

Green Computing

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Abstract:

Global warming and environmental changes have become sophisticated problematic issues with governments, corporations and therefore all are seeking out new ways to green up. Green messaging in general and in the IT industry in particular tends to center around carbon footprint and emissions reduction or cost savings. Therefore recently green computing gained a lot of attention and visibility by concerning global warming due to increased CO₂ emissions. The evaluation, analysis and optimization of the workload demands and IT infrastructures are required to determine the present and future energy consumption needs. Therefore the primary motivation behind this green approach is cost saving and also at the same time there are lots of money savings and eco-friendly. This paper includes about major issues of green computing and how it is benefitted to the world as eco-friendly, the approaches to green computing and also the future directions of it.

Keywords:

Power management, Capacity planning, Carbon emission, e-waste, Energy Star, Environment, Green Computing, Recycle, Sustainable.

I. INTRODUCTION

Green computing is the study and practice of minimizing the environmental impact of computer system and related resources efficiently and eco-friendly. Some of the major components of green computing include implementation of energy-efficient CPUs, server systems and peripherals. Further, green computing focuses on reduced resource consumption and the proper disposal of electronic wastage. 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. These solutions benefit for bottom line (people, planet, profit). People mean human capital and it pertains

to beneficial business practices toward labor, the community and region in which a corporation conducts its business. Planet means natural capital and it refers to sustainable environmental practices. Profit is the bottom line shared by all commerce within the sustainable framework. The field of "green technology" encompasses a broad range of subjects — from new energy-generation techniques to the study of advanced materials to be used in our daily life. Green technology focuses on reducing the environmental impact of industrial processes and innovative technologies caused by the Earth's growing population.

II. WHAT IS GREEN COMPUTING

Green Computing is an application of environmental science which offers economically possible solutions that conserve natural environment and its resources. It can be defined as environmentally responsible use of computers and its resources. Green computing is all about designing, manufacturing, using and disposing of computers and its resources efficiently and effectively with minimal or no impact on environment. It is efficient approach towards electricity saving and less amount of heat generated by the computers. The goals of green computing are power management and energy efficiency, choice of eco friendly hardware and efficient software and material recycling and increasing the product's life. With the help of information and communication technologies (ICT), Green computing becomes an effective approach to grow segments that affects carbon emission. It also implements energy star

management strategies and technologies that reduce energy consumption waste.



Fig 1 Green Computing

History of Green computing

In 1992, the U.S. Environmental Protection Agency launched Energy Star, a voluntary labeling program which is designed to promote and recognize energy-efficiency in monitors, climate control equipment, and other technologies. This resulted in the widespread adoption of sleep mode among consumer electronics. The term "green computing" was probably coined shortly after the Energy Star program began;

For a PC disposal, it is necessary to know everything there is to know in order to be involved in green computing. Basically, the whole green aspect came about quite a few years back when the news that the environment was not a renewable resource really hit home and people started realizing that they had to do their part to protect the environment. Basically, the efficient use of computers and computing is what green computing is all about. The triple bottom line is what is important when it comes to anything green and the same goes for green computing. This considers social responsibility, economic viability and the impact on the environment. Many businesses simply focus on a bottom line, rather than a green triple bottom line, of economic viability when it comes to computers. The idea is to make the whole process surrounding computers friendlier to the environment, economy, and society. This means manufacturers create computers in a way that reflects the triple bottom line positively. Once computers are sold businesses or people use them in a green way by reducing power usage and

disposing of them properly or recycling them. The idea is to make computers from beginning to end a green product.

III. EFFORTS FOR GREEN COMPUTING

We need not to stop using computers and even need not to stop using electricity but we have to do some efforts to make environment healthy. The following actions should be taken by us:

Use Energy Star labelled products: All the energy star labelled products are manufactured with keep in mind the term Green Computing and its features. These products are manufactured on the idea of less power consumption. These devices are programmed to power-down to a low power state or when they are not in use. so we have to use "Energy Star" labelled desktops, monitors, laptops, printers and other computing devices.

Turn off your computer: As the previously used figures stated that PC's and its peripherals consume more power and resultant is the high amount of CO₂ emission. So we have to keep it in our mind and never hesitate to turn off our personal computers when they are not in use.



Sleep Mode: - Sleep mode save our session and put our computer in a low power state so that we can quickly resume windows. Always put our PC on sleep mode when not in use. It saves 60-70 percent of electricity.

Hibernate our computer: - This mode allows us to shut everything down. When we are not using our computer for a short period of time we have to hibernate it. It saves the electricity when computer is not in use.



IV. BACKGROUND

A. *Governments go green*

Any governments worldwide have initiated energy-management programs, such as Energy Star, an international standard for energy-efficient electronic equipment that was created by the United States Environmental Protection Agency in 1992 and has now been adopted by several other countries. Energy Star reduces the amount of energy consumed by a product by automatically switching it into —sleep|| mode when not in use or reducing the amount of power used by a product when in —standby|| mode. Surprisingly, standby —leaking,|| the electricity consumed by appliances when they are switched off, can represent as much as 12 percent of a typical household's electricity consumption. In Australia, standby power is a primary factor for the country's increased greenhouse gas emissions — more than 5 megatons (CO₂ equivalent) annually..

B. *An example of VIA technologies Green Computing*

VIA Technologies, a Taiwanese company that manufactures motherboard chipsets, CPUs, and other computer hardware, introduced its initiative for "green computing" in 2001. With this green vision, the company has been focusing on power efficiency throughout the design and manufacturing process of its products. Its environmentally friendly products are manufactured using a range of clean-computing strategies, and the company is striving to educate markets on the benefits of green computing for the sake of the environment, as well as productivity and overall user experience.

Carbon-free computing

One of the VIA Technologies' ideas is to reduce the "carbon footprint" of users — the amount of greenhouse gases produced, measured in units of

carbon dioxide (CO₂). After the 1997 Kyoto Protocol for the United Nations Framework Convention on Climate Change, the world has finally taken the first step in reducing emissions. The emissions are mainly a result of fossil-fuel-burning power plants.

Solar Computing

Amid the international race toward alternative-energy sources, VIA is setting its eyes on the sun, and the company's Solar Computing initiative is a significant part of its green-computing projects. For that purpose, VIA partnered with Motech Industries, one of the largest producers of solar cells worldwide. Solar cells fit VIA's POWER efficient silicon, platform, and system technologies and enable the company to develop fully solar-powered devices that are non polluting, silent, and highly reliable

Quiet computing

A central goal of VIA's green-computing initiative is the development of energy-efficient platforms for low-power, small-form-factor (SFF) computing devices. In 2005, the company introduced the VIA C7-M and VIA C7 processors that have a maximum power consumption of 20W at 2.0GHz and an average power consumption of 1W. These energy-efficient processors produce over four times less carbon during their operation and can be efficiently embedded in solar-powered devices.

V. STEPS TO GREEN COMPUTING

1. Develop a sustainable green computing plan. Discuss with the business leaders the elements that should be factored into such a plan, including organizational policies and checklists. Such a plan should include recycling policies, recommendations for disposal of used equipment, government guidelines and recommendations for purchasing green computer equipment. Green computing best 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.

2. **Recycle.** Discard used or unwanted electronic equipment in a convenient and environmentally responsible manner. Computers have toxin metals and pollutants that can emit harmful emissions into the environment. Never discard computers in a landfill. Recycle them instead through manufacturer programs such as HP's Planet Partners recycling service or recycling facilities in your community. Or donate still-working computers to a non-profit agency.
3. **Make environmentally sound purchase decisions.** Purchase Electronic Product Environmental Assessment Tool registered products. EPEAT is a procurement tool promoted by the non profit 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.
 - Recognize manufacturer efforts to reduce the environmental impact of products by reducing or eliminating environmentally sensitive materials, designing for longevity and reducing packaging materials.
4. **Reduce Paper Consumption:** There are many easy, obvious ways to reduce paper consumption: e-mail, electronic archiving, use the —track changes feature in electronic documents, rather than redline 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.

5. **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.

VI. CONCLUSION

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.

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