

ECO-FRIENDLY COMPUTING: GREEN COMPUTING

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ABSTRACT

Cloud Computing provides the provision of computational resources on demand via a computer network. Here the term "cloud" represents to the Internet. The main purpose of the Computer is to store and retrieve the information. As cloud computing becomes more widespread, the energy consumption of the network and computing resources that underpin the cloud will grow. The main point related to Cloud Computing is that data centres which are hosting cloud computing applications consume huge amounts of energy, contributing to high operational costs and carbon footprints to the environment. With energy shortages and global climate change leading our concerns these days, the power consumption of data centers has become a key issue. So, the main aims of Green Computing is to reduce the use of hazardous materials, maximize energy efficiency during the product's lifetime, and promote recyclability or biodegradability of defunct products and factory waste. The plan towards green IT should include new electronic products and services with optimum efficiency.

Keywords: *Green Computing, Power Consumptions, Data Centres, Cloud Computing, Energy.*

Introduction

Green computing is the term used to denote efficient use of resources in computing. This term generally relates to the use of computing resources in conjunction with minimizing environmental impact, maximizing economic viability and ensuring social duties. Green computing is very much related to other similar movements like reducing the use of environmentally hazardous materials like CFC's promoting the use of recyclable materials, minimizing use of non-biodegradable components, and encouraging use of sustainable resources.

The huge amount of computing manufactured worldwide has a direct impact on environment issues, and scientists are conducting numerous studies in order to reduce the negative impact of computing technology on our natural resources. Companies are addressing e-waste by

offering take-back recycling programs and other solutions, with lower energy consumption and less wasted hardware. A central point of research is testing and applying alternative nonhazardous materials in the products' manufacturing process.

History of Green Computing

One of the first manifestations of the green computing movement was the launch of the Energy Star program back in 1992. Energy Star served as a kind of voluntary label awarded to computing products that succeeded in minimizing use of energy while maximizing efficiency. Energy Star applied to products like computer monitors, television sets and temperature control devices like refrigerators, air conditioners, and similar items.

One of the first results of Green computing was the Sleep mode function of computer monitors which places a consumer's electronic equipment on standby mode when a pre-set period of time passes when user activity is not detected. As the concept developed, Green Computing began to encompass thin client solutions, energy cost accounting, virtualization practices, eWaste, etc.

Why Go Green?

Computing power consumption of companies has reached a critical point. For example, an E-commerce business with 100,000 servers can easily spend up to \$20 million a year on server power. Add another \$10 million for a/c cooling and it tops \$30 million a year in power alone. Clearly there is a huge potential for savings in their infrastructure.

Despite the huge surge in computing power demands, there are many existing technologies and methods by which significant savings can be made. This series is dedicated to the ways a typical organization can reduce their energy footprint while maintaining required levels of computing performance. So Why should a company promote green, or energy efficient computing?

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Climate Change: First and foremost, conclusive research shows that CO₂ and other emissions are causing global climate and environmental damage. Preserving the planet is a valid goal because it aims to preserve life. Planets like ours, that supports life, are very rare.

Savings: Green Computing can lead to serious cost savings over time. Reductions in energy costs from servers, cooling, and lighting are generating serious savings for many corporations.

Reliability of Power: As energy demands in the world go up, energy supply is declining or flat. Energy efficient systems help ensure healthy power systems. Also, more companies are generating more of their own electricity, which further motivates them to keep power consumption low.

Performance Tuning: Performance tuning is the process of adjusting a computer so that it will perform to the best of its ability, given its current or aggregate workload. By doing so you can squeeze out every drop of computing goodness that your current systems have, which is often a lot. This will reduce energy footprint by avoiding unnecessary hardware upgrades, cooling, and associated e-waste. Performance tuning and management can also lower the overall energy a given system uses because there are less resources allocated internally for a given software process. Disk I/O, CPU, memory reduction can lead to measurable energy savings.

Capacity Planning: Capacity Planning allows an organization to grow in a coherent and organized way while minimizing the amount of hardware needed to perform all required computing. Resource utilization is measured over time and analyzed to determine the precise computing infrastructure requirements. Organized growth is important because it avoids having heterogeneous and ill-performing systems that drive up costs and excess energy need. It also avoids purchasing of overpowered or under-powered equipment that must be later disposed or would otherwise sit and suck power.

Because the success of any IT operations center hinges on the performance requirements of its customers, it is vital to know what the current and future capacity needs are in advance so

that designs will accurately reflect future needs. Server consolidation, virtualization, and performance all rely on accurate forecasts of future needs which are provided by capacity plans and forecast models.

Reliability Considerations: Reliability of hardware is an important aspect of green computing because it reduces the overall costs of energy associated with system failures and E-waste. Performing coherent and routine reliability analysis of the IT infrastructure can identify unreliable systems and designs. In addition, companies benefit by realizing a more reliable IT and e-commerce framework. System failures cost significant amounts of energy expenditure due to human intervention in cooled environments, travel to and from data centers, and other related activities.

E-waste, or scrapped computer hardware, is a very serious problem because of the energy required disposing of the materials, and the hazardous chemicals embedded in the waste materials. Reliability is directly related to manufacturing, repair, and ROI costs of systems. Increasing the reliability of the IT infrastructure leads to significant energy savings while minimizing hazardous waste materials and their disposal.

Some Facts - How Computer effect the Environment?

- An average desktop computer requires 85 watts just to idle, even with the monitor off. If that computer were in use or idling for only 40 hours a week instead of a full 168, over \$40 in energy costs would be saved annually.
- One computer left on 24 hours a day costs you between \$115 and \$160 in electricity costs annually while dumping 1,500 pounds of CO₂ into the atmosphere.
- A tree absorbs between 3 and 15 pounds of CO₂ each year. That means up to 500 trees are needed to offset the annual emissions of one computer left on all the time.
- If each household in a region the size of the metro Boston area turned off its computer for just one additional hour per day, it would save \$3.2 million in electricity costs and prevent 19,000 tons of CO₂ from heating the atmosphere.
- Electricity production is the largest source of greenhouse gas emissions in the United States, ahead of transportation.

Energy Saving Programs

Many countries now adopted programs to minimize energy consumption in electronic equipments. The Climate Savers computing initiative is the program launched to reduce power consumption in computers. The Green Electronic Council promotes the manufacturing and sale of Green Computers. The Green Grid is a global consortium promoting the use of energy efficient IT devices in data centers and business firms. The Green Comm Challenge is the organization formed to promote energy conservation techniques in the field of Information Technology.

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METHODS:

1. Use of a single hardware to run two or more logical computer systems.
2. Use of a terminal server system to connect multiple users to transfer datas into a Central server. The central server will process the datas .This reduces energy consumption.
3. Power efficiency system can be introduced, so that the computer and peripherals turn off after a period of time if it is not using. The Hibernating mode and Advanced power management of modern computers are meant for this.
4. Power supply efficiency of the PC can be increased to 80% from 70% efficiency of the present power supply system.
5. Replacement of CRT monitor with LCD or LED monitors.
6. Reduction in the uses of toxic chemicals such as lead, cadmium, mercury etc. in computer parts.
7. Introduction of recycling programs in all places to dispose obsolete devices easily.
8. Promotion of telecommuting systems. This reduces the cost, travel expenses, carbon dioxide emission from vehicles etc.

SOME GREEN COMPUTING TIPS

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1. If you are not using the computer frequently, purchase a small system with minimum attachments and peripherals.
2. Turn off the computer immediately after the use. Do not keep it in standby mode. Even in the standby mode, it consumes around 10 watts power.
3. Buy a good quality computer with Energy star. Always observe the power consumption.
4. Unplug peripherals such as printer, audio system, scanner, modem etc if these are not using.
5. Do not keep the UPS always switched on. Switch on the UPS only when the computer is using. If you are using the computer for one or two hours daily, that is enough for charging the battery. This prevents overcharging of the battery and reduces the electricity cost.

CONCLUSION

Many governments worldwide have initiated energy-management programs, such as Energy Star, an international standard for energy-efficient electronic equipment that was created by the United States Environmental Protection Agency in 1992 and has now been adopted by several other countries. Energy Star reduces the amount of energy consumed by a product by automatically switching it into "sleep" mode when not in use or reducing the amount of power used by a product when in "standby" mode. Surprisingly, standby "leaking," the electricity consumed by appliances when they are switched off, can represent as much as 12 percent of a typical household's electricity consumption.

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