

Green Computing

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Abstract— During recent years, attention in ‘Green Computing has moved research into energy-saving techniques for home computers to enterprise systems’ Client and Server machines. Saving energy or reduction of carbon footprints is one of the aspects of Green Computing. The research in the direction of Green Computing is more than just saving energy and reducing carbon foot prints. This study provides a brief account of Green Computing. The emphasis of this study is on current trends in Green Computing; challenges in the field of Green Computing and the future trends of Green Computing.

Keywords—Energy consumption, e-waste recycling, Green Computing, Green Introduction

1. INTRODUCTION

Environment responsibility is emerging as an important topic for cooperate IT ograization and their technology supplier. Market pressure to “GO Green” because of its role to the enterprise technology supplier. Green Computing is a concept of Green Technology. It is also called green technology, is the environmentally responsible use of computer and related resource. Such practice include the implementation of energy-efficient central processing units (CPUs), Severs 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 labelling program known as Energy Star. It was conceived by the Environment Protection Agency (EPA). In 1982 to promote energy efficiency in hardware of all kinds. The Energy Star label became a common sight especially in notebook computer and displays. Similar program have been adopted in Europe and Asia.

2. THREE GOOD REASONS TO GO GREEN

The use of energy sources has a negative reaction on the environment. The technology give rise to various environmental problems like global warming, pollution and health hazard. Serious Diseases. Computers are incessantly using a large amount of power and so regular cooling energy is needed to counteract this power usage. It can be an endless

circle of energy waste. There is need to think about it and remove these problems. One good way is “GO GREEN”.

1. **To save cost** - Green computing lower the energy use and thereby the power bills by making IT systems more Efficient. Using less electricity, designing systems for longer useful live, reducing the amount of equipment purchase and reducing the amount of waste produced saves money and has a optimistic environmental benefit.
2. **To Decrease environmental problems**- Green Computing decrease ecological problems by manufacturing computers with the use of nontoxic materials like lead, Mercury can be replaced by silver ,copper and Bamboo. Landfills by E waste can be forced by making best use of the device by upgrading and repairing in time with a need to make such processes.
3. **To Lesson Energy Expenditure**-- Green computing is an successful approach towards Energy Efficient Products. Energy severe manufacturing of computer parts can be minimized by making manufacturing Process more energy efficient like Power-sucking display can be replaced with green light display made of OLED or organic light-emitting diodes.

3. CONCEPT OR ROADS OF GREEN COMPUTING

Use of computer create a big role in environment pollution and squalor .Today there is a great need to implement the concept of Green computing and guide the common people to save our environment. In this paper. These technology are environmentally Sustainable, Cost effective. The Actual mean of Green is-

Green Computing is depend on following or process-



Fig- 1.0 Four Domain of Green Computing

Green Use :- These days everyone knows it's important to save energy with cost and demand rising and economy and environment suffering, controlling energy uses is become more every day. However, most people don't realize that there are simple changes that each of us can make in the way we use our computer and electronic equipment that can add up to large saving of energy. This energy saving will help the environment and keep more money in your pocket.

Green Design:- Green Design is known as designing energy-efficient computers, servers, printers, projectors and other digital devices that are environmentally friendly. With that in mind, green design means designing with the whole life cycle of the product in mind Green designers look at the entire chain of production, from mining and processing, to developed, use, and disposal.

EOL (End of Life):- Management must be measured in planning with environmentally friendly intentions. EOL group answer questions about when and what happens after the product reaches the end its life cycle; such as support, marketing, and maintenance.

Green-Manufacturing:- Computers and other electronics often contain substances that are damaging to the environment and therefore can also have adverse effects on the population. As the public concern about harmful substances in our electronics grows, manufacturers are taking steps to reduce or eliminate them in their products. A few of those substances are considered in greater depth below.

Bromine-Chlorine:- Bromine and Chlorine are used in flame retardants and in the plastic resins of many of today's electronic products. chemicals are released into the environment during the burning of electronic waste. As these compounds build up in the environment, over time they can pollute not only the air, but also the water and soil. The compounds of Bromine and Chlorine do not break down quickly. They can linger in the environment for a long period of time. These two substances have been linked with some cancers, weakened immune systems, and skin lesions.

Green Disposal:-E-waste is terrible that no disposal method would completely eliminate the problem. Granted, new technology and efforts exerted by many to create a green world have certainly cut back the pollution problem. Even the greatest of efforts cannot reverse the damage which has already happened. It would be impossible to predict last year pollution will infest our lives, but we can safely assume it wrong doing will take great efforts to un-do.

4. ADVANTAGES AND DISADVANTAGES OF GREEN COMPUTING

ADVANTAGE:-

- 1) Green computing technique reduces the energy use which results into low carbon dioxide emission.
- 2) In green computing techniques we can also save money that was spent in extra practice of energy and resources
- .3) Green computing also apply altering government policy to encourage recycling.
- 4) Green computing also removes the risk which is breathing in the laptop such as chemical .
- 5) Use preserves resources which use less energy to produce use and disposes of product.

DISADVANTAGES:-

- 1). Equipment power density / Power and cooling capacities
- 2). Increase in energy requirements for Data Centres and growing energy cost removing equipment.
- 3). High Cost

5. SOME GREEN TECHNOLOGIES

Technology is ever-changing and expanding and so any device which is new today will become out of date tomorrow. New computer are enter the market and soon remain nothing more than a piece of scrap. The Green technology encourages people to use and save to over environment.

A.Power saving by Link Status:- When a computer on network equipment is shut down, switches often remain on and continue to consume substantial amounts of power. But this Green Technology allows switches to automatically detect link status and reduce power usage of ports that are idle. Switch can notice a device is connected to each port. If no device is connected to a port, the switch will mechanically power down that port.

This switch will save 73% of power as compare to normal switch.

- 16/24-Port Unmanaged Gigabit Switch series
- TL-SG1005D 5-Port Gigabit Desktop Switch

B Power Saving by Cable Length:- Green verified switches have the ability to analyze the length of any Ethernet cable connected to them for change of power usage accordingly, helping you save energy without moving networking performance. It's not the case most devices as they will use the same amount of power crossways the cable regardless of the length.

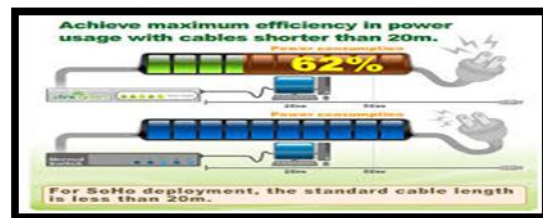


Fig 3.2 Power cable Length

C. Power Saving by Hard Drives Hibernation:- In conventional person network attached storage (NAS) systems, hard drives are continually rotating even when they are not actively being accessed. With green hard drive power management, the hard drive is automatically powered down during periods of stillness, save power, reducing heat and give more life of the equipment.

D.LCD Standby - Devices with LCD such as photo frames and storage routers include a feature to automatically disable the screen/backlight when no motion or activity is detected.

E. Smart FAN :- Green technology makes use of Smart Fan technology to mechanically turn off or minor the speed of the fan to decrease noise and power consumption whenever system temperature are low. Regulate the speed of the fan based on an increase or decrease in temperature.



Fig 3.3- Smart Fan

F. Power on/off Button:- The Power On/Off button allows customers to turn off their router and their gateway when we not in use. Products without an on/off button can only be motorized down by actually unplugging it.



Fig 3.4- Power In/Off Button

6. Current Trends And research of Green Computing

CURRENT TRENDS

Current trends of Green Computing are efficient utilization of resources. Energy is deliberate as the main resource and the carbon footprints are considered the main threads to environment. There are some areas where researcher are putting lots of efforts to achieve desired results:-

Energy Consumption:- Organizations are feel that the source and amount of their energy consumption significantly contributes to Green house Gas (GhG) emissions. In response to this finding,

Organizations are currently using the following equation:

Reduced energy consumption =

Reduced greenhouse gas emissions =

Reduced operational costs for the Data Center.

According to Environmental Protection Agency in around 30% to 40% of personal computers are kept 'ON' after office hours and during the weekend and even around 90% of those computer or idle.

B E-Waste Recycling:-Based on the Gartner estimations over 133,000 PCs are discarded by U.S. homes and businesses every day and less than 10 percent of all electronics are currently recycled. Many countries around the world require electronic companies to finance and manage recycling programs for their products especially under-developed Countries. Green Computing must take the product life cycle into thought from production to operation to recycling. Recycling computing works to saving energy and reducing impact on environment which can be due to electronic waste.

C. Data Centre Consolidation & Optimization:-

Today's Green Computing area is on Data Centres, as the Data Centres are known for their energy hunger and wasteful energy consumptions. United State Department of Energy (DoE) reported in 2006, United States data centres consumed 1.5% of all electricity and their demand is increasing by 12% per year and cost \$7.4 billion per year by 2011. According to DoE's current report in July 2011 Data Centres are consuming 3% of all US electricity and this consumption will double by 2015. With the purpose of reducing energy consumption in Data Centres it is worthwhile to concentrate on following-

- Information Systems – Efficient and right set information systems for business needs are a key in building Green Data Centres. As per green computing best practice efficient servers, storage devices, networking equipments and power supply selection play a key role in design of information systems.

- **Cooling Systems-** It is suggested by the researchers that at the initial stage of design process for Data Centre cooling systems, it is significant to consider both current and future requirements and design the cooling system in such a way so it is expandable as needs for cooling dictates.
- **Standardized environment for equipment** is must for Data Centre Air Management and Cooling System.

D. **Virtualization**:- The main trends Green Computing is virtualization of computer resources. Concept of computer resources, such as the running two or more logical computer systems on one set of physical hardware is called virtualization. Green computing offers virtualization software as well as management software for virtualized environment. One of the best way to go green and save enough space, enough resources, and the environment.

Virtualization runs fewer systems at higher levels of operation. Virtualization allows full operation of computer resources and benefits-

- Reduction of total cost of hardware.
- Power off Idle Virtual Server to save product and energy.
- Reduction in total space, air and rent requirement and low cost.

7. FUTURE TREND

As discussed earlier the reason for shift is because of growth in computing needs, energy cost and global warming and this shift is great challenge for IT industry. The future of Green Computing is going to be based on efficiency, rather than reduction in consumption. The primarily focus of Green IT is in the organization's self interest in energy cost reduction, at Data Centres and at desktops, and the result of which is the corresponding reduction in carbon generation. .

A. Cloud Computing:- Cloud Computing has recently received significant attention as a promising move towards for delivering Information. Technology services by improving the utilization of Data Centre resources. Cloud computing is energy-efficient technology for ICT provided that it's potential for significant energy savings that have so far focused on only hardware aspects. Cloud Computing results in

better resource operation which is good for the sustainability movement for green technology.

B. Product Longevity:- As per Gartner and Fujitsu reports on product life cycle it is obvious that the product life time and prolonged existence are one of the best approaches towards achieving Green Computing objectives. Long life of product will allow more utilization of products and it will put a control on unnecessary manufacturing of products.

C. Power Management Tools:- Power management is proving to be one of the most valuable and clear-cut techniques in near future to decrease energy consumption. IT departments with focus on saving energy can decrease use with a centralized power management tool. Compiling data from Energy Star case studies for 7 deployments of 11,000 - 499,000 equipment, it was found that sleep preparation was able to save between \$10.75 and \$95 per computer per year. These deployments used a mixture Windows built-in sleep function, group policies, different software systems, such as PC Power-down, EZ GPO, Tivoli systems, Big Fix etc.

❖ **Leveraging Unused Computer Resource**:-

One of the exit areas where Green Computing can grow is the share and use well the idle resources on idle computers. Leveraging the unused computing power of modern machines to create an environmentally proficient substitute to traditional desktop computing is cost effective option. This makes it possible to reduce CO2 emissions by up to 15 tons per year per system and reduce electronic waste by up to 80%.

9. CONCLUSION

Technology is not a passive spectator, but it is inactive donor in achieving the goals of Green Computing. IT industry is putting efforts in all its sectors to achieve Green computing. Equipment recycling, reduction of paper usage virtualization, cloud computing, power management, Green manufacturing are the plan Green computing. Current challenges to achieve Green Computing are enormous and the impact is on computing performance. Efforts of Governments and Non-Government Organizations (NGOs) are also appreciate-able. Government system are pushing Vendors to act green act do green go green think green use green and no hesitation to reduce energy consumptions as well. All these efforts are still in limited areas and currently efforts are mainly to reduce energy consumption, e-Waste. But the future of Green Computing will be depending on efficiency and Green products. Future work in Green Computing discipline will also rely green technologies are discuss which are

environmentally sustainable products. By Adapting “Green Computing”, “SAVE THE ENVIRONMENT, SAVE YOUR LIFE”.

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