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GREEN COMPUTING: AN OVERVIEW

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Abstract: Green computing is use of computers and related resources like - monitors, printer, storage devices, networking and communication systems - efficiently and effectively with minimal or no impact on the environment. It 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 techniques reduces carbon dioxide emissions, stemming from a reduction in the fossil fuel used in power plants and transportation. Conserving resources means less energy is required to produce, use, and dispose of products, saving energy and resources saves money.

Keywords: Green Computing, Electronic-waste, Energy Star, EPEAT, Recycling.

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INTRODUCTION

In 1992, the U.S. Environmental Protection Agency launched Energy Star, a voluntary labeling program that 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. Green Computing is also defined as the study of designing, manufacturing/engineering, using and disposing of computing devices in a way that reduces their environmental impact. 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 and paper. The solution to green computing is to create an efficient system that implements these factors in an environmentally friendly way. A good example would be IT managers purchasing hardware that has been EPEAT approved meaning that maintenance is reduced, the hardware's life is extended, and makes recycling the computer easy once it is no longer necessary. Mobile phones are better than computers – green computing. What do you use your computer for? Surfing Internet, chat, gaming, social networking, downloading, desktop computing including documents, spreadsheets or presentation making or just watching your photos and videos ? Today's mobile phones are capable of doing it all, rather sometimes more than the traditional phones. They have faster processors, more ram, faster wireless Internet connectivity and larger memories. Mobile Phones consume very low power. VIA Technologies, a Taiwanese company that manufactures motherboard chipsets, CPUs, and other computer hardware, introduced its initiative for "green computing If everyone takes into account green computing then our world of computers will have as little a negative impact on our physical world as possible and that is what green computing is all about.

Green computing, the study and practice of efficient and eco-friendly computing resources, is now under the attention of not only environmental organizations, but also businesses from other industries. In recent years, companies in the computer industry have come to realize that going green is in their best interest, both in terms of public relations and reduced costs. When we heard the term green computing the first thought that came into our mind was —going green with computers but the questions that strike our thoughts the very same moment were HOW and WHY to —go green, and in the quest for finding the answers to our questions we landed up with the conclusion —GREEN COMPUTING –GREAT COMPUTING[1].

Green Computing is the study and practice of the design, development, implementation, utilization and disposal of IT infrastructure efficiently and effectively with low or zero impact on the environment whilst reducing operating costs. Currently the ICT industry is responsible for

204

3% of the world's energy consumption. With the rate of consumption increasingly by 20% a year, 2030 will be the year when the world's energy consumption will double because of the ICT industry. Organizations use the Green Computing Lifecycle when designing and implementing green computing technologies. The stages in the Life Cycle include Strategy, Design, Implementation, Operations and Continual Improvements. The 5 core green computing technologies advocated by GCI are Green Data Center, Virtualization, Cloud Computing, Power Optimization and Grid Computing. Company like Via Technology offer green PC's that are affordable, non- toxic and ultra low wattage. It takes responsibility for their outdated products by offering a PC recycling service. [2]Cutting back on these two energy uses - the computers themselves and the energy used to cool them - makes a direct impact on company costs. Cutting back on energy use by making things more efficient can bring secondary savings too, which may not be immediately obvious. If you can increase the energy efficiency of front and back-office computing, you may not need to increase hardware.

I.   Why Green Computing

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 to accomplish our tasks, great gadgets with royal looks and features 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-

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 rate of e-waste creation.

6) 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.

7)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.

8) Use the device only if it is necessary.

9) 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.

10)   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.

III. Approaches towards 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.

A. 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 (CO_2). Greenhouse gases naturally blanket the Earth and are responsible for its more or less stable temperature. An increase in the concentration of the main greenhouse gases — carbon dioxide, methane, nitrous oxide, and fluorocarbons — is believed to be responsible for Earth's increasing temperature, which could lead to severe floods and droughts, rising sea levels, and other environmental effects, affecting both life and the world's economy.

B. 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 nonpolluting, silent, and highly reliable. Solar cells require very little maintenance throughout their lifetime, and once initial installation costs are covered, they provide energy at virtually no cost. Worldwide production of solar cells has increased rapidly over the last few years; and as more governments begin to recognize the benefits of solar power, and the development of photovoltaic technologies goes on, costs are expected to continue to decline. As part of VIA's —pc-1 initiative, the company established the first-ever solar-powered cyber community center in the South Pacific, powered entirely by solar technology.

C. Lead-Free and RoHS computing

In February 2003, the European Union adopted the Restriction of Hazardous Substances Directive (RoHS). The legislation restricts the use of six hazardous materials in the manufacture of various types of electronic and electrical equipment. The directive is closely linked with the Waste Electrical and Electronic Equipment Directive (WEEE), which sets collection, recycling, and recovery targets for electrical goods and is part of a legislative initiative that aims to reduce the huge amounts of toxic e-waste. Driven by these directives, VIA implemented a set of internal regulations in order to develop products that are compliant with these accepted policies, including the use of nonhazardous materials in its production of chipsets, processors, and companion chips. In 2001, they focused on lead-free manufacturing, introducing the Enhanced Ball Grid Array (EBGA) package for power efficient VIA processors and the Heat Sink Ball Grid Array (HSBGA) package for their chipsets. In traditional manufacturing processes, lead is used to attach the silicon core to the inside of the package and to facilitate integration onto the motherboard through tiny solder balls on the underside of the package. VIA's lead-free manufacturing technologies do not require a lead bead, and the solder balls now consist of a tin, silver, and copper composite.

D. Energy-efficient 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. VIA isn't the only company to address environmental concerns: Intel,

the world's largest semiconductor maker, revealed eco-friendly products at a recent conference in London. The company uses virtualization software, a technique that enables Intel to combine several physical systems into a virtual machine that runs on a single, powerful base system, thus significantly reducing power consumption. Earlier this year, Intel joined Google, Microsoft, and other companies in the launch of the Climate Savers Computing Initiative that commits businesses to meet the Environmental Protection Agency's Energy Star guidelines for energy-efficient devices.

E. vision through the pc-1 initiative

VIA isn't focusing only on the technological aspects of its eco-friendly devices, it's also taking a look at their applications. The VIA pc-1 initiative seeks to enable the next 1 billion people to get connected, by providing wider access to computing and communications technologies. The company is concentrating on empowering new, emerging markets, looking at models that reach beyond individual ownership of a PC, such as local pay-for-use facilities. Products built for such a use are characterized by ultra-efficient energy consumption and the ability to withstand heat and dust in harsh environments. In VIA's own words: "Pc-1 brings together business ingenuity with corporate responsibility and altruism. Helping to build skills and literacy throughout the world and incorporating and preserving cultural content are goals now within our grasp. Information is the oxygen to nurturing social mobility, economic equality and development, and global democracy. Providing not just the tools and the know-how, but the support and the maintenance, is all part of what makes pc-1 the next generation of information technology, the next generation of global development.Among the company's projects under the pc-1 program are the —tuXlab computer center in South Africa and an ICT Training Center in Vietnam.

F. Recycling:

Many materials used in the construction of computer hardware can be recovered in the recycling process for use in future production. Reuse of tin, silicon, iron, aluminum, and a variety of plastics – all present in bulk in computers – can reduce the costs of constructing new systems. Electronic devices, including audio-visual components (televisions, VCRs, stereo equipment), mobile phones and other hand-held devices, and computer components, contain valuable elements and substances suitable for reclamation, including lead, copper, and gold. They also contain a plethora of toxic substances, such as dioxins, PCBs, cadmium, chromium, radioactive, and mercury. Whole computers and pieces of electronic equipment are shredded into smaller pieces to be more manageable and facilitate the separation of the constituent components. Leaded glass from cathode ray tubes is sold to foundries for use as a fluxing agent

in the processing of raw lead ore. Other valuable metals, such as copper, gold, palladium, silver and tin are sold to smelters for metal recycling. The hazardous smoke and gases generated by these processes are captured, contained, and treated to ensure that they do not become a threat to the environment. These methods allow for the safe reclamation of all the valuable materials used in computer construction.

G. Tele computing

Telecommuting, e-commuting, e-work, telework, working at home (WAH), or working from home (WFH) is a work arrangement in which employees enjoy flexibility in working location and hours. A frequently repeated motto is that "work is something you do, not something you travel to". Long distance telework is facilitated by such tools as virtual private networks, videoconferencing, and Voice over IP. It can be efficient and useful for companies as it allows staff and workers to communicate over a large distance, saving significant amounts of travel time and cost. As broadband Internet connections become more commonplace, more and more workers have enough bandwidth at home to use these tools to link their home office to their corporate intranet and internal phone networks.

IV. CONCLUSION

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. As part of the VIA Green Computing Initiative, VIA Carbon Free Computing is a natural extension of VIA's leadership in developing the most power efficient computing products on the market. As individuals and organizations around the world look to reduce their impact on the environment, a growing concern is the reduction of one's Carbon Footprint which is a measure of the impact human activities have on the environment in terms of the amount of green house gases produced, measured in units of carbon dioxide (CO_2). It has taken upon itself the goal to provide society's needs in ways that do not damage or deplete natural resources. Mainly this means creating fully recyclable products, reducing pollution, proposing alternative technologies in various fields, and creating a center of economic activity around technologies that benefit the environment. Green IT programs are demonstrating fundamental economic as well as environmental sense, it is understandable why organizations are exploring green computing options with such intense interest across the IT industry. As more and more companies include some form of reporting on their goals and achievements in the area of CSR, there is a growing awareness among business leaders that greening their IT practices offers the —double-win of

reducing costs while demonstrating a positive environmental commitment. Use mobile phones for your computing needs whenever and wherever possible.

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