ICT sustainability, is the study and practice of environmentally sustainable computing or IT. It comprises designing, engineering, using, and recycling of resource like computers, servers, and supplementary subsystem such as monitors, printers, storage devices, networking and communication systems having low effect or without effect on the environment. The present paper explores the ideas to reduce the use of harmful materials, steps for saving energy, money and human efforts and to suggest the best use of energy during the product's lifetime.

Keywords: Computing, Energy, Environment, Green, Human, Technology

I.   INTRODUCTION

Recently, the green computing has become the part and parcel of each industry. In simple words, the study and practice of efficient and eco-friendly computing resources, is under the attention of not only environmental organizations but also other business houses. Specifically, companies in the IT industry realized that going green is not only in their best interest but also beneficial for public relations and cost reduction. Green computing is the way to use of computers and related resources not on the cost of environment but it includes 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). 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. It benefits the environment as companies take care for disposal of electronic waste in an effective way. Consequently, the environment is not affected. In the present era, people do take note of

the importance of green technologies and the ways in which it helps the planet. Therefore, it is pertinent to do the needful to save the environment.

One of the major problems faced in the present scenario is the increase in the quantum of electronic wastes. The electronic wastes constitute more than 70 percent of all the hazardous wastes. The production of certain computer parts involves the usage of large number of toxic materials, harmful chemicals, heavy metals, plastics which cannot be easily burnt. Such materials, when burnt, can easily pollute the ground water and also the environment. Green computing is the need of the hour. It promotes use of all possible measures to save energy and improving the lives of electronic components. Companies around the world are very much serious to find the ways to save energy and reduce costs through buying new hardware and softwares. Previously, electricity has been treated as an overhead expense like the cost of space. But with rising power costs and issues regarding reliability, supply, capacity and electricity requires its own specific strategy. Further, projects regarding performance optimization and cost reduction are the best practices in each business. As per IT professionals, many of us make decisions about the configuration and setup of servers, the specifications of the equipment, the requirements for data centre up-gradation and construction.

II.   STEPS FOR GREEN COMPUTING

To promote green computing concepts at all possible levels, the following four complementary approaches may be employed:

- **Usage**: Minimizing the electricity consumption of computers and their peripheral devices and using them in an eco-friendly manner.
- **Manufacturing**: Minimizing waste during the manufacturing of computers and other subsystems to reduce the environmental impact of these activities.
- **Disposal**: Structuring an existing computer or recycling, unwanted electronic equipment.
- **Design**: Designing energy-efficient computers, servers, printers, projectors and other digital devices.

The work habits of computer users and businesses can be modified to minimize adverse impact on the global environment. Green PCs have recently surfaced in the media due to claims that the manufacturing and operation of computer hardware may be a significant contributor to global warming. In fact, extreme cases show that a computer may use as much power as a refrigerator or it may be higher side. So, efforts to keep green your wallet and use eco-friendly hardware, the following steps may also be considered.

a)   Hardware Related

- Use flat-screen or LCD monitors [2], instead of conventional cathode ray tube (CRT) monitors. Consider upgrading to a flat panel LCD monitor. They use approximately 1/3 the energy as equal-sized CRT monitors.

- Gamers [4] – consider an upgrade to your video card. An upgrade. ATI and nVidia's latest cards are becoming more powerful and efficient. For example, nVidia's new 9600GT performs marginally better to that of their older 8800GT, yet uses approximately 10 percent less power.

- If there is not use of super-fast computing power then look out for energy efficient components when buying a new computer, such as green hard drives and low-energy processors. In particular buying an energy efficient power supply unit for a desktop PC can help the environment and save money. They are often quieter too verify the computer's power supply is 80 Plus Certified – meaning that it is at least 80 percent efficient across a range of loads: 20, 50, and 100 percent.

- Buy energy efficient notebook computers, instead of desktop computers.

- Refill printer cartridges, rather than buying new ones.

- Power-up and power-down energy-intensive peripherals such as laser printers according to need. Buy ink jet printers, not laser printers. Ink jet printers use 80 to 90 percent less energy than laser printers and print quality can be excellent.

- Use of N-computing will also help in green computing. Today's PCs are so powerful that we no longer need one PC per person. We can tap into the excess power in one PC and share it with many users. N-Computing thin client devices use just 1 to 5 watts, last for a decade, and generate just a few ounces of e-waste. Not only this is a simple solution to a complex problem but also the energy efficiencies are achieved by using this technology. N-Computing [7] solutions

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237

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save 75% on hardware, and since they draw less than 5 watts of power, it can be reduced energy footprint by as much as 90% per user. N-Computing thin client devices produce practically no heat, reducing the need for energy-consuming air conditioning. Electricity savings alone can pay for the N-Computing virtual desktops in as little as one year.

- Advances in technology mean our reliance on physical items has been greatly reduced. It means there is not need to buy a CD because music can be legally purchased from Amazon, iTunes or many other sources. And rather than printing documents and photographs make use of email and instant messaging to send documents, or gadgets such as digital photo frames to display pictures without paper.

- If the computer is running slow it doesn't mean you have to buy a whole new system, simple upgrades such as extra RAM, a new hard drive or a new processor can have a major impact and give your system a new lease of life. Most laptops can be upgraded as well, not just desktop systems. It may not even need new parts, clearing out old files are reinstalling the operating system can improve performance without costing any money [3].

b)   Software Related

- Seems obvious but many of us leave computers powered up for long periods when not in use. Computer displays in particular use a large amount of energy so if you're not using the computer for a while press the power button to shut it off until required, you can do this even if the computer is working on something. Remember that a screensaver doesn't save power. Same goes for your computer itself, you don't have to shut it down completely if you don't want to reboot, just use sleep or hibernation mode. That will save energy but restore the system to its current state when you need it again by enabling a monitor's power-saving mode that places the monitor in a "sleep" state until activity from the mouse or keyboard is detected.

- Screensavers are not energy savers; they continually use the monitor at full power and were originally designed to prevent "burn in" [5].

- Employ alternative energy sources for computing workstations, servers, networks and data centres [6].

- Proper coding and usage of best algorithms would reduce the load on computer servers, thus reducing energy consumption. To minimize the load on the server, coding should be done in a way so that optimum use of cache and validation functions. Algorithms which are smartly written using only few lines of code can also help in using the servers efficiently.

c)   User Habits

Average computer users can employ the following general tactics to make their computing usage greener:

- Make proper arrangements for safe electronic waste disposal.
- Adjust the brightness on your monitor. The brighter a monitor, the more energy it uses. A monitor's brightness can be reduced dramatically if used in a dark room.
- Turn off your laptop's bluetooth or wireless capabilities when not in use to get some extra minutes, or even hours, out of the device before the battery dies.
- Turn off computers at the end of each day. Shut down your computer when you leave the office or home for more than two hours. An alternative would be to place it in hibernation or standby mode. Despite popular belief, powering your computer on and off daily is a good habit for proper PC maintenance.
- Instead of purchasing a new computer, try refurbishing existing devices. Computer hardware is packed with all kinds of material which can be hazardous to the environment so make sure you dispose of old components properly.
- Don't just throw broken technology in the bin; take the time to track down local recycling schemes. There may be companies which can extract the valuable rare metals, or charities which may repair or restore items.
- You may even be able to sell some things yourself on eBay to make a little extra cash. If nothing else you should check with your local authorities to find out what facilities they offer for safely disposing of old computing equipment.

- Try to do computer-related tasks during contiguous, intensive blocks of time, leaving hardware off at other times.

- Minimize the use of paper and properly recycle waste paper.

- Dispose of e-waste according to federal, state and local regulations.

- Use Online banking, ATMs , I-Banking and M-Banking for banking transaction and tasks

d)   Cloud Computing

Cloud Computing is the emerging buzzword in cyberspace. It is rising day by day due to its rich and well-to-do features of services. Cloud computing refers to applications and services that run on distributed networks using virtualized resources and accessed by common internet protocols and networking standards. Cloud computing is a new flavor of computing where our trend of using Internet changes. The term "cloud" is analogical to "Internet". The term "cloud computing" is used for the computation over the Internet. It is the future of Internet [9].

- It is also called as fifth generation of computing after Mainframe, Personal Computer, Client-Server Computing, and the Web. Currently various Internet services are available in distributed manner. There are three well-known technologies associated with Cloud Computing, specifically Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS) and Infrastructure-as-a-Service (IaaS). Cloud provides Computing resources only when user required. These feature save energy and production of more resources some time user by resources when he required only for short time or less time.

- Though the word "cloud" evokes images of a clean, simple and environmentally friendly process, the systems that support it are massive industrial facilities, densely packed with processors and hard drives that devour energy by the megawatt. Data centres use between 1 and 2 % of the world's electricity and, with dead trees that make paper giving way to magnetic disks, energy use and consequently emissions from the Internet is poised to surge furtherPooling these resources in a central location means companies can effectively buy

computing power in bulk and servers can spend more time doing actual work per processing unit, reducing the overall need for more computers. [8]

III. CONCLUSIONS

A company called N-Computing is working on just such an arrangement for schools: One computer hosts all of the memory and processing capability and up to 30 students can connect to the host computer via a small device that consumes far less energy than a desktop computer (or even a laptop). Many businesses have servers and computing hardware on-site, which are often inefficient and underused, soaking up electricity while sitting idle". Sun Microsystems is a big proponent of the thin client system. By considering the tips discussed in the research paper, one can help in implementing Green Computing.

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