Green Computing

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Abstract
The hue "green" is often associated with safety, used to indicate a rise in stock prices (in some regions) and also considered a symbol of prosperity, life and happiness. Thus, 'Green Computing' is in essence the study and way of using computing resources that are economical and eco-friendly.
In this really fast moving world, where there is a vying for getting all the problems solved through computers, the proliferation of the use of these devices have grown at a such a rapid pace that there is hardly any area which is untouched by them.
No doubt, computers produce results at much faster rates as compared to humans or any other species in this world but the fact that they are machines cannot be ruled out, that these work with the equipments which in turn use electricity supply, power batteries, the material that they use emits such things which may affect the human health and may bring climatic changes needs to be checked.
Although this area has not been explored as much as it should have been, this paper will be discussing the energy efficient modern techniques that facilitate this computing; organisational concerns and other related issues that not only affects the humans but also overall environment that surrounds them.
Keywords: Green Computing, Energy Efficient Computing, Sustainable IT, Eco-Friendly Computing, Green IT.

Introduction

Green Computing is a kind of eco friendly computing wherein the utilization of computer resources is done in such a way which affects the environment to the minimum. Green computing helps in developing, manufacturing, usage and removal of computing resources to reduce the technological impact on the global environment.

As per IFG International Federation of Green ICT and IFG Standard

"Green computing, Green ICT , green IT, or ICT sustainability, is the study and practice of environmentally sustainable computing or IT.

This can include "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 effect on the environment."[1]

Launching Program

UEPA, U. S. Environmental Protection Agency in the year 1992 launched a program with the name Energy Star which was earmarked to promulgate the awareness of utilizing the electronic products which are eco-friendly. The concept of "Sleep Mode" also became popular amongst the general masses.

Steps to Green Computing

- **'Blue'-print for Going 'Green'**
  It should be the aim of every organization to chalk out a working plan for including the best practices such as recycling policy, paperless work, use of power saving devices etc. in order to promote green computing.
- **Conservation of Energy**
  Power Management helps in saving a lot of energy which when not checked may increase the electricity bills and decrease the efficiency and lifespan of the electronic products. When not in use the computers and other electronic items should either be turned off or should be put on low-power state mode.
- **Paperless Computing**
  Use of printed outputs should be kept to the minimum, only originals may be retained in hardcopies, electronic archiving may be used to retain most of the contents inside the computer to enhance the paperless computing.
- **E-waste management**
  Computers and related electronic products should never be buried under the grounds as the harmful material that they emit degrades the quality of soil making it infertile and even dumping can emit those gases which are harmful for the environment around. So recycling ensures that the environment where we live should healthy and safe.
- **Energy efficient products**

  All the purchases shall be made only after checking the energy efficient logos i.e. the products should have undergone through the tests making them recognized as energy efficient products.

- **Sustainable development**
  The product hence development keeping in mind the energy efficacy shall not only be helpful in present but also take care of the future.

[1] San Murugesan, "Harnessing Green IT: Principles and Practices," IEEE *IT Professional*, January–February 2008, pp 24-33.

- **Keep yourself informed**

  Visit online stores or skim through the magazines providing information regarding the latest upgrades in the technology.

Literature Review

Ranjita Panda has enlightened in her paper on "E-waste Management: A Step towards Green Computing"[2] that pollution control and environmental safety has become the greatest of environmental scientists and activists worldwide. Dumping of electronic wastes, one of the by-products of this urbanisation process has become a major problem in our society. Because these wastes are not biodegradable, gradual deposition of these e-wastes leads to accumulation of various toxic metals like lead (Pb), cadmium (Cd) etc. and contaminates the soil and the ground water. Ground water contamination in turn, affects the plant animal and the living system as a whole causing severe health hazards and disorders.

Biswajit Saha in his paper "Green Computing" [3] has emphasized on global warming which is increasing since the last decade. In his paper, he has shared his concern about climate change and associated impacts which vary from region to region across the globe. Further, he added that owing to global warming, various regulations and laws related to environmental norms forces manufacturers of I.T equipments are developing tools in order to meet various energy requirements.

Gaurav Jindal co-authored a paper along with Manisha Gupta titled Green Computing "future of computers" [4] has shared his valuable experience regarding green computing and sketches researcher's view on the next generation of IT systems for green computing. Subsequently, in his paper tried to help in identifying key issues relevant to green computing and evaluate different approaches to these problems. Finally, paper point out future directions of research and conclude the paper. Keywords Eco Friendly Computing, Energy Efficient Coding, Green Computing ,Green IT ,Smart Comp.

The Indian Scenario: GISFI

The Global ICT Standardization Forum for India (GISFI) is an Indian standardization body active in the area of Information and Communication Technologies (ICT) and related application areas, such as energy, telemedicine, wireless robotics, biotechnology.

GISFI is an effort to create a new coherence and strengthen the role of India in the world standardization process by mapping the achievements in ICT in India to the global standardization trends. Further, GISFI is focused on strengthening the ties among leading and emerging scholars and institutions in India and the world; to develop and cultivate a research and development agenda for the field.

[2] www.ripublication.com/ijeem_spl/ijeemv4n5_02.pdf retrieved on 10.9.16
[3] http://icexams.ru/files/Green_Computing_-IJCTT-Vol14-nr2-Aug-2014.pdf retrieved on 10.9.16
[4] http://www.ermt.net/docs/papers/Volume_1/Issue_2_Decemebr2012/V1N1-0105.pdf retrieved on 10.9.16

GISFI addresses the research and product development of ICT in India and provides a bridge towards the globalization of the Indian achievements; the issues of technology, governance, and development; and a platform for raising an awareness of the importance and the internationalization of the higher education in the field are supported by the joint partnership with the Government of India. The working groups organized in GISFI will draw knowledge from academia, business, civil society, and Government/policy-making circles.

The concept of a standardization body for India, which would represent the nation in totality, was conceived by Prof. Ramjee Prasad during his participation in a meeting together with Korean, Japanese and Chinese companies and other organizations of the various countries. Soon after realising the imperativeness of such an entity for India's growth in the knowledge based economy, Prof. Prasad proposed the matter to several major Indian companies and they agreed to the immediate need for such an initiative. Furthermore, the international companies and organizations also expressed that they face lots of difficulties in entering the Indian market. The underlying issue is fragmentation of the market, and due to this disparateness, the country has lost investment from a number of organizations. Formation of Global ICT Standardization Forum for India (GISFI) was publically announced in Kolkata in December 2008.[5]

Role of Green Data Centres

Data Centres are the storehouse of data wherein the storage, management and distribution of data takes place.

Data centres produce a large amount of heat and due to 24x7x365 working hours e.g. data centres of banks. If not checked, these data centres may even prove fatal for the surroundings due to emission of harmful materials.

Green data centres take care of it. These systems are designed for maximum energy efficiency and minimum environmental impact.

Challenges

The development of computers with high processing power has promoted them not only in the business world but also in the normal day to day life. The challenge in today's computer market has shifted from the development of computers with high processing power to the computers which are eco-friendly as well.

One of the examples is of the computer HP rp5700 developed by Hewlett Packard which has a life time of not less than 5 years and major part of it is recyclable.

Some of the challenges that IT industry is facing while developing IT equipments now a days are but not limited to:-

- **E-Disposal.**
- **Management of life cycle of these equipments.**
- **Growing Energy Costs**
- **To reduce the power consumption by the IT equipments**

[5] http://www.gisfi.org/index.php as retrieved on 9.12.16

Green Computing: Sustainable Development in IT World

Green Computing is the first step of IT industry towards sustainable development in IT World. Developing computers and other IT equipments which are not only helpful for the mankind in present but also takes care of the future generation in terms of environmental impact.

The radical shift in strategies and techniques has taken place in IT industry wherein the tools which are developed are being seen as a service and not merely a product. This trend has emerged as a promising factor in providing the society the tools which shall only prove to be beneficial.

Organizational Concerns

1) **Certifications**

   While purchasing such Green IT equipments, organizations have to be really pensive because once the government frame stringent laws in this direction, the organizations budget may fluctuate.

2) **Cloud Computing**

   The future of Computing is growing i.e. Cloud computing is emerging in the computing world. The organizations have to take care of this aspect to sustain in the future and live up with the international standards.

3) **Power Management**

   Be it a simple electronic device or complicated one, this concern has to be taken care of by the organizations in order to check the financial growth.

4) **Product Longevity**

   More the product life, better they are. This is a well said statement which will be enforced and recommended by the government in near future for all the organizations to ponder over the need of implementing only the devices which have longer life.

5) **Recycling Computing Resource**

   This shall be the major concern of all organizations using IT equipments to recycle the computing resources which will pave the path in achieving the goal of Green computing by reducing the emissions of harmful gases and e-waste.

   Green Cloud: The future of Green Computing

   Cloud computing is highly cost-effective tool for running enterprise applications. This technology along with the use of green data centres is the future of the Computing World.

Conclusion

In the end, it can be asserted that by simply improving the efficiency of equipment by using more powerful technologies, computing cannot be claimed to be Green. What is important is to make its usage and development more efficient in terms of energy consumption, cost-effectiveness and eco-friendliness. Sustainable IT can only be achieved if such technologies are not merely theoretical concepts but are applied at the ground level in all the organizations.

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[1] http://www.gisfi.org/index.php as retrieved on 9.12.16