International Journal of Electrical Electronics & Computer Science Engineering
Special Issue - ICSCAAIT-2018 | E-ISSN : 2348-2273 | P-ISSN : 2454-1222
Available Online at www.ijeecse.com

Green Computing

Venkat Reddy.B
Dept. Computer Science, R S College of Management & Science, Bangalore, India
venkatreddy6532@gmail.com

Abstract: ***Green computing or green IT, refers to environmentally sustainable computing or IT. This report depicts all about 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 com munications systems. Efficiently and effectively with minimal or no impact on the environment.***

The goals of green computing are similar to green chemistry, 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. Do you know sending sixty-five emails is equivalent to driving a car for half a mile, you might not realize it, but by sending even a short email has an impact on the environment, Scientists estimate that an email adds about four grams of carbon dioxide equivalent into the atmosphere.

Research continues into key areas such as making the use of computers as energy-efficient as possible, and designing algorithms and systems for efficiency-related computer technologies.

Green computing is the environmentally responsible use of computers and related resources .Such practices include the implementation of energy-efficient central processing units (CPUs), servers and peripherals as well as reduced resource consumption and proper disposal of electronic waste (e-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 notebook computers and displays. Similar programs have been adopted in Europe and Asia.

Adopting green computing strategies makes sense not only from an ethical, or moral stand-point, but from a commercial stand-point.

I. INTRODUCTION

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 [6].

Green computing is the study and practice of using computing resources efficiently. The primary objective of such a program is to account for the “triple bottom line” (People, Planet, Profit), an expanded spectrum of values and criteria for measuring organizational (and societal) success. Modern IT systems rely upon a complicated mix of people, networks and hardware as such, a green computing initiative must be systemic in nature, and address increasingly sophisticated problems.

II. HISTORY OF GREEN COMPUTING

In 1992, the U.S. Environmental Protection Agency launched Energy Star, a voluntary labeling program which is designed to promote and recognize energy-efficiency in monitors, climate control equipment, and other technologies.

The term "green computing" was probably coined shortly after the Energy Star program began, there are several USENET posts dating back to 1992 which use the term in this manner. Concurrently, the Swedish organization TCO Development launched the TCO Certification program to promote low magnetic and electrical emissions from CRT-based computer displays; this program was later expanded to include criteria on energy consumption, ergonomics, and the use of hazardous materials in construction.

III. WHY GREEN COMPUTING

Today almost all streams weather its IT, medicine, transportation, agriculture uses machines which indirectly requires huge amount of power and money for its effective functioning. We have great machines and equipments to accomplish our tasks in a very easier way, great gadgets with royal looks and features make our lives more impressive and smooth. But it is very disappointing that we are not concerned about our nature which could get affected by our modern technologies. Hence green computing is the one which goals to reduce the use of hazardous materials, maximize energy efficiency during the product's lifetime, and promotes the recyclability or biodegradability of defunct products and factory waste [6].

IV. APPROACHES TO GREEN COMPUTING

There are new performance requirements to qualify for the Energy Star rating for desktop and notebook computers, workstations, integrated computers, desktop-derived servers and game consoles.

1. Develop A Sustainable Green Computing Plan: If you are in development field then it important to discuss with your business leaders the elements that should be factored into such a plan, including organizational policies and checklists. Such a plan should include recycling policies, recommendations for disposal of used equipment, government guidelines and recommendations for purchasing green computer equipment.

Green computing best practices and policies should cover power usage, reduction of paper consumption, as well as recommendations for new equipment and recycling old machines [1].

2. Recycle: It would very easy for us to discard used or unwanted electronic equipment. But we have to make sure that whether it is possible to recycle the old equipment in a convenient and environmentally responsible manner.

Computers have toxin metals and pollutants that can emit harmful emissions into the environment. Never discard computers in a landfill [1].

3. Make Environmentally Sound Purchase Decisions: Always you must prefer to purchase Electronic Product Environmental Assessment Tool (EPEAT) registered products. EPEAT is a procurement tool promoted by the non-profit Green Electronics Council.

All EPEAT-registered products must meet minimum requirements in eight areas of environmental impact and be energy efficient to reduce emissions of climate-changing greenhouse gases.

4. Reduce Paper Consumption: There are many easy, obvious ways to reduce paper consumption: e-mail and sms. When you do print out documents, make sure to use both sides of the paper, recycle regularly, use smaller fonts and margins, and selectively print required pages.

5. Conserve Energy: Turn off your computer when you know you won't use it for an extended period of time. Turn on power management features during shorter periods of inactivity.

6. Virtualization: Computer virtualization is the process of running two or more logical computer systems on one set of physical hardware. 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. One of the primary goals of almost all forms of virtualization is making the most efficient use of available system resources [5].

7. Power Management: We know that lower power consumption also means lower heat dissipation, which increases system stability, and less energy use, which saves money and reduces the impact on the environment [5].

8. Power Supply: Power supplies in most computers (PSUs for short) aren't designed for energy efficiency. In fact, most computers drain more power than they need during normal operation, leading to higher electrical bills and a more dire environmental impact [5].

9. Displays: LCD monitors typically use a cold-cathode fluorescent bulb to provide light for the display. Some newer displays use an array of light emitting diodes (LEDs) in place of the fluorescent bulb, which reduces the amount of electricity used by the display. LCD monitors uses three times less when active, and ten times less energy when in sleep mode. LCDs are up to 66% more energy efficient than CRTs, LCDs are also upwards of 80% smaller in size and weight, leading to fuel savings in shipping [5]. As we are heading towards highly advanced technologies now are using LED, OLED, advanced OLED's. The LED displays perform even more efficiently than CRT and LCDs.

V. FUTURE IS GREEN

Sometimes it is very often facing an energy crisis in IT services. Today most large Data Centers (DC) consume 10-100 times more energy per square foot than a typical office building and most of these data centers have become chillers (over cooled), which again eats into power needed to cool them. Now, emerging high density computer systems and consolidation of IT resources into fewer DCs are stretching the limits. That is why one would witness that DCs are evolving at a faster rate due to which customers have to modify or redesign their DC every five years. Customers are looking for solutions that adapt to the changing needs of the data centre without needing additional investment. The existing scenario for DC includes reviewing installed power sources and finding any technical solutions that can reduce the energy demand. For DCs that are in the design stage, it is vital to provision for such devices, or to use the latest power conditioning equipment. One should not go only by the specifications; it is a good idea to measure the power output from a sample device and monitor it. A deep study on the efficiency of the devices being used can prove helpful. Even a one or two percent drop in power consumption can result in substantial cost savings in the long run. It is this scenario that is forcing many IT departments to evaluate their DC power consumption and find ways to become more energy efficient. In today's 24x7 world of information availability, on-demand services, and round-the clock commerce sites, companies increasingly are adding high-performance servers, storage and other equipment to their data centers to satisfy user and customer demand. As a result, companies find that they need more and more power to run and cool this equipment. At the same time, the cost of electricity is on the rise. Many companies are trying to be good corporate citizens by becoming green (or at least greener).

Large DCs are looking at pocketing more green into their pocket. It is primarily because they want to minimize the risk in the DC as heat generation goes higher, leading to greater power consumption. So DCs need to go in for optimization of power as well as cooling. There is a strong possibility that organizations

will look at green technologies to reduce their data centre costs without even knowing it and that because most of the bigger and multiple

One thing that each and every DC manager agrees upon is that power and cooling are the two important factors required for the smooth functioning of a DC. Data centre power and cooling go hand-in-hand. And it will be right to say that based on the requirement per rack, the cooling and power management must be designed at the rack level to avoid any wastage of energy within a data centre. Today cooling contributes nearly 35 to 40% of total DC energy consumption and if we see the distribution of IT servers within a rack in a data centre, we will find that the loads are unequally distributed. This means that there may be a few racks that generate 3/4 kW to 15 kW per rack of heat load. The racks with more than 10 kW load are the extreme density racks and are required to be cooled for reliability within the DC.

VI. LAWN PC

Technology isn't always on the same page with sustainability. Still when green innovation transforms the trajectory, even we find ourselves inclining towards the novelty. Such is the Lawn PC, which visions to transform computing in the near future. The concept PC from David Veldkamp is powered by the solar cells attached to the grass like lawn on the PC, made from natural cotton fabric these blades transfer the generated 60 watts of energy down to the plug-in button at the bottom each blade. The concept requires no cooling fans, just put it where natural light and air are readily available and then leave rest on this wirelessly functional device that'll give you the cleanest computing all the time.

VII. FACTS ABOUT BUSINESS COMPUTING

- Simply leaving a computer running consumes electricity and adds to computing costs.
- The use of screen savers does not save energy [1].
- It is estimated that a typical desktop PC with a 17-inch flat panel LCD monitor requires about 100 watts—65 watts for the computer and 35 watts for the monitor [1].
- If left on 24x7 for one year, this same system will consume 874 kilowatt hours of electricity—enough to release 750 pounds of carbon dioxide into the atmosphere and the equivalent of driving 820 miles in an average car [1].

VIII. ADVANTAGES OF GREEN COMPUTING

1. Reduced energy usage from green computing techniques translates into lower carbon dioxide emissions, stemming from a reduction in the fossil fuel used in power plants and transportation.
2. Conserving resources means less energy is required to produce, use, and dispose of products.
3. Saving energy and resources saves money.
4. Green computing even includes changing government policy to encourage recycling and lowering energy use by individuals and businesses.

IX. RECENT IMPLEMENTATIONS OF GREEN COMPUTING

1. Blackle: Blackle is a search-engine site powered by Google Search. Blackle came into being based on the concept that when a computer screen is white, presenting an empty word or the Google home, your computer consumes 74W. When the screen is black it consumes only 59W. Based on this theory if everyone switched from Google to Blackle, mother earth would save750MW each year. This was a really good implementation of Green Computing. The principle behind Blackle is based on the fact that the display of different colours consumes different amounts of energy on computer monitors [6].

Since 2007, Google has been a carbon neutral company, utilizing energy efficient improvements, green power and carbon offsets to bring our footprint down to zero. Users of Gmail also enjoy this benefit of zero carbon emission email [3].

2. Zonbu Computer: The Zonbu is a new, very energy efficient PC. The Zonbu consumes just one third of the power of a typical light bulb. The device runs the Linux operating system using a 1.2 gigahertz processor and 512 Meg of RAM. It also contains no moving parts, and does even contain a fan.

3. Sunray Thin Client: Sun Microsystems is reporting increased customer interest in its Sun Ray, a thin desktop client, as electricity prices climb, according to Subodh Bapat, vice president and chief engineer in the Eco Responsibility office at Sun. Thin clients like the Sun Ray consume far less electricity than conventional desktops, he said. A Sun Ray on a desktop consumes 4 to 8 watts of power, because most of the heavy computation is performed by a server. Sun says Sunrays are particularly well suited for cost-sensitive environments such as call centres, education, healthcare, service providers, and finance. In the United States, desktops need to consume 50 watts or less in idle mode to qualify for new stringent Energy Star certification.

4. The Asus Eee PC and Other Ultra Portables: The "ultra-portable" class of personal computers is characterized by a small size, fairly low power CPU, compact screen, low cost and innovations such as using flash memory for storage rather than hard drives with spinning platters.

X. CONCLUSION

So green computing is a mindset that asks how we can satisfy the growing demand for network computing without putting such pressure on the environment. I would like to conclude my report by giving a suggestion that it important for us to implement some mandatory rules for the companies to develop computers and machineries which are less harmful to the nature, at the same time it is our responsibility to follow the rules properly which leads to build a better environment in future.

XI. REFERENCE

[1] HP Total care http://www8.hp.com.

[2] A seminar report on Green computing.

[3] Google's Green computing - Efficiency at Scale.

[4] International Journal of Computer Trends and Technology (IJCTT) - Volume 14 number 2 – Aug 2014.

[5] Green Computing by Ms. Priyanka Kotwani and Ms. Suman Goyal.