IJESMR

International Journal OF Engineering Sciences & Management Research

STUDY OF THE FUTURE USES OF GREEN COMPUTING

Vivek Yadav*, Rakesh Patel, Suman Bala Nande
* Student, B.E.(IT), Kirodimal Institute of Technology, Raigarh(C.G.),India
Lecturer, Department of Information Technology, Kirodimal Institute of Technology Raigarh(C.G.),India
Student, B.E.(IT), Kirodimal Institute of Technology, Raigarh(C.G.),India
*Correspondence Author: vivekyadavp27@gmail.com

ABSTRACT

Green computing, also called green technology, is the environmentally sustainable to 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. The principle behind energy efficient coding is to save power by getting software to make less use of the hardware, rather than continuing to run the same code on hardware that uses less power. This paper, first discuss the connotation of green computing and sketch researcher's view on the next generation of IT systems for green computing. This paper will help the researchers and administrators to have a clear understanding of Green Computing and Green Cloud Computing. It also defines the security issues and the solution methods to these issues. Green computing is the environmentally responsible use of computers and related resources Servers and Peripherals as well as reduced resource consumption and proper disposal of electronic waste (e-waste). Finally, paper point out future directions of research and conclude the paper

I.   INTRODUCTION

Green computing is a new technology that is now under attention of business, industries for the energy efficiency and to dispose E-waste in an effective and harmless way. Green computing is very much essential for the future world. It is required to make our self and our environment healthy.

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.

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. We will also have a talk with VIA to learn more about the future of green computing. The Green Computing Initiative, stewards of the industry standards EFGCD – Eco – Friendly Green Computing Definition defines Eco- Friendly Green Computing as the study and pratice of the design, development, implementation, utilization and disposal of IT infrastructure efficiently and effectively with low the ICT industry is responsible for 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. computing means any goal-oriented activity requiring, benefiting from, or creating computers. It is important to understand the need of the study of green computing. It is a tool by which global warming can be control and reduce. The Global surface temperature increased by 0.84 ± 0.28 °C (33.512 ± 32.502 °F) during the 100 years ending in 2014. Most conspicuously, according to the latest IPCC report the global surface temperature will likely torise a further 2.2 to 8.9 °C (36.96 to 48.09 F) during the twenty-first century.

IJESMR

International Journal OF Engineering Sciences & Management Research

Global Effect
No matter what we do, global warming is going to have some effect on Earth. Here are the six deadliest effects of global warming.
1. Polar ice caps melting
2. Spread of disease
3. Warmer waters and more hurricanes
4. Increased probability and intensity of droughts and heat waves
5. Economic consequences
6. E-Waste

Why we use Green Computing
We have great machines and equipments to accomplish our tasks, great gadgets with royal looks and features make our lives more impressive and smooth. Goals of green computing 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) 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.
7) Use the device only if it is necessary.
8) The manufacturing of disks and boxes needed for video games takes up a lot of resources.
9) 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.

IJESMR

International Journal OF Engineering Sciences & Management Research

II.   HISTORY OF GREEN COMPUTING

The term Green computing came into existence with the launch of Energy Star program in 1992 by U.S environmental protection agency. Energy Star is a kind of label awarded to computers and other electronics products. Energy Star program minimizing the use of energy while maximizing efficiency. One of the first approaches towards green computing was sleep mode function in computers. Sleep Mode function which places a computer on standby mode to a pre-set period of time. According to Wikipedia "The Swedish organization TCO development launch the TCO certification program to promote a low magnetic and electrical emission from Cathode Ray Tube (CRT) based computer display; this program was later expanded to include criteria on energy consumption, ergonomics and the use of hazardous material in construction".

III.   NEED OF GREEN COMPUTING

Now a day computer is the basic need of every human. A computer made our life easier and saves a lot of time and human efforts, but the use of computer also increase power consumption and also generate a greater amount of heat. Greater power consumption and greater heat generation means greater emission of green house gases like Carbon Dioxide(CO2) that has various harmful impacts on our environment and natural resources. This is because we are not aware about the harmful impacts of the use of computer on environment.

There are various reasons for the use of green computing are:

A. Computers and electronic devices consume a lot of electricity that have some harmful impact on our environment. It produces air pollution, Land pollution and water pollution. Electricity generated through Fossil Fuel power plants release air pollution and requires a lot of water that effect our environment like climate change, acid rain (pH<5), ozone(O3) and air toxic.

B. Co2 is one of the green house gases, warming the earth surface to higher temperature by reducing outward radiation.

C. It also releases heavy metal like lead (PB), mercury (Hg), cadmium (Cd) into air.

IJESMR

International Journal OF Engineering Sciences & Management Research

D. The manufacturing of computers product release heavily on the use of toxic comical for electrical insulation, soldering, and fire protection All these causes can be reduced using one concept i.e. "Green computing"

E. "The Green Grid is a global consortium of IT companies and" Board members of The Green Grid include AMD, EMC, Intel, APC, HP, Microsoft, Dell ,IBM, and Oracle.

IV.   AREA OF FOCUS

It is important to understand the life cycle of computer while applying the concept of GREEN IT. From the view of a user in an organization, following are the area of focus for making the IT GREEN:

• Energy Consumption – saving energy while use
• Purchase - Responsible computer purchase
• Energy use - Energy use and efficient ways to computing.
• Reducing waste - Using computers to reduce the use of natural resources.
• Recycling - disposal considerations.

Technologies of Green Computing

A. **Carbon-free computing**
B. **Solar Computing**
C. **Lead-Free and RoHS computing**
D. **Energy-efficient computing**
E. **vision through the pc-1 initiative**

1) Carbon-free computing:

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. 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.

IJESMR

International **J**ournal OF **E**ngineering **S**ciences & **M**anagement **R**esearch

2) **Solar Computing:**
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. 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.
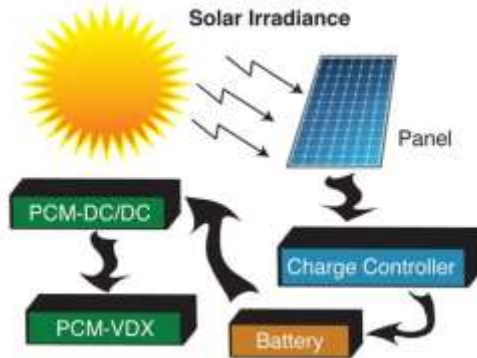

3) **Lead-Free and RoHS computing:**
In traditional manufacturing processes, lead is used to attach the silicon core to the inside of the package and to facilitate integration onto the motherboard through tiny solder balls on the underside of the package. VIA's lead-free manufacturing technologies do not require a lead bead, and the solder balls now consist of a tin, silver, and copper composite. 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. 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.

4) **Energy-efficient computing**
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 semiconductormaker, revealed eco-friendly products at a recent conference in London. . 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. 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.
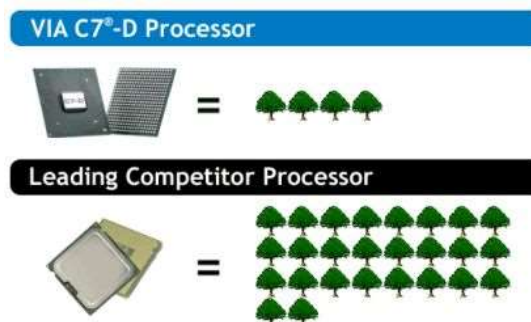
5) **vision through the pc-1 initiative:**
The VIA pc-1 initiative seeks to enable the next 1 billion people to get connected, by providing wider access to computing and communications technologies. VIA isn't focusing only on the technological aspects of its eco-friendly devices, it's also taking a look at their applications**.** . 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

IJESMR

International Journal OF Engineering Sciences & Management Research

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".

Benefits:

A combination of new database technologies expressly designed for analysis of massive quantities of data and affordable, resource-efficient, open-source software can help organizations save money and become greener. Organizations can do so in the following three key areas: reduced data footprint, reduced deployment resources, and reduced ongoing management and maintenance. This technology is beneficial as it:-

➢ Reduce energy consumption of computing resources during peak operation .
➢ Save energy during idle operation.
➢ Use eco-friendly sources of energy.
➢ Reduce harmful effects of computing resources.
➢ Reduce computing wastes.

Global warming and the problem of minimizing environmental impact from fossil-fuel emissions have raised to the top of global public policy agenda. As a result, businesses and consumers alike have started to embrace environmentally sustainable products that offer low- carbon solutions that can not only reduce their global greenhouse gas (GHG) emissions, but can do so by more efficient energy consumption and lower costs.

**Green Computing: Issues on the Monitor of Personal Computers**

Saving power is the main objective of Green Computing and that is also with minimum impact to the environment. It is about how to reduce the power consumption of the monitors to save energy, increase the life time of the product and also to make it efficient. "Faster processors use more power, because they use too much power and their waste heat increases temperature for which air conditioning necessary, especially in server farms--between the computers and the HVAC. The waste heat also causes reliability problems, as CPU's crash much more often at higher temperatures". A bus is simply a circuit that connects one part of the motherboard to another. The more data a bus can handle at one time, the faster it allows information to travel. The speed of the bus, measured in megahertz (MHz), refers to how much data can move across the bus simultaneously. Bus speed usually refers to the speed of the front side bus (FSB), which connects the CPU to the north bridge. Since the CPU reaches the memory controller though the north bridge, FSB speed can dramatically affect the performance of the computer. From the motherboard, the data to be displayed will be sent to the monitor through the bus. Monitors are the primary output device in a system. It is the one produces visuals for human being to perceive. They consist of a display and an enclosure. They are mainly of three types, namely,

1. Cathode Ray Tube (CRT)
2. Liquid Crystal Display (LCD)
3. Light Emitting Diode (LED)

When there is no need for the monitor for the time being, then the monitor can be switched to either off state or the sleep state or low power states. The mode to which the monitor is switched any one of these states is decided case by case by the user. Suppose if the monitor is switched to low power or sleep state, then the activation requires more energy than the saving of power due to keeping the low power or sleep state. This problem could be solved by leaving the responsibility to the program itself. i.e. when the computer is involved with large computation, say, at least one hour, then the operating system can make the monitor switched off automatically. When the computation is about to be completed the monitor may be switched on. This is totally relieving the intervention of human beings in between the process. Quite often if the monitors are flipped between these states, they may require more power than that of saving.

V.   GREEN CLOUD COMPUTING

The term combines the words green -- meaning environmentally friendly -- and cloud, the traditional symbol for the Internet and the shortened name for a type of service delivery model known as cloud computing. Green cloud is a buzzword that refers to the potential environmental benefits that information technology (IT) services delivered over the Internet can offer society.Because the color green is also associated with paper money, the label green cloud is sometimes used to describe the cost-efficiency of a cloud computing initiative .

IJESMR

International **J**ournal OF **E**ngineering **S**ciences & **M**anagement **R**esearch
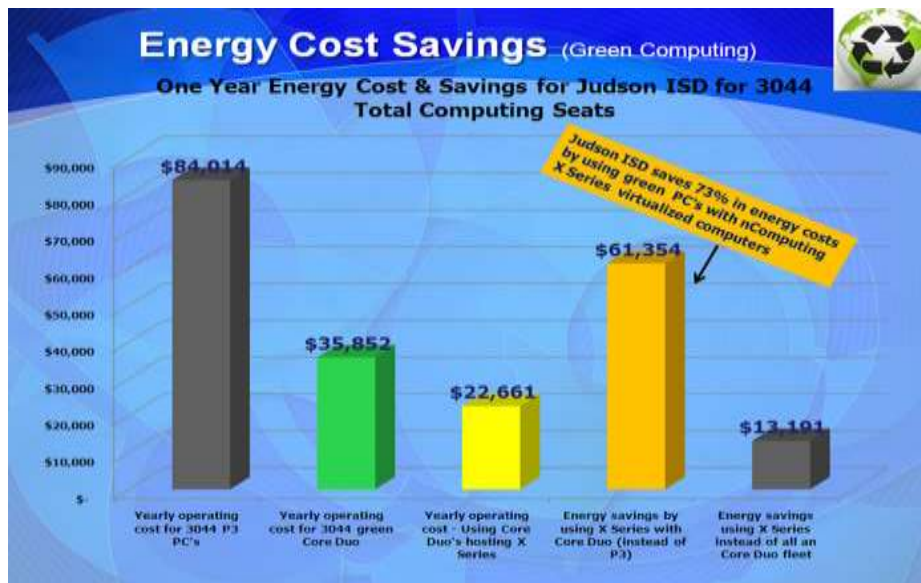
Benefits of Green Cloud Computing:
- o   Reduced Cost
- o   Automatic Updates
- o   Green Benefits of Cloud computing
- o   Remote Access
- o   Disaster Relief
- o   Self-service provisioning
- o   Scalability
- o   Reliability and fault-tolerance
- o   Ease of Use
- o   Skills and Proficiency
- o   Response Time
- o   Increased Storage
- o   Mobility

Security Issues in Green cloud computing:
There are four types of issues raise while discussing security of a cloud.
1) Data Issues
2) Privacy issues
3) Infected Application
4) Security issues

Solution to security issues in Green Cloud Computing

1) Control the consumer access devices.
2) Monitor the Data Access.
3) Share demanded records and Verify the data deletion.
4) Security checks events.

VI.   EFFORTS FOR GREEN COMPUTING

We need not to stop using computers and even need not to stop using electricity but we have to do some efforts to make environment healthy. The following actions should be taken by us:

A. Use Energy Star labeled products: - All the energy star labeled products are manufactured with keep in mind the term Green Computing and its features. These products are manufactured on the idea of less power consumption. These devices are programmed to power-down to a low power state or when they are not in use. So we have to Use "Energy Star" labeled desktops, monitors, laptops, printers and other computing devices.

IJESMR

International Journal OF Engineering Sciences & Management Research

B. Turn off your computer: - As the previously used figures stated that PC's and its peripherals consume more power and resultant is the high amount of CO2 emission.

C. Sleep Mode: - Sleep mode save our session and put our computer in a low power state so that we can quickly resume windows. Always put our PC on sleep mode when not in use. It saves 60-70 percent of electricity.

D. Hibernate our computer: - This mode allows us to shut everything down. It saves the electricity when computer is not in use.

E. Set a power plan: - Set an effective power plan to save electricity. Because if our computer , they produced more harmful impacts on our environment.

F. Avoid using screen saver: - Screen savers are also consumes electricity even when a computer is not in use. Screen saver can be a graphic, text or an image that shows on computer screen when it is not used for pre-set time.

G. Turn down monitor brightness: - Electricity consumption plays a main role in CO2 emission. A high brightness it consumes more electricity than using at a normal brightness. So we should always turn down our PC's brightness to save electricity.

H. Stop informal Disposing: - Computer and its components use toxic chemicals when manufactured and when we use informal disposing they put harmful impacts on our environment.

I .Use LCD rather than CRT monitors: - The use of new technologies can play a vital role to reduced power consumption. LCD (Liquid Cristal Display) is the less power consumption device then CRT (Cathode Ray Tube). So if we have to save our environment from the effect of CO2 emission we have to use LCDs rather than CRTs.

VII.   CONCLUSION

This research paper shows the importance of Green computing. We should understand the need of Green computing and as shown in research paper necessary steps should be taken for healthy environment. If not then we of us will suffer from air pollution, water pollution, soil pollution etc. 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 (CO2). It has taken upon itself the goal to provide society's needs in ways that do not damage or deplete natural resources. 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.

VIII.   REFERENCES

1. Navdeep Kochhar, Er. Arun Garg),'Eco-Friendly Computing: Green Computing
2. International Journal of Advanced Computer and Mathematical Sciences.Vol 1, Issue 1, Dec, 2010, pp 45-51. http://bipublication.com..' GREEN COMPUTING SAVES GREEN" by **Priya Rana,**Department of Information Technology, RKGIT, Ghaziabad
3. Ms. Swati Aggarwal, Mrs. Monika Garg, Mr. Pramod Kumar, International Journal of Emerging Technology and Advanced Engineering, February 2012- Green Computing is Smart Computing – A Survey
4. Baroudi, Hill, Reinhold, and Senxian (2009) Green IT for Dummies,
5. http://en.wikipedia.org/wiki/Mobile_computing