A Study on Improving the Environment: Green Computing

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ABSTRACT: Nowadays the research work on "Green Computing" is increasing day by day as the awareness among the people increases and also the areas in which research is done is increasing .It has become necessary to take such an initiative to save the environment from the harmful effects occurring in the society and the environment from such E-hazards. The present paper discusses the reasons, approaches and some dos and don'ts to be followed to save the earth from being victimized of such harmful effects. The research work and survey is necessary to aware the people of this hazard. Green Computing refers to using the eco-friendly ways of using the computer devices and other such related products. Nowadays it is becoming more and more challenging to develop such a eco-friendly environment for the IT leaders due to the expensive nature of such devices.

KEYWORDS: E-hazards, Green Computing.

I. INTRODUCTION

Green Computing can be referred as the practice of using the computers resources and the related devices like printers, monitors, storage devices and other networking devices efficiently. Green [1] computing is the environmentally responsible and eco-friendly use of computers and their resources. In [2] broader terms it is also defined as the study of designing, manufacturing/engineering, using and disposing of computing devices in a way the reduces their environmental impact.

The amount of computing devices being made are increasing to a large extent and hence the scientists are in a constant effort of the study on how to reduce the harmful effects of these numerous devices on the environment. [3] The goal of green computing is to maximize the use of power consumption or very little or no wastage of power with efficient use of energy and to minimize the cost and CO2 emission. To prolong or maximize the energy efficiency these devices should be used efficiently. The energy consumption of such devices should be reduced and promote such energy efficient devices as much as possible.

In 1992, the U.S. Environmental Protection Agency launched a voluntary program Energy Star, which is designed to promote and recognize energy-efficiency in monitors, climate control equipments, and other technologies. The main purpose of Green Computing is to maximize the device efficiency and thereby increasing the environment lifetime. These approach is basically balanced and useful in order to achieve the clean environment without even compromising the technology needs and within shorter period of time.

II. WHY GO GREEN

Today almost all streams weather its IT, medicine, transportation, agriculture uses machines which indirectly requires large amount of power and money for its effective functioning. We have great machines and equipments available to accomplish our tasks, great gadgets with attractive looks and features which make our lives more impressive and smooth. 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. Therefore we use Green Computing for following benefits:
- By implement Green Computing energy conservation can be achieved.
- It helps in saving the cost saving.

- By using Green Computing, resource utilization can be done efficiently and effectively.
- Environment sustainability can be achieved.
- CO_2 emissions can be reduced.

III. ACTION PLAN FOR GREEN COMPUTING[4]

The following steps should be taken in order to achieve efficient green computing.

1. Using ENERGY STAR qualified products help in energy conservation.
2. The Climate Savers Computing Initiative (CSCI) catalog can be used for choosing green products.
3. Organic light-emitting diodes should be used instead of the regular monitors.
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 e-waste creation rate. Moreover, those who cannot afford to buy a computer can benefit from such donations. Through proper disposal of computers and its accessories, it is possible to reduce environmental pollution.
6. It was expected that computers would help reduce paper wastage. However, even today wastage of paper is a serious issue in industries. The easy availability of photocopiers and printers is also one of the culprits behind unchecked paper wastage. Think twice before using printers.
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 your computer. This 'Windows' program makes adjustments to the power options of your computer and helps minimize energy consumption.

IV. GREEN COMPUTING VS CLOUD COMPUTING [5]

- Green Computing is that a computer and technology is how much responsible for the environmental change.
- Cloud Computing is an internet service that provides computing needs to the computer users.
- Green Computing aim is to make efficient use of computers to reduce its impact on environment.
- Cloud Computing aim is to increase the efficiency of the network by diversifying it and the infrastructure.

## V. APPROACHES OF GREEN COMPUTING

a) Virtualization[6]

- Computer Virtualization means abstraction of computer resources, such as the process of running two or more logical computer systems on one set of physical hardware. Through Virtualization, a system administrator can combine several physical systems into virtual machines on one single, powerful system, thereby reducing power and cooling consumption. In the longer run, more profits and less expenses.
- Reducing the number of hardware components and replacing them with Green Computing systems reduces energy costs for running hardware and cooling as well as reducing carbon dioxide emissions and conserving energy.
- The phrase —green computing‖ may conjure up some humorous images if you're not familiar with the term. Normally, we think of gas guzzling cars, factories, pesticides, and such when considering environmental concerns. So what does the term —green signify in the context of everyday computing.
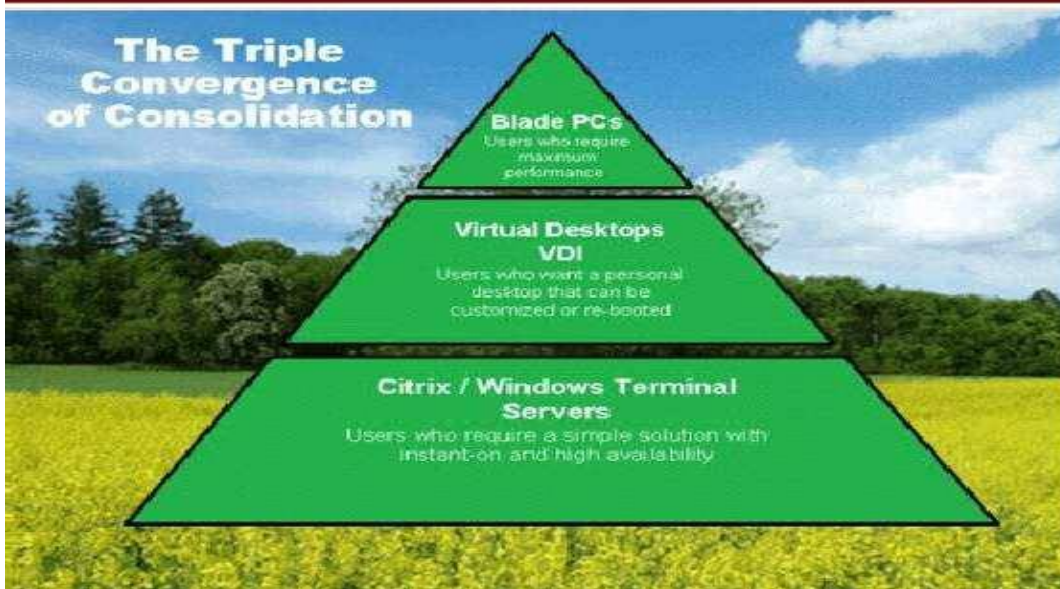
- In a world where computers are everywhere, and environmental concerns are growing by the day, we need to consider how we can build, use and dispose of computers in a manner that's conducive to the health of the environment. That includes reducing the use of lead and other hazardous materials in manufacturing, being careful about energy consumption and paper waste by computer users, and concern for salvage or recycling of old computers. Millions of computers are dumped into landfills each year. That equates to a lot of lead, cadmium, mercury and brominates flame retardants, which will contaminate both water and air.

b) Video Card [7]

- 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. Reuse an older video card that uses little power; many do not require heat sinks or fans. Select a GPU based on average wattage or performance per watt.

c) Display

- LCD [8] monitors typically use a cold-cathode fluorescent bulb to provide light for the display. Some newer displays use an array of light emitting diodes (LED's) in the place of fluorescent bulb, which reduces the amount of electricity used by the display.
- Microsoft has been heavily criticized for producing operating systems that, out of the box, are not energy efficient. Due to Microsoft`s dominance of huge desktop operating systems market this omission may have resulted in more energy waste than any other initiative by other vendors. Microsoft claimed to have improved this in Vista. This claim is disputed in the community. This problem has been compounded because Windows versions before Vista did not allow power management features to be configured centrally by a system administrator. This has meant that most organizations have been unable to improve this situation. Again, Microsoft Windows Vista has improved this by adding basic central power management configuration. This basic support offered has been unpopular with system administrators who want to change policy to meet changing user requirements or schedules. Several software products have been developed to fill this gap.

d) Power Supply

➢ In general, the Desktop computer power supplies (PSUs) are 70-75% efficient, dissipating the remaining energy as heat. An [9] industry initiative 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.

e) Telecommuting

➢ Teleconferencing and telepresence technologies are nowadays often implemented in green computing initiatives. The advantages are many; increased worker satisfaction, reduction of greenhouse gas emissions related to travel, and increased profit margins as a result of lower overhead costs for office space, heat, lighting, etc. The savings are significant; the average annual energy consumption for U.S. office buildings is over 23 kilowatt hours per square foot, with heat, air conditioning and lighting accounting for 70% of all energy consumed. Other related initiatives, such as hoteling, reduce the square footage per employee as workers reserve space only when they need it. Many types of jobs — sales, consulting, and field service — integrate well with this technique.[8]

f) Storage

➢ Smaller form factor (e.g. 2.5 inch) hard disk drives often consume less power per gigabyte than physically larger drives. Solid-state drives store data in flash memory or DRAM unlike hard disk drives. Power consumption may be reduced somewhat for low capacity flash based devices with no moving parts. Even at modest sizes, DRAM-based SSDs may use more power than hard disks, (e.g., 4GB I-RAM uses more power and space than laptop drives). Flash based drives are generally slower than hard disks for writing.

➢ As hard drive prices have fallen, storage farms have tended to increase in capacity to make more data available online. This includes archival and backup data that would formerly have been saved on tape or with offline storage. The increase in online storage has increased power consumption. Reducing the power consumed by large storage arrays, while still providing the benefits of online storage, is a subject of ongoing research.[8]

g) Materials Recycling

➢ Computer systems that have outlived their particular function can be repurposed, or donated to various charities and non-profit organizations. However, recently many charities have imposed minimum system requirements for donated equipment. In addition to this, parts from outdated systems may be salvaged and recycled through certain retail outlets and municipal or private recycling centers.

➢ Recycling computing equipment can keep harmful materials such as lead, mercury, and hexavalent chromium out of landfills, but often computers gathered through recycling drives are shipped to developing countries where environmental standards are less strict than in North America and Europe. According to the Silicon Valley Toxics Coalition estimation, the 80% of the post- consumer e-waste collected for recycling is shipped abroad to countries such as China, India, and Pakistan. Computing supplies, such as printer cartridges, paper, and batteries may be recycled as well.[8]

VI. STEPS TO ACHIEVE GREEN COMPUTING[10]

As of Oct. 20, there are new performance requirements to qualify for the Energy Star rating for desktop and notebook computers, workstations, integrated computers, desktop-derived servers and game consoles. These specifications go into effect on July 20.But businesses don't have to wait until then to initiate more environmentally-friendly computing practices. Here are five first steps you that can be taken toward a green computing strategy.

a) Develop a sustainable green computing plan.

Discuss with your business leaders/partners the elements that should be considered into such a plan, including organizational policies and checklists. Such a plan should be equipped with recycling policies, recommendations for disposal of used equipment, government guidelines and recommendations for purchasing green computer equipment.

Green computing's such practices and policies should cover power usage, reduction of paper consumption, as well as recommendations for new equipment and recycling old machines. Organizational policies should include communication and implementation as well.

b) Recycle

Discard used or unwanted electronic equipment in a convenient and environmentally responsible manner.

Computers have toxin metals and pollutants that emit harmful emissions into the environment, increasing the risk of the environment. Never discard computers in a landfill, instead recycle them through manufacturer programs such as HP' Planet Partners recycling service or recycling facilities available in your community. Or donating still-working computers to a non-profit agency is also considered helpful.

c) Make environmentally sound decision

Purchase Electronic Product Environmental Assessment Tool registered products. EPEAT is a procurement tool which is promoted by the nonprofits Green Electronics Council to:
➢ Help institutional purchasers evaluate, compare and select desktop computers, notebooks and monitors based on environmental attributes.
➢ Provide a clear, consistent set of performance criteria for the design of products.
➢ Efforts should be made to reduce the environmental impact of products by reducing or eliminating environmentally sensitive materials, designing for longevity and reducing packaging materials.

All EPEAT-registered products must meet minimum requirements in some areas of environmental impact and be energy efficient to reduce emissions of climate-changing greenhouse gases. To demonstrate corporate social and environmental performance, manufacturers must offer safe end-of-life management and recycling options when products are no longer in use.

"Developing environmentally sound products has long been a priority for HP' design and engineering teams," says Jeri Callaway, vice president and general manager, Americas Commercial Solutions, Personal Systems Group, HP. "We' particularly proud that our business-class products already meet, and in some cases exceed, the basic EPEAT standards without any alteration to their existing design.

d) Reduce paper consumption

There are numerous easy, obvious ways to reduce paper consumption: e-mail, electronic archiving, use the ―track changes feature in electronic documents, rather than red-line corrections on paper. When you do print out documents, make sure to use both sides of the paper, recycle regularly, use smaller fonts and margins, and selectively print required pages. Minimize the use of paper as far as possible.

e) Conserve energy

Turn off your computer when you know you won't use it for an extended period of time. Turn on power management features during shorter periods of inactivity.

Power management allows monitors and computers to enter low-power states when sitting idle. By simply hitting the keyboard or moving the mouse, the computer or monitors awakens from its low-power sleep mode in seconds. Power management tactics can save energy and help protect the environment.

VII. CONCLUSION

To conclude the technology of green computing though still is an emerging technology holds a significant importance in the emerging world. Green Technology, already being accepted in countries like U.S.A and U.K has created a significant impact on the commercial world as well as on the environment. The industry is prepared and far more competent than almost any other industry when it comes to facing and responding to rapid change.

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