

Green Computing: The approaches to Go Green

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Abstract— Widespread and extensive use of electronic gadgets has become a part and parcel of everyday life. These gadgets include right from electronic toys up to the high end computing devices. The widespread use of these gadgets has resulted in tremendous amount of non-biodegradable waste, the E-waste. Undoubtedly the E-waste has become threat to environmental balance and consequently has become a major concern for environmetologist. At this time, it has become the moral responsibility of the computerist community to make computing as The Green Computing to keep the mother Earth a healthy mother. Green computing is the study and practice of environmentally sustainable computing. The Green Computing aims at reducing the use of *hazardous materials*, making product energy efficient, recycling of defuncted products, making use of more biodegradable products. In this paper a stock of various approaches to green computing is taken which involves primarily product longetivity, design of data centers, software optimization, power efficiency and so on.

Keywords: *non-biodegradable, E-waste, computerist, Green Computing, hazardous materials, energy efficient, product longetivity, software optimization.*

I. INTRODUCTION

The “Green Computing” terminology and its alternative “Green IT” have recently popular and taken on increased importance their conceptual origin is almost two decades old. In this paper, the terms are used for described the Green Computing concept they are given below.



Figure1: Green Computing

E-waste describes discarded electrical or electronics devices, these electronics gadgets/widget has a resulted in tremendous amount of non biodegradable waste. Non biodegradable materials do not decompose instead they remain intact in landfills and caused potential harm to the environment once they have outlived their usefulness.

The term reuse or recycling generated from E-waste is the process of converting non biodegradable waste substances into the biodegradable product.

Recycling is the process to change waste materials into new products which properly use in other fields, it gives new life product to the future use.

Hazardous material is defined as any substance or material could adversely, affect the safely of the public, handless or carries during transportation. Hazardous waste is a waste that

poses substantial or potential threads to public health or the environment. This waste with properties that make it dangerous or potentially harmful to human health or the environment, it can be liquid, solids, contained gases or sludge's.

Energy efficient is “using less energy to provide the same service”, the goal of this is to reduce the amount of energy required to provide product and services.

In this paper, the Approaches of Green computing is described in following sections. The first approach of green computing is the product longevity is describe in the section [1], the other approach is data center design given below in section [2], the next approach is software and development optimization in this some factors are considered they are algorithmic efficiency, resource allocation, virtualization, terminal servers are describe in the section [3], and the last but not least is the power efficiency in this we will again considered the subpoints they are data center power, operating system support, power supply, storage and display are described in the section [4].

II. APPROACHES OF GREEN COMPUTING

“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 communications systems — efficiently and effectively with minimal or no impact on the environment.” The four approaches or the roads to Green Computing are Green use, Green disposal, Green design, and Green manufacturing.

To comprehensively and effectively address the environmental impacts of computing/IT, we must adopt a holistic approach and make the entire IT lifecycle greener by addressing environmental sustainability along the following four complementary paths.

- Green use — reducing the energy consumption of computers and other information systems as well as using them in an environmentally sound manner.
- Green disposal — refurbishing and reusing old computers and properly recycling unwanted computers and other electronic equipment.
- Green design — designing energy-efficient and environmentally sound components, computers, servers, cooling equipment, and data centers.
- Green manufacturing — manufacturing electronic components, computers, and other associated subsystems with minimal impact on the environment.

A. Product Longevity

Product Longevity implies the quality of product being long-lasting or the expectancy of a product from the time it is launched until it is no longer available. Climate change is one of the most important global challenges that society of the 21st century faces, it is necessary to limit the average temperature to two degrees towards the pre industrial level in order to minimize the risks of global warming.

Fujitsu Technology solution GmbH assigned and bifa environmental institute to carry out a Life Cycle Assessment (LCA) for the desktop.

Manufacturing a new PC makes a far bigger ecological footprint than manufacturing a new RAM module to upgrade an existing one, is a measure of human demand on the Earth's ecosystems. A number of NGOs offer ecological footprint calculators it is for individuals and is based on average national data [7].

B. Data Center Design

Data center is a large group of networked computer servers typically used by organization for the remote storage, processing or distribution of large amount of data. Data center design provides a resilient environment with redundant platforms and links however, this cannot protect your data center from a complete failure resulting from a total loss of power or cooling.

When designing data center must consider how much power you will require, how you will provide backup power in the event of a loss of your power feed from your provider and how long you will retain power in a backup power event.

C. Software and Deployment Optimization

- **Algorithm Efficiency:**
An algorithm must be analyzed to determine its resource usage, thus for maximum efficiency we wish to minimize resource usage.
The efficiency or running time of an algorithm is stated as a function relating the input length to the number of steps or storage location.
- **Resource Allocation:**
Resource allocation is the assigning of the available resources to the various processors to complete their task smoothly and effectively. Resource allocation decided by using computer program

applied to a specific domain to automatically and dynamically distribute resources to applicants.

- **Virtualizing:**
The process of running two or more logical computer system on the basis of one set of physical hardware is known as computer virtualization. The concept originated with the IBM mainframe operating system in the 1960s but was commercialized for x86 compatible computer only in the 1990s.
- **Terminal servers:**
It is also called a thin client because when user using terminal servers, user connected to a central server all of the computing is done at the server level user is not aware about this [5].

D. Power Efficiency

The power consumes by the system or electronics devices emitted the CO₂ into the environment. The maximum power consume by the display of the system so it must see the configuration of the system during buying the system from the shops.

Use hibernate and sleep mode while the system is not in use condition, it can reduce the energy consumption by 80-96%.

- **Data center Power:**
Data center are the new polluters for the healthy environment. According to the report of the Natural Resources Defence Council (NRDC) data centers are the backbones of the modern economy from the server rooms that power small – to –medium sized organization to the enterprise. Server runs on the cloud computing services hosted by Amazon, Facebook, Google and others [8].
- **Operating system support:**
the first result of green computing is the sleep mode available in the computer systems & laptops, initially it provided for stand-by (Suspend-to-RAM) and a monitor low power state, further improvement of windows added hibernate(suspend-to-disk) and support for (Advanced Configuration & Power Interface) the ACPI standard.
Linux operating system utilizing less resource than other operating system and also have a better power management facility.
- **Power Supply:**
The power supplies in most computers (PSU) aren't designed for energy efficient. Most computers drain more power than they need during normal operation leading to higher electrical bills.
- **Storage:**
Data storage systems — computers that enable companies to store and access large amounts of data — might be a bit of a dry topic for a Monday morning. But this morning, computing company Sun Microsystems is launching a new set of data storage products that use open source and solid-state memory drives to cut their energy consumption to one quarter that of traditional data storage systems.

- *Display:*

CRT monitors typically use more power than LCD display. CRT monitor uses a vacuum tube containing electron gun and a fluorescent screen used to view images.

LCD monitor use a cold-cathode fluorescent bulb to provide light for the display and LED monitor display use the array of light emitting diodes in place of the fluorescent bulb which reduces the amount of electricity used by the display.

III. CONCLUSION

“Green Computing” or “Green Technology”, and “Green IT” it is not only a new trend, it is a technology of itself. The move to become more environmentally friendly, healthy is more than just a means to a better corporate image.

We conclude that to handle the recycling arrangements, devices use less and less power while renewable energy gets more and more portable and effective.

Make the organization ‘Being Green’ should be understood as a long-term commitment, use green equipment in our computing life, save energy from consumption and reduce the level of CO₂ from the environment to make healthy earth.

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