



Saving Computer World With Green Computing

KEYWORDS

Green House Gas, ICT, GeSI, SGIP, NIST, etc

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ABSTRACT *Green computing is an approach to handle issues of environment usually created by computing. It is a solution for environment sustainability, where any part of computer does not pollute our environment system. In recent time, we are not going with smart computing however, computing is a crucial factor in polluting our environment. There are many tools which are provided by various companies for virtualization, storage management, Power management and dynamic frequency scaling. These tools are very helpful in creating environment sustainability. This paper elaborates Green Computing with current issues and smart use of computing through better tools and techniques for saving our computer world.*

INTRODUCTION

Internet has revolutionized this world by connecting billions of peoples. It has grown from its humble beginnings as a means of communication between computers to a highly sophisticated super highway that caters to every need, starting at home to controlling mission critical applications. It is envisaged that future Internet consist of large number of electromechanical devices which generates lots Green House Gas (GHG). India has set the target to reduce GHG emission intensity by year 2020. Around 4% of GHG emission is generated from ICT products and around 25% of the GHG emission is from telecom sector. To reduce carbon emission from ICT is very important to quantify the emission from networks and devices across life cycle from manufacturing to waste disposal [1]. The main focus of Green computing is to reduce harmful material used in computers, boost the energy efficient and create recyclability of waste. In computer data centre power is consumed at huge level. To reduce the consumption of power virtualization power management and cooling systems are used.

GLOBAL EFFORTS

At the global level, several initiatives and programs are on the way on "Greening" of ICT and leveraging the power of ICT for creating the low carbon economy and society. Few of them are listed below:

Global e-Sustainability Initiative [4]

GeSI is a non-profit organization, headquartered in Brussels, Belgium that brings together ICT companies, industry associations and NGOs to further the cause of sustainable economy using innovative use of ICT. GeSI was formed 2001 and has over 25 global companies and organizations as its associate members. Some of the world's largest technology companies and service providers are its members.

The Green Grid

It is consortium of over 180 organizations across the globe. Few technology companies are on the board of Green Grid and it focuses on the energy efficiency in data centers and computing environments [5].

Climate savers computing initiative

The Climate Savers is a non-profit organization started in

2007 by Google and Intel. It has as its board some of the world's leading PC technology companies like Dell and HP. It has over 500 members worldwide. The focus of this group is on energy efficient PC and servers [6].

US Energy Star* Program

Energy Star* is an initiative of the US Environmental Protection Agency and Department of Energy. The Energy Star program for computers aims to generate awareness of energy saving capabilities and accelerate the market penetration of more energy-efficient technologies. In July 2009, Energy Star* release the Version 5 of its specifications for PCs, Laptops, Power Supplies, Displays, Workstations and Thin Clients [7].

Smart Grid Interoperability Panel

The Smart Grid Interoperability Panel (SGIP) is a membership-based organization created by the US National Institute of Standards and Technology (NIST). NIST is responsible for coordinating the development of and publishing a framework, including protocols and model standards, to achieve interoperability of Smart Grid devices and systems [2].

Advantages and Minor Tips

Green computing is a way to save environment as well as human health. There are following major advantages of Green Computing [3].

1. Reduce power consumption leads to lower carbon dioxide emission.
2. Reduce chemical risk in PCs/Laptops which is cause of cancer.
3. Green Computing includes changing government policies to encourage recycling and lowering energy use by individuals.
4. Reduce in fossil fuel used in power plants and transportation.

There are some tips for end users. By using these tips end user can play a great role in Green Computing[3].

1. Don't use screen savers.
2. Use sleep mode to save power than remains on your screen.

3. Go for Switch off than Shut down.
4. Use Thin Client than GPU.
5. Go for flash drives for reduce power consumption.
6. Use virtualization than Physical server of files.
7. Do not storage useless data online using drives.
8. Do not use social website only for the sake of time pass.
9. Use low brightness.
10. Use Blackle than Google.

Major Approach for Green Computing

There are many approaches are available for the purpose of green computing. Followings are the basic requirement for Green computing.

Green Use: Reduce the power consumption of computer system and use them in environmentally sound manner.

Green Disposal: Recycle and reuse of computer waste.

Green Design: Reduce hazardous material production.

Green Manufacturing: Manufacture computers and other sub parts with minimal impact on environment.

There are some major approaches available for the purpose of green computing.

Virtualization: Virtualization refers to abstraction of computer resources. In virtualization the process of two or more logical computer systems on one set of physical hardware. With virtualization a system administrator become able to combine several physical systems in to a single virtual machine with the help of single system. virtualization reduce power and cooling consumption. The virtualization tools are provided by VMware, Citrix, StarWind, WinImage.

PC Power Management: Reduce power consumption is included under PC power management. There is a feature of directly control power saving in some operating systems. This allows a system to automatically turn off components such as monitors and hard drives after some period of inactivity. The power management for microprocessor can be done over the whole processor or in specific area. There are many software available PC power management like PowerMan, PowerSave, Surveyor, LongRun, LongRun2.

Dynamic Frequency Scaling: Dynamic frequency scaling is the part of power management which helps to handle clock rate, decrease voltage. Power management decrease power consumption at the price of slower performance. PowerNow!, Cool'n'Quiet, SpeedStep and LongHaul are softwares used for dynamic frequency scaling in processors.

Storage: Power consumption can be reduce by using low capacity flash based devices. Solid State Disks can be used but DRAM based SSD's use more power than hard disks for example 4GB i-RAM consumes more power and space than laptop drives. The increase in online storage using MySpace and other drives increase power consumption.

Video Card: A fast Graphic Processing Unit consumes lot of power. For the sake of energy saving use thin client, share terminals, motherboard video outputs.

Monitor Screens: CRT monitors consume more power than LCD and LED monitors. Average consumption of CRT

is 76w and of LCD is 20w. Increasing the brightness leads to increasing the power consumption. LED consumes less power than CRT and LCD.

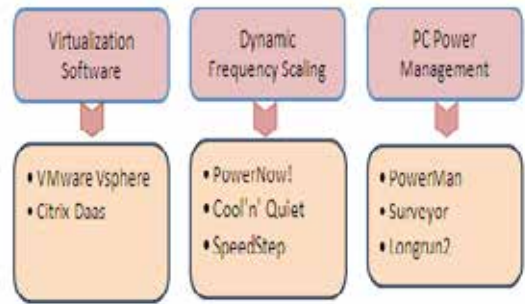


Figure 1: Various Types of Green Computing Software

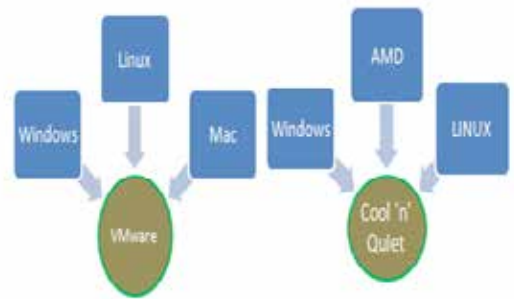


Figure 2: Platform supported by Green Computing Software

Given figure 1,2&3 defines the different software's provided by different companies for Green Computing. Where VMware[10], SpeedStep and PC Power Management software's can play grand role in Green Computing.



Figure 3: Green Computing Software features and applications

CONCLUSIONS

Green Computing is a major concept which can be able to change whole digital life. If end users go with tips as described in this paper can solve many problem of environment sustainability. The intelligent power management scheme and virtualization improves our CPU utilization. Optimal network design with efficient radio base stations, intelligent broadband equipment will have the largest CO₂ footprint in ICT sector since the number of PCs is expected to touch 4 billion by 2020. Therefore efficient use of

power source and reduction of idle power will help in reducing environment pollution.

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