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Green Computing: A Solution to Electronic Pollution

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ABSTRACT

Electronic pollution is the most dangerous in today's world. Electronic pollution comes from e-waste that is electronic wastage. Electronic waste does not means only waste materials of computer and its peripheral devices like keyboard, mouse, scanner, printer, tonner, printer inks, tapes etc. but e-waste also includes other electronics materials like our television and their CRT's, bulbs, electronic shopping cards, power bank devices etc. All electronic scrap components, such as CRTs, may contain contaminants such as lead, cadmium, beryllium, or brominated flame retardants The solution for this problem is green computing. Green Computing or Green IT is a hot topic today and will continue to be an important issue for several years to come. Green computing is the study and practice of using computing resources efficiently.

1. Introduction

Today we are ardent for advancement and widespread implementation of IT. However, in this advancement we are not realizing that this development also contribute in environmental problems.Green Computing (or Green IT) refers to eco-friendly and supportable computing.In an article[1] San Murugesan defines the field of green computing as:

"**The study and practice of designing, manufacturing, using and disposing of computers, servers, and associated subsystems - such as monitors, printers, storage devices, and networking and communications systems – efficiently and effectively with minimal or no impact on the environment.**"

We also say that Green Computing is similar to Green Chemistry as both have same aim: minimize the use of dangerous materials, during the lifetime of product maximize their energy efficiency and the most important thing is to endorse the recyclability or biodegradability of non-operational products and factory waste.Green Computing enables companies to meet business demands for cost-effective, energy-efficient, flexible, secure and stable solutions while being environmentally responsible.

Apple, Wipro and Google are vendors for Green computing.

2. History:

In 1992, the US Environmental Protection Agency Launched "Energy Star", a voluntary labeling program which was designed to promote and recognize energy efficiency in monitors, climate control equipment, and other technologies. Sleep mode of electronics is the best result of this technology. The Energy Star label became a common sight, especially in notebook computers and displays. After Energy star program Europe and Asia also accepted similar processes.

Later the "Energy star" program, green computing is invented and after that TCO certification program is hurled by the Swedish.

3. Necessity of Green Computing:

- To increase awareness of society towards eco-friendly environment.
- To reduce global warming
- To minimize damaging effects of computing resources
- Corporate social responsibility

Green computing tracks:

- Green use
- Green disposal
- Green design
- Green manufacturing

4. Green computing tactics:

Virtualization

Virtualization[2] results effective use of system resources inkling energy consumption.Virtualization is defined asthe way to make a single piece of hardware function as multiple parts. Different user interfaces isolate different parts of the hardware, thereby making each one behave and function as an individual, separate entity. In the context of a data center, installing virtual infrastructure allows several operating systems and applications to run on a lesser number of servers, helping to reduce the overall energy used for the data center and for its cooling.Once the number of servers is reduced, it also means that data center can reduce the building size as well. It balances the workloads across a server group and increases its ability to share resources. Virtualization also helps to monitor and manage resource allocations.Server utilization rates can be increased up to 80% as opposed to an initial 10-15%

Algorithm efficiency

Algorithmic efficiency is the feature of an algorithm, which relate to the amount of resources used by the algorithm. An algorithm must be analyzed to determine its resource usage. Algorithmic efficiency isequivalent to engineering productivity for a repeating or continuous process, which tells how to minimize resources usage.However, the various resources (e.g. time, space) cannot be compared directly, so

which of two algorithms is considered to be more efficient often depends on which measure of efficiency.

Power management

Power Management[3] is an important feature for green computing. When electrical appliances, especially computers, monitors and printers,are inactive it turns off the power or switches the system to a low-power state.Power management is desired for many reasons, particularly:

- To minimize energy consumption
- To extend battery life Prolong battery life for portable systems
- It decrease the noise
- Least requirement of cooling
- Because of less energy consumption and less cooling requirement, operating costs for energy and cooling also reduces.
- To increase system stability
- To save money and reduce harmful effects on environment

Storage

Green Computing the industry catch phrase for finding ways to make the most efficient use of computing resources. Storage virtualization, by the way, is using hardware and software to break the link between an application, application component, system service or whole stack of software and the storage subsystem. This allows the storage to be located just about anywhere, on just about any type of device, replicated for performance reasons, replicated forreliability reasons or for any combination of the above consolidation, appropriate devices.

Material recycling

Sometime computer[4] is not practical for a person for a specific process or task but appropriate for other person or some other things. In that cases better way is to re-purposed the system or donate to other society. For example a computer is no longer functional for shopkeeper but relevant for simple word processing job and other simple and complex calculations. Than that shopkeeper can donate that system or sell that system to needy person.

5. Technologies used for Green Computing:

Carbon free computing

It is a new class of carbon-free PC products that reduce the impact of carbon on the environment. The main motive of organizations is to create PCs that can be certified and promoted as “carbon free”. VIA also focuses on providing an effective way to allow commercial, government, and end users to discover “carbon-free” PCs and their benefits. The VIA Carbon Free Computing initiative consists of a set of programs and products that are developed to reduce their impact on the environment.

The Carbon Free Computing initiative focuses on the following:

- Participating in sales and tenders with green requirements
- Promoting carbon-free PCs to build a green working environment
- Spreading awareness of alternate solutions, such as energy conservation, to mitigate the levels of carbon released into the environment

Solar computing

In rural and remote areas where we have power infrastructure deficiencies, Solar Computing is a revolution. As a clean energy that can be harnessed to provide reliable, sustainable power, solar naturally complements VIA's power efficient silicon, platform and system technologies in promoting environment-conscious computing.

Advantages of solar power for computing

VIA Solar Computing is focusing on photovoltaic (PV) solar power to take advantage of the numerous benefits for both emerging market and urban computing installations:

1. Solar power is a clean, non-polluting energy
2. Solar panels are silent in operation; ideal for classroom, kiosk, shops or evening operations where a noisy generator would be disturbing
3. Solar power is virtually free energy once the capital cost has been covered
4. Solar panels are self-sufficient and no need to require refueling
5. Solar panels are highly reliable and virtually maintenance free, some requiring only annual changes of water in deep-cycle batteries, and usually come with an average warranty of 20 years due to the absence of moving parts.

Lead – free and RoHS computing

In traditional manufacturing processes, lead is used in the bump that attaches 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 bump and the solder balls now consist of a Tin, Silver and Copper composite. These lead-free packages include the letter "G" on their top marking to signify their suitability for Green Computing systems. All VIA companion chipsets are available in a lead free package option and marked with a 'G' for Green Computing, including audio, networking, multimedia and optical storage chips.

VIA continues to work towards compliance across all product groups with the RoHS and WEEE European Union directives that are helping to speed up the move to environmentally friendly computing.

Steps for green computing:

- When there is no need of CPU and other peripherals such as printers for long time, power-down them.
- Try to do computer-related tasks during contiguous, intensive blocks of time, leaving hardware off at other times.
- Use windows 7 rather than windows XP.
- Use liquid-crystal-display (LCD) monitors rather than cathode-ray-tube (CRT) monitors.
- Prefer use of laptops or notebook system rather than desktop system.

- Minimize the use of paper and properly recycle waste paper.
- In case of disposing e-waste,follow all local, state and central rules and regulations.
- Employ alternative energy sources for computing workstations, servers,networks and data centers.

Current Applications in Green Computing:

Blackle

Blackle[5] saves energy because of black screen. “Image displayed is primarily a function of the user’s color settings and desktop graphics, as well as the color and size of open application windows. White or light screen monitors require more power than black or dark screen monitors.”

Fit-PC

Fit-PC[6] stands out in the cheap mini PC market with an advance design and inflexible build quality.They are planned for:

- Least possible size
- To produce maximum performance
- Consume minimum power
- Highest durability

To achieve that, fit-PCs are designed from the ground up to be fanless, in a die-cast aluminum case using embedded grade components.

Zonbu computer

Zonbu was established by GregoireGentil and Alain Rossmann. It is a company that markets a computing platform which combines web-centric services, a small form factor PC, and an open source based software architecture.

Sunray thin client

Sun Ray is a networked displayed system. In Sun ray device user can check the state of their working while applications are running on server. It permitsthe user to go from one Sun Ray to another and continue their work without closing any programs. With a smart card, all the user has to do is insert the card and they will be accessible with their session. Reauthentication requirement depends on the mode of operation. For distinction smart card is necessary otherwise procedure is almost identical. To get their session user must specify their username as well as password. In either case, if a session does not yet exist, a new one will be created the first time they connect. Connection between Sun Ray clients and Sun Ray Server is done via an Ethernet network. Sun Ray software is available for the Solaris and Linux.

The Asus Eee PC

The Asus Eee PC[7] is a netbook computer line fro, ASUSTeK Computer Incorporated, and a part of the Asus Eee PC product family. Eee originates from: the three Es” which implies “Easy to learn, Easy to work and Easy to play”. The first Eee PC was a milestone in the personal computer business which introduced small and low cost laptops.

6. Conclusion:

In global warming issue, Green Computing signifies a control and responsible way. It is an emerging topic these days which will not miraculously fall from the sky rather it will be the product of years of enhancements. Energy efficiency, manufacturing and materials, self-powering and recyclability are the key structure of green computing.The plan towards green IT should include new electronic products and services with optimum efficiency and all possible options towards energy savings.

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