



Green Computing an Eco Friendly It Environment for Upcoming Technologies

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Abstract: 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 this paper we have traced out certain innovative measures which may be helpful for overcoming the major problems which are emerging due to the immense usage of computing devices. With the pervasive increase of computing, to meet the requirements the energy consumptions are climbing to their peak, beside the clarion call in order to reduce consumption and reverse greenhouse effects, it's becoming a major challenge for the IT leaders to develop and meet with the current expenses related to computing in the present financial crisis. Green computing or green IT, refers to environmentally sustainable computing or IT.

Keywords: Green Computing, Hibernate the computer, VPN, CO₂.

I. INTRODUCTION

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. In the article *Harnessing Green IT: Principles and Practices*, 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."

Making use of computing resources effectively is termed as Green Computing, during green computing it is observed that with the not only the product life time increases but also helpful in recyclability and bio degradability leading to the reduction of hazardous materials and maximizing the energy efficiency, with lot of positive sides of green computing lot of industries are attracting towards it as it not only saves the energy and money but also helpful to reduce the misuse of the computing resources.

Global warming is one of the principal problems which the world is facing today; it is believed that heating effects in the atmosphere is tremendously increasing due to more production of carbon dioxide and other greenhouse gases, which are ringing danger bells for human life. As the computing devices are mainly used in the industry side, industries depend too heavily with the computing devices in their industrial activities, when the computer dependent industrial needs are not balanced with other computing devices by the computing industries this may even lead to suffering of the global market. During this period when the computing industries was losing control over the usage of computing resources, while searching for new replacements

for these problems experts laid path to a new technology termed as Green computing. In order to point out few things, if which when carried out would lead to an Eco friendly IT environment so we carried out a small overview covering all the necessary steps to make computing an eco friendly. Many manufacturers are generating different varieties of computer equipments, during this situation a third party may not only helpful for the reproduction of the equipments and also helpful in data elimination securely following the local laws and regulations.

Green computing is the environmentally responsible use of computers and related resources. Such practices include the implementation of energy-efficient central processing units, servers, peripherals as well as reduced resource consumption and proper disposal of electronic waste. One of the earliest initiatives toward green computing in the United States was the voluntary labeling program known as Energy Star. It was conceived by the Environmental Protection Agency (EPA) in 1992 to promote energy efficiency in hardware of all kinds. The Energy Star label became a common sight, especially in laptops and displays. Similar programs have been adopted in Europe and Asia.

II. HISTORY OF GREEN COMPUTING

U.S Environmental Protection Agency has launched Energy star In 1992, which is an international standard for energy-efficient electronic equipment, climate control equipment and other technologies. Energy Star switches the product into —sleep mode when not in use for reducing the amount of energy consumed by a product rather than the amount of power used by a product when it is in —standby mode. At the same time for achieving low magnetic and electrical emissions from CRT-based computer displays. The Energy Conservation Center in Japan is responsible for

raising public awareness on conservation of energy, training, state examinations for energy managers and their energy-conservation campaign[1][2].

III. HOW THE COMPUTING DEVICES HARM THE ENVIRONMENT

Without our knowledge every one of us is wasting some or the other form of energy especially when the computing devices are kept in the standby modes this wastage is more during which a lot harmful emission of CO₂ is occurring this small amount of emission of harmful gasses are more in number according to the reports collected recently it was observed that 20KWh of energy is wasted in a year due to the devices working in the stand by mode. This kind of emission of CO₂ by the devices is considered to be one seventh the percentage of the emission of the same gases from the automobiles.

IV. IMPORTANCE OF GREEN COMPUTING

In the present technological world where business transactions are carried out round the clock for various purposes either may be for storing, tracking, analyzing huge volumes of data, to carry out all these thing it is needed that one has to take the backup of data and keep a continuous track on it this can be achieved only by huge amount of power. This much of power automatically has to be obtained by more cost. Due to huge volumes of data either from traditional, application centric increases more hardware problem.

V. APPROACHES TO GREEN COMPUTING

Cost of energy plays a crucial role in the data center whether they may be related to internal IT operations or IT outsourcing , cooling , equipment operations such as data servers, during the present time focusing is done only on energy costs rather than equipment costs..

Virtualization: Computer virtualization is the process of running two or more logical computer systems on one set of physical hardware. The concept originated with the IBM mainframe operating systems of the 1960s, but was commercialized for x86- compatible computers only in the 1990s..

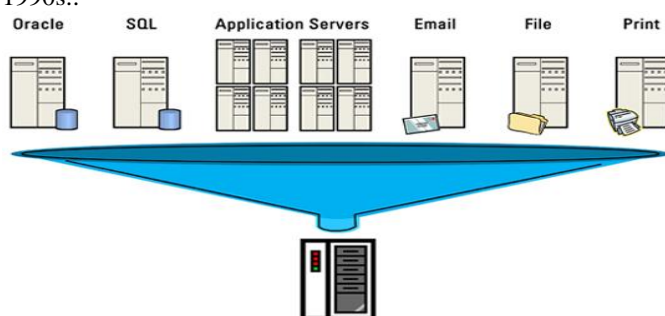


Figure 1. : Virtualization

With virtualization, a system administrator could combine several physical systems into virtual machines on one single, powerful system, thereby unplugging the original hardware and reducing power and cooling consumption. The concept of virtualization with respect to storage, desktop ,server not only increases the energy but also cost effective there by when the desktops are being replaced by the thin client machines it not only reduce the energy but also cost effective similarly other contents also

Power Management

Power management of computing equipment seems to be easy but its not at all.. These power management initiatives include the following:

- Energy setting for PC's and monitors is carried out by software.
- before the PCs are distributed they are customized with the required power saving modes..
- using only Energy Star Certified devices.

Power management for computer systems are desired for many reasons, particularly:

To provide long life batteries for the portal and embedded systems..

reduction in cooling requirement and noise.



Figure 2: power management

- Low operating cost for cooling and energy..
- High system stability due to low power consumption. Which saves money and reduces the impact on the environment

Power supply

Computing equipment are not designed with the view of energy efficient, due to which most of the computers utilize more powers even at their normal operations which leads to high electric bills and more vital environment impact. To overcome this 80 plus voluntary certification system is followed by the power supply manufacturers.

Storage Video Card

Cost, performance and capacity are the three available things, these three can be achieved only by paying attention on the concept of manufacturing reduced power consumption devices, there by resulting reduced RAM low

power idle mode with stable rotation speed which leads to high performance and high possible capacity.

Display

fluorescent bulbs are used in LCD monitors for the display where as an array of LED's are replaced in place of fluorescent bulbs in other display devices , during the sleep mode LCD monitors use less energy when compared to the situation when they are active, compared to CRT's LCD's more power conservative.

IT Equipment Recycling

After using computing equipment for a stipulated period of time they are not needed further, but at the same time they are not bio degradable so they create problems so in order to overcome this the products should be made with such as materials such that after their period of use the raw material of them should be utilized for the future manufacturing of the computing devices so this creates the concept of recycling due to which the hazardous materials such as lead and other which are then utilized for the next product rather than leaving them as it is.

Remote Conferencing & Telecommuting Strategies

Regarding the harms of green house gas emission and with the hike of fuel costs most of the companies have reduced their travels in order to cut the cost and decrease the environmental impact these reductions can be carried out by the following activities

- By conducting remote conferencing & collaboration between offices and clients
- Online collaboration environments telecommuting strategy
- Virtual Private Network (VPN) or voice communications which are carried out from everywhere.
- Developing various policies where people are allowed to work for less number of days and which attract the people to work even from home

Product longevity

By increasing the life time of equipment one can contribute much to green computing this can be achieved by upgrading and modularity of the product these things were suggested by Gartner , so rather than manufacturing of a new PC if components of existing computing devices are manufactured with upgrading then it leads to product longevity.

Algorithmic efficiency

Algorithms also play an vital role in green computing if good algorithmic programs are written then they consume less energy there by reducing the production of CO₂

emission, recently during the study by Alex Wissner Gross a physicist at Harvard showed that an average Google search produces 7 grams of CO₂ but this was wrongly proven by Google saying that it produces a negligible CO₂ release.

Resource allocation

Electric expenses can be reduced with the help of well developed algorithms which lay path for the data to their data centers, it has been proved by various researches that Energy allocation algorithms are very successful in routing traffic; this concept can also be used to avail the effective usage of the available energy rather than going for the production of the new.

Terminal servers

This concept creates thin clients where 1/8 of the energy of normal work station is used this results in the decrease of energy costs and consumption and also creates virtual labs. Examples of terminal server software include Terminal Services for Windows and the Linux Terminal Server Project (LTSP) for the Linux operating system.

Operating system support

It is also observed that the latest available Operating Systems are utilizing less power consumption compared to the existing ones so it would be beneficial to update the Operating System so that maximum power savings can be achieved. This is probably because the power management settings design relied upon a connected set of per-user and per-machine binary registry values, effectively leaving it up to each user to configure their own power management settings.

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 [3].

VI. INDUSTRIAL IMPLEMENTATION OF GREEN COMPUTING

By performing the following techniques one can create green computing in industry:

- **Blackle**
- **Fit-PC**
- **Zonbu computer**

- **Sunray thin client**
- **The Asus Eee PC**
- **Other implementations**

Blackle: it is the search engine site which is provided by Google Search, this search engine came in to the concept when we are using a Google search engine it is observed that the white background, consumes much power but if it is black then it consumes less power i.e for white screen the power consumes is 74W where are for the black it is 59W. So this is the calculation of an individual user if every one of us going to use the same concept then nearly the contribution leads to 900MW of power each year on the earth..[4] .

Fit-PC: a tiny PC that draws only 5w: during the situation where a standard PC is too bulky , noisy and power hungry during such situation a proper solution for this is Fit-PC is the size of a paperback and absolutely silent, yet fit enough to run Windows XP or Linux. fit- PC is the perfect fit for you. Fit-PC draws only 5 Watts.

Zonbu Computer: a more energy efficient computer which consumes even one third of the power of typical light bulb is The Zonbu is a new, very energy efficient PC.

Sunray thin client: with the electric price hikes it is sometime not bearable for other desktop devices a good replacement for this was Sun Ray from Microsoft which is a thin desktop client which consumes less power and performs in better way then other conventional desktop clients.

The Asus Eee PC and other ultra portables: as ordinary desktops use much power so to replace them ultra portable class of personal computers are taken which are not only consumes less power but also have small screen and high processing power, and works in a more great way. The Asus Eee PC is one example of an ultraportable. It is the size of a paperback, weighs less than a kilogram, has built-in Wi-Fi and uses flash memory instead of a hard drive. It runs Linux too.

Other implementations: one of the modern portable device is notebooks, which consume less power but as their power is lasting for two hours only then in order to have their power for long time then they should have the energy efficient components Apple's MacBooks or Acer-models have intelligent charging electronics that ensure the current-flow sinks below 0.1 Watts after the battery is charged.

Printers and multifunctional devices: it is observed that generally color laser consume much power than ordinary laser printers not only in standby mode but also in sleep mode so there must be proper settings for the printers with respect to the power consumptions.

Communications and network: telephone lines , W-LAN routers, DSL modems which are used at any moment in the 24 hours so there is no standby mode for these devices thereby they are consuming much power so they should be manufactured with low power consuming materials.

External hard disks: when these devices are connected to the system they continuously use the power consumption whether they are not in use for read and writing the disk, only few models are manufactured sophisticatedly in the power saving modes, of which Seagate devices are commendable.

VII. EFFORTS FOR GREEN COMPUTING

One need not stop using computer or even using electricity but some efforts to do environment health. The following actions are required

- Use only Energy Star labeled products
- Turn off the Computing device when not in use
- Use sleep mode when computing not in use.
- Hibernate the computer (shutting down the system for a short period of time when it is not in use).
- Set a power plan.
- Avoid using screen saver
- Turn down the monitor brightness
- Use LCD rather than CRT monitors

VIII. CONCLUSION

It has been observed that the tremendous mushrooming growth of IT industries is slowly poisoning the environment, which requires an immediate attention. Green computing is a approach that asks how we can satisfy the growing demand for network computing without putting such pressure on the environment. There is an alternative way to design a processor and a system such that we don't increase demands on the environment, but still provide an increased amount of processing capability to customers to satisfy their business needs. Green computing is not about going out and designing biodegradable packaging for products. Now the time has come to think about the efficiently use of computers and the resources which are non-renewable. It opens a new window for the new entrepreneur for harvesting with E-waste material and scrap computers. The greenest computer will not miraculously fall from the sky one day; it'll be the product of years of improvements. The features of a green computer of tomorrow would be like: efficiency, manufacturing & materials, recyclability, service model, self-powering, and other trends. Green computer will be one of the major contributions which will break down the 'digital divide', the electronic gulf that separates the information rich

from the information poor. Hope that we have provided a satisfied approach of green computing.

IX. REFERENCES

- [1] Tariq Rahim Soomro and Muhammad Sarwar, —Green Computing: From Current to Future Volume 2, Issue 1 available at www.scitecresearch.com/journals/index.php/jisct/index 132| Journal of Information Sciences and Computing Technologies ISSN 2394-9066 .
- [2] Robert R. Harmon and Nora Auseklis, —Sustainable IT Services: Assessing the Impact of Green Computing Practices|| . Portland State University, Strategic Marketing Area, Portland, OR, USA Intel Corporation, Engineering computing, Hillsboro, OR, USA. PICMET 2009 Proceedings, August 2-6, Portland, Oregon USA
- [3] San Murugesan, “Harnessing Green IT: Principles and Practices,” IEEE IT Professional, January-February 2008, pp 24-33.
- [4] S Ruth. Green IT More Than a Three Percent Solution? IEEE Internet Computing, 2009.
- [5] [Http://en.wikipedia.org/wiki/Green_computing](http://en.wikipedia.org/wiki/Green_computing)
- [6] <http://www.greencomputing.co.in>
- [7] <http://www.wikipedia.org/>
- [8] Paradiso, J., Dutta, P., Gellersen, H., Schooler, E.: Smart Energy Systems. IEEE Pervasive Computing
- [9] Want, R.: How Green is Green? . IEEE Pervasive Computing
- [10] imeno, M., Christensen, K., Nordman, B.: A Network Connection Proxy to Enable Hosts to Sleep and Save Energy. In: IEEE International Performance, Computing and Communications Conference, IPCCC.