Green Strategy for Reducing E-Waste

Siddharth Ghansela
Dept. of Computer Science & Application
G B Pant Engineering College
Pauri Garhwal-246194,India

Abstract— Energy is one and important thing because the cost of energy increasing day by day and many electronic companies emphasize on to make minimum energy consuming electronic equipment's so that the can save power and minimize CO_2. In this paper we suggest some techniques for saving energy by using some power saving techniques. These techniques comes under green computing. Green computing is rising energy cost and potential savings. The quantity of electrical and electronic waste generated each year, especially computers and televisions is huge.Although no definite official data exist on how much waste is generated in India or how much is disposed of, there are estimations based on independent studies conducted by the NGOs or government agencies. In this paper we also suggest some techniques for proper recycling of e-waste.

Keywords—   Energy, Green computing, E-waste.

I. INTRODUCTION

Green computing is the term used to denote efficient use of resources in computing. "Green" has become a popular term for describing things that are good for the environment, generally healthful and, more recently, economically sensible [1]. "Going Green" implies reducing your energy use and pollution footprint. The technology community, specifically computer users, have popularized the term "Green Computing," which is the reduction of the pollution and energy footprint of computers [2]. One of the sequel of green computing is EPEAT or Electronic Products Environmental Assessment Tool. EPEAT products serve to increase the efficiency and life of computing products. Moreover, these products are designed to minimize energy expenditures, minimize maintenance activities throughout the life of the product and allow the re-use or recycling of some materials. The introduction of green technology projects such as the Low Carbon ICT Project at the University of Oxford [3] are indicative of a positive trend, although there is significant opportunity for theoretical and experimental research to be performed by computer scientists.

II. WHAT IS GREEN COMPUTING

Green Computing is a discipline that studies, develops and promotes techniques for improving energy efficiency and reducing waste in the full life cycle of computing equipment from initial manufacture, through delivery, use, maintenance, recycling and disposal in an economically realistic way [4,1]. Green IT, also known as Green Computing, refers to the study and practice of designing, manufacturing, and using computer hardware, software, and communication systems efficiently and effectively with no or minimal impact on the environment.
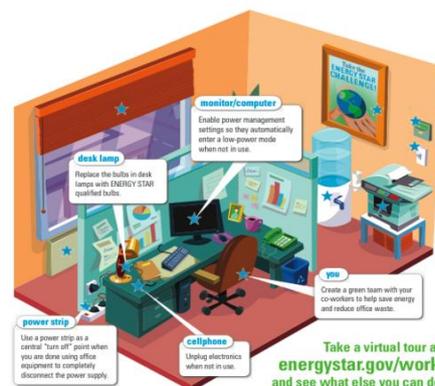

Fig.1

Green computing is the study and practice of efficient and eco-friendly computing e.g.
- 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

- Making Computing "Green"
- Mobile (Low) power computing
- Power/Energy/Thermal-aware computing
- Environmental-friendly computing
- Sustainable Computing

III. SOME NEW TECHNIQUES OF GREEN COMPUTING

A. *Energy saving mode should be enabled in all software and hardware devices*

It should be mandatory to all software and hardware manufacturing companies for designing with energy saving mode option. This could be save more energy.

B. *Green Design And Manufacturing*

Design energy efficient and environmentally sound components, computers, servers, cooling equipment, and data centers and Green manufacturing—manufacture electronic components, computers, and other associated subsystems with minimal impact on the environment.

C. *Upgrade your video card*

Consider an upgrade to your video card. You heard me right, an upgrade. ATI and nVidia's latest cards are becoming more powerful and efficient. For example, nVidia's new 9600GT performs marginally better to that of their older 8800GT, yet uses approximately 10% less power.

D. *Upgrading to a flat panel LCD monitor*

Consider upgrading to a flat panel LCD monitor. They use approximately 1/3 the energy as equal-sized CRT monitors.

E. *Disable devices that are not needed*

Laptops come with all sorts of devices that a user might not need. Each of the devices – if enabled – consume energy. A laptop user that uses the build in network adapter and a cable to connect to the Internet probably does not need Wi-fi, the build in modem, Bluetooth or infrared. The same might be valid for other devices like the DVD drive or sound card.

F. *Use cloud computing*

Cloud infrastructure addresses two critical elements of a green IT approach: energy efficiency and resource efficiency. Whether done in a private or public cloud configuration, as-a-service computing will be greener for (at least) the following three reasons.

G. *Verify computer's power supply*

Verify that your computer's power supply is 80 Plus Certified – meaning that it is at least 80 percent efficient across a range of loads: 20, 50, and 100 percent.

H. *Turn down the brightness*

Turning down the brightness of the computer monitor, or any other monitor actually, saves energy. This is actually a good tip for users with laptops, netbooks and other mobile devices including cell phones. It can also be helpful on desktop systems.

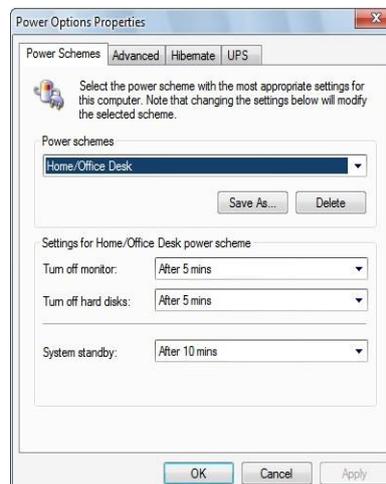### I. *Use build in power saving features*

Fig.2

Most operating systems come with power saving features that put hardware like hard drives or the computer monitor into idle mode or turn it off for the time it is not being used. Idle mode consumes between 20 to 50 times less energy. Windows users find the power saving settings in the Control Panel. It might be necessary to tweak the values for turning off the computer monitor, hard drives and setting a system standby time to suit the individual needs. A lower time will save more energy but is also likelier to affect work.

J. Share hardware where appropriate

Hardware like printers, scanners or routers that are connected to a computer system are also using power. A way to save energy is to share these devices where possible. This does require some computer knowledge though. It is possible to save lots of energy by turning off devices when they are not needed. Buying energy efficient hardware and using power saving settings are the two other helpful options.

K. Turn off wireless devices when not in used

Turn off your laptop's Bluetooth or wireless capabilities when not in use to get some extra minutes, or even hours, out of the device before the battery dies.

IV. E-WASTE

Electronic waste, e-waste, e-scrap, or waste electrical and electronic equipment ('WEEE) describes discarded electrical or electronic devices. There is a lack of consensus as to whether the term should apply to resale, reuse, and refurbishing industries, or only to product that cannot be used for its intended purpose. E-waste contains more than 1000 different substances, many of which are toxic metals such as lead, arsenic, cadmium, hexavalent chromium and flame retardants used in the plastics [5]. The fraction including iron, copper, aluminium, gold and other metals in e-waste is over 60%, while plastics account for about 30% and the hazardous pollutants comprise only about 2.70% [6].
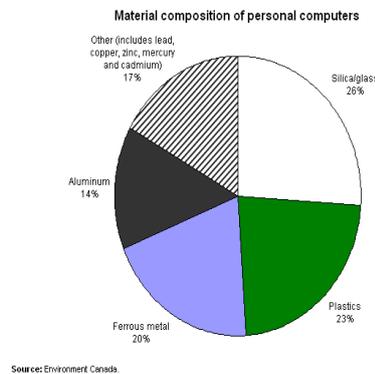

Fig. 3

V. E-WASTE RECYCLING

Recycling raw materials from end-of-life electronics is the most effective solution to the growing e-waste problem. Recycling computing equipment such as lead and mercury enables to replace equipment that otherwise would have been manufactured. The reuse of such equipment's allows saving energy and reducing impact on environment, which can be due to electronic wastes [7]. Most electronic devices contain a variety of materials, including metals that can be recovered for future uses. Additionally, recycling reduces the amount of greenhouse gas emissions caused by the manufacturing of new products. It simply makes good sense and is efficient to recycle and to do our part to keep the environment green. Recycling reduces the amount of greenhouse gas emissions caused by the manufacturing of new products[8]. About 50 millions cell phones are replaced worldwide a month, and only 10% are recycled. If we recycled just a million cell phones, it would reduce greenhouse gas emissions equal to taking 1,368 cars off the road for a year.
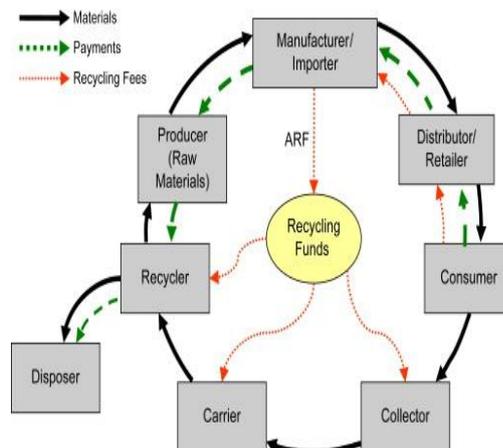

Fig.4

VI. STEPS TO REDUCE ELECTRONIC WASTE

A. *Repair or upgrade instead of recycling*
If something goes wrong with an electronic item, often only one component is actually broken, not the whole thing repair your component.

B. *Donate your used electronic equipment's*
There are plenty of charitable organizations that will take your used electronics and donate them for charitable causes.

C. *Refurbishing and leasing*
Refurbished items are those that have been taken back by the manufacturer and inspected to make sure they still work. When you buy refurbished, you save money and reduce waste. You can also save resources by leasing. It's great way to stay up to date when needed, and the item will be passed on to someone else when you're done with it.

D. *Join a recycling incentive program*
We can join a recycling incentive program by which we are able to aware about recycling of our e-waste. It is beneficial for us in local level recycling.

Fig.5

E. *Sale and free classifieds for e-waste*
Depending on how old the technology is there are many tech-geeks active on eBay who buy old computers for parts. As an extra incentive to get rid of old electronics, you could offer free postage or drop off to ensure a swift moving listing. If you're looking to give away to freebie sites look under online classifieds which facilitate free listings for people giving away old computers and technology.

F. *Reduce, Reuse, Recycle*
An one good option is to reduce e-waste is to buy a good product from a reputed brand. Consider the purchase of refurbished products when possible. Refurbished products usually carry the same manufacturer's warranty as new items. Working consumer electronics may be donated to a charity or thrift store so that they can be reused by others. Batteries, depending on the type, can and should be recycled. Alkaline batteries are considered by the federal government to be non-hazardous waste and can be disposed of in the trash. Lithium ion and nickel metal hydride batteries commonly used in laptops and cell phones are also considered non-hazardous waste; however, they can be recycled and should be taken to a recycling center.

Fig.6

VII.   CONCLUSION

This article summarizes that e-waste contains a number of hazardous substances. So by using proper methods as mentioned above we can reduce energy as well as waste. Establishment of e-waste collection, exchange and recycling centers should be encouraged in partnership with private entrepreneur sand manufacturers. It should set targets for collection and reuse/recycling, impose reporting requirements and include enforcement mechanisms and deposit/refund schemes to encourage consumers to return electronic devices for collection and reuse/recycling.

REFERENCES
[1]   Andrea Prothero and James A. Fitchett. Greening Capitalism: Opportunities for a Green Commodity. Journal of Macromarketing, 20(1), pp. 46-55, 2000.
[2]   Joseph Williams and Lewis Curtis. Green: The New Computing Coat of Arms? IT Professional, 10(1), pp. 12-16, Jan.-Feb. 2008.

[3]   Colin Holland. Oxford University launches low carbon computing project. EE Times UK, March 14, 2008.

[4]   Arpad Horvath and Eric Masanet. Enterprise Strategies for Reducing the Life-Cycle Energy Use and Greenhouse Gas Emissions of Personal Computers. Proceedings of the 2006 IEEE International Symposium on Electronics and the Environment, pp. 21-26, 2006.

[5]   Sunil Herat, Electronic Waste: An Emerging Issue in Solid Waste Management in Australia .

[6]   Widmer R., Global perspectives on e-waste, Environmental Impact Assessment Review, 25, 436– 458,(2005).

[7]   Robert R. Harmon, Haluk Demirkan, The Corporate Sustainability Dimensions of Service-Oriented Information Technology, Annual SRII Global Conference, March 29 2011 – April 2011,DOI:10.1109/SRII.2011.116,http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=5958139

[8]   "Benefits of Recycling". Ewastecenter.com. Retrieved 2012-11-08.