BEST: International Journal of Management, Information Technology and Engineering (BEST: IJMITE)
Vol. 1, Issue 1, Oct 2013, 23-28

GREEN COMPUTING A MODERN APPROACHES TO INFORMATION TECHNOLOGY

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ABSTRACT

Green computing is the practice of using computing resources efficiently. Modern IT relies upon a complicated mix of people, networks, and hardware, as such a green computing initiative must be systematic in nature, and address increasingly sophisticated problems. Green computing is the utmost requirement to protect environment and save energy along with operational expenses in today's increasingly competitive world. Green technology focuses on reducing the environmental impact of industrial processes and innovative technologies caused by the Earth's growing population. It has taken upon itself the goal to provide society's needs in ways that do not damage the natural resources. This means creating fully recyclable products, reducing pollution, proposing alternative technologies in various fields, and creating a center of economic activity around technologies that benefit the environment. 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. A central point of research is testing and applying alternative nonhazardous materials in the products' manufacturing process.

KEYWORDS: Proposing Alternative Technologies in Various Fields, "Green Computing", Maximize Energy Efficiency during the Product's Lifetime

INTRODUCTION

Overview 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. This resulted in the widespread adoption of sleep mode among consumer electronics. The term "green computing" was probably coined shortly after the Energy Star program began. Energy management has always began an important topic for laptop manufacturers, who have been working on this for years as they struggled to manage weight versus battery life issues.

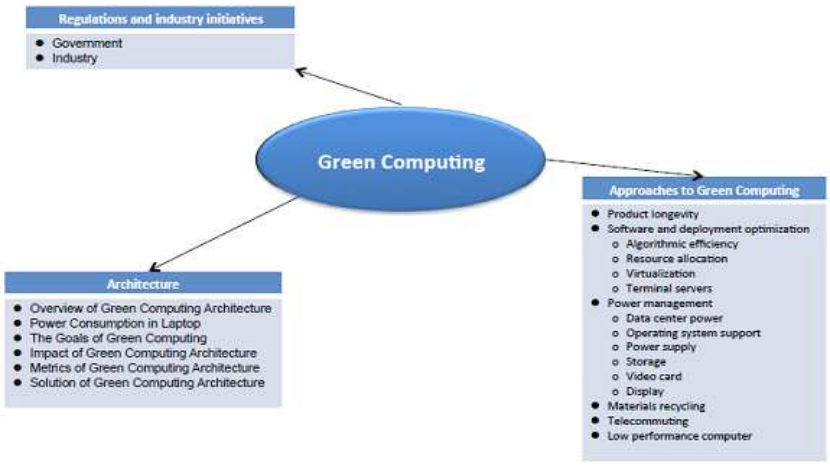

Figure 1: Brief Layout of Green Computing

GREEN COMPUTING ARCHITECTURE

Power Consumption in an Average Laptop

The powerful new laptop with the terrifically beautiful video display might require a more expensive battery technology if the laptop's weight is to be maintained as well as its battery life. Longer battery life always comes with a price—typically a guns-or-butter trade-off between heavier batteries or more expensive battery technologies for every additional minute of battery life.

Goals of Green Computing

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. 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.

Impact of Green Computing

Green computing was impact on the fields of Regulatory, Business and Public in various aspects. In regulatory it will depend upon the non government and government, business has the impact of profit/market operations and IT operations, as well as the public in view of the customer, partner, and public interest groups.

Metrics of Green Computing

Metrics of green computing are pollution in refer to Co_2 and e-Waste, operation for the power and business, perception can have the satisfaction metrics.

Solutions of Green Computing

Green computing can have the various solutions of platforms such as the data center, client and business platforms.

Regulations and Industry Initiatives

The Organisation for Economic Co-operation and Development (OECD) has published a survey of over 90 government and industry initiatives on "Green ICTs", i.e. information and communication technologies, the environment and climate change. The report concludes that initiatives tend to concentrate on the greening ICTs themselves rather than on their actual implementation to tackle global warming and environmental degradation. In general, only 20% of initiatives have measurable targets, with government programs tending to include targets more frequently than business associations.

Government

Many governmental agencies have continued to implement standards and regulations that encourage green computing. The Energy Star program was revised in October 2006 to include stricter efficiency requirements for computer equipment, along with a tiered ranking system for approved products. In 2008, a report published in the UK by the Department for Communities and Local Government, quantified that the potential carbon savings from increasing the usage of online public service delivery were significantly in excess of the negative impact of extra IT server capacity. In January 2010, the U.S. Energy Department granted $47 million of the ARRA money towards projects that aim to improve the energy efficiency of data center. The projects provided research to optimize data center hardware and software, improve power supply chain, and data center cooling technologies.

Industry

The green grid is a global consortium dedicated to advancing energy efficiency in data centers and business computing ecosystems. Climate Savers Computing Initiative (CSCI) is an effort to reduce the electric power consumption of PCs in active and inactive states. The CSCI provides a catalog of green products from it‘s member organizations, and information for reducing PC power consumption.

Approaches to Green Computing

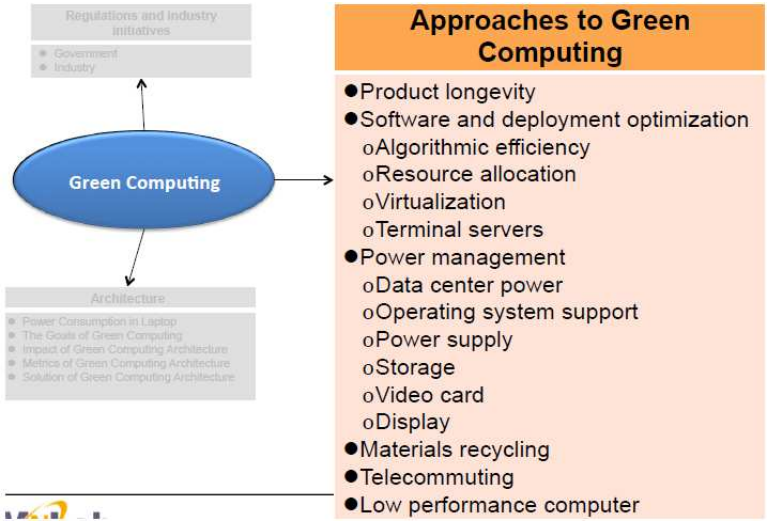

Figure 2

Modern IT systems rely upon a complicated mix of people, networks and hardware; as such, a green computing initiative must cover all of these areas as well. A solution may also need to address end user satisfaction, management restructuring, regulatory compliance, and return on investment (ROI). There are also considerable fiscal motivations for companies to take control of their own power consumption; of the power management tools available, one of the most powerful may still be simple, plain, common sense.

Product Longevity

- The PC manufacturing process accounts for 70 % of the natural resources used in the life cycle of a PC.
- Fujitsu released a Life Cycle Assessment (LCA) of a desktop that show that manufacturing and end of life accounts for the majority of this laptop ecological footprint.
- The biggest contribution to green computing usually is to prolong the equipment's lifetime.
- "Look for product longevity, including upgradability and modularity."

Software and Deployment Optimization

Optimize the software and deployment is an efficiency way for saving energy which includes algorithmic efficiency, resource allocation, virtualization, terminal servers.

Algorithmic Efficiency

- The efficiency of algorithms has an impact on the amount of computer resources required for any given computing function and there are many efficiency trade-offs in writing programs.

- The average Google search released 7 grams of carbon dioxide (CO2), however, Google disputes this figure, arguing instead that a typical search produces only 0.2 grams of CO2.

Resource Allocation

- Resource allocation is used to assign the available resources in an economic way. It is part of resource management, project management resource allocation is the scheduling of activities and the resources required by those activities while taking into consideration both the resource availability and the project time.
- There are two parts of the resource allocation: Strategic planning, Resource leveling.
- In strategic planning, resource allocation is a plan for using available resources, for example human resources, especially in the near term, to achieve goals for the future. It is the process of allocating resources among the various projects or business units.

Virtualizing

- Computer virtualization refers to the abstraction of computer resources, such as 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.
- Virtualization can assist in distributing work so that servers are either busy or put in a low-power sleep state.

Terminal Servers

- Terminal servers have also been used in green computing.
- When using the system, users at a terminal connect to a central server all of the actual computing is done on the server, but the end user experiences the operating system on the terminal. There has been an increase in using terminal services with thin clients to create virtual labs.

Power Management

- The Advanced Configuration and Power Interface (ACPI), an open industry standard, allows an operating system to directly control the power saving aspects of its underlying hardware.
- This allows a system to automatically turn off components such as monitors and hard drives after set periods of inactivity.
- Some programs allow the user to manually adjust the voltages supplied to the CPU, which reduces both the amount of heat produced and electricity consumed.

Data Center Power

- Data centers, which have been criticized for their extraordinarily high energy demand, are a primary focus for proponents of green computing.
- With the aid of a self-styled ultra efficient evaporative cooling technology, Google Inc. has been able to reduce its energy consumption to 50% of that of the industry average.

- Data collected from physical and cyber systems in data centers is correlated and analyzed to provide models and tools for data center management and performance optimization.

Operation System Support

- The dominant desktop operating system, Microsoft Windows, has included limited PC power management features since Windows 95.
- The most recent release, Windows 7 retains these limitations but does include refinements for more efficient user of operating system timers, processor power management and display panel brightness.

Power Supply

- Desktop computer power supplies (PSUs) are generally 70–75% efficient, dissipating the remaining energy as heat.
- An industry initiative called 80 PLUS certifies PSUs that are at least 80% efficient. As of 20 July 2007, all new Energy Star 4.0-certified desktop PSUs must be at least 80% efficient.

Storage

- Smaller form factor (e.g. 2.5 inch) hard disk drives often consume less power than physically larger drives.
- Reducing the power consumed by large storage arrays, while still providing the benefits of online storage, is a subject of ongoing research.

Video Card

- A fast GPU may be the largest power consumer in a computer.
- Energy efficient display options include:

  No video card - use a shared terminal, shared thin client, or desktop sharing software if display required**.**

  Use motherboard video output - typically low 3D performance and low power**.**

Display

- CRT monitors typically use more power than LCD monitors, they also contain significant amounts of lead.
- LCD monitors typically use a cold-cathode fluorescent bulb to provide light for the display. Fluorescent back-lights also contain mercury, whereas LED back-lights do not.

Materials Recycling

- Computer systems that have outlived their particular function can be repurposed, or donated to various charities and non-profit organizations.
- Recycling computing equipment can keep harmful materials such as lead, mercury, and hexavalent chromium out of landfills, but often computers gathered through recycling drives are shipped to developing countries where environmental standards are less strict than in North America and Europe**.**

Telecommuting

- Teleconferencing and telepresence technologies are often implemented in green computing initiatives**.**

- The advantages are many; increased worker satisfaction, reduction of greenhouse gas emissions related to travel, and increased profit margins as a result of lower overhead costs for office space, heat, lighting, etc.
- The savings are significant; the average annual energy consumption for U.S. office buildings is over 23 kilowatt hours per square foot, with heat, air conditioning and lighting accounting for 70% of all energy consumed.

Low Performance Computer

- As of 2007, several personal computer vendors (e.g., Everex, Linutop, Systemax, Zonbu and OLPC) ship dedicated low-power PCs.
- These systems provide minimal hardware peripherals and low performance processors, which makes them impractical for applications that require a lot of processing power such as computer gaming and video production.
- A low power PCs is usually much smaller than traditional desktop. The limited capacity for upgrades, low performance and proprietary may lead to shorter life spans and greater difficulty in repair.

CONCLUSIONS

Green Computing **or** green IT refers to the environmentally sustainable computing or IT. Green Computing is the study and practice of using computing resources efficiently. Green computing is the utmost requirement to protect environment and save energy along with operational expenses in today's increasingly competitive world. Green computing is a mindset that asks how we can satisfy the growing demand for network computing without putting such pressure on the environment. Green computing is not about going out and designing biodegradable packaging for products. It opens a new window for the new entrepreneur for harvesting the E-wastage material and scrap computers. It discuss various green initiatives currently under computer industry as well as the architecture and approaches for the Green Computing

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