



# One Step towards the “Green Computing”: An Eco-Friendly Approach

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**ABSTRACT:** We should realize the significant of the term “Go Green”. Green Computing is an effective study in which we learn about disposing, recycling and manufacturing of computers and other electronic devices to reduce the e-wastage to lower down the use of hazardous materials, maximize energy efficiency. In this paper we will focus on the sources of the wastage of energy and we will find out the various ways of solutions that by providing different aspects and different approaches that how to control wastage of energy.

**KEYWORDS:** Energy Star, Green ICT, Energy savings, Cost Savings, Eco friendly, Green Approaches

## I. INTRODUCTION

In the year 1992, the U.S environmental protection Agency launched “Energy Star” the symbol represents the energy efficiency in monitor and climate control equipment etc. The term Green Computing has proposed shortly after the “Energy Star” launching to make the concept applicable in real life.



Now a days the global warming and lacks of energy are the serious issues in our society. So, to overcome the situation scientists are doing effortless research. And they have found a solution using Green Computing. “Green Computing” the term itself represents that it is an eco-friendly concept to use the computer and other peripheral devices more effectively and efficiently.

Green Computing is also known as Green IT. The Green Computing is now under an attention of not only environment organizations but also other industries. Recently the Computer industries has realized that go green is the best solution in terms of public relation and reduce cost.

### **Green ICT:**

ICT (Information and Communication Technology) is responsible for 2% of global CO<sub>2</sub> emission. But Green ICT is about reducing the impact of ICT on the environment. It is about reducing the energy use of computers, servers and data centers. ICT is not only part of the problem of our environmental impact, it is also part of the solution. From the perspective of an organization or from an ICT department, it makes sense to think about Green ICT as the direct impact of ICT on the environment. Green ICT is about considering all impacts of ICT on the environment, direct or indirect, positive or negative. We have to minimize the negative impacts and maximize the positive impacts. Yes, ICT can have a positive influence and reduce our environmental footprint: it can be used as an enabler for new environmental-friendly technologies, it can be used to make other processes more efficient and thus reduce their impacts.



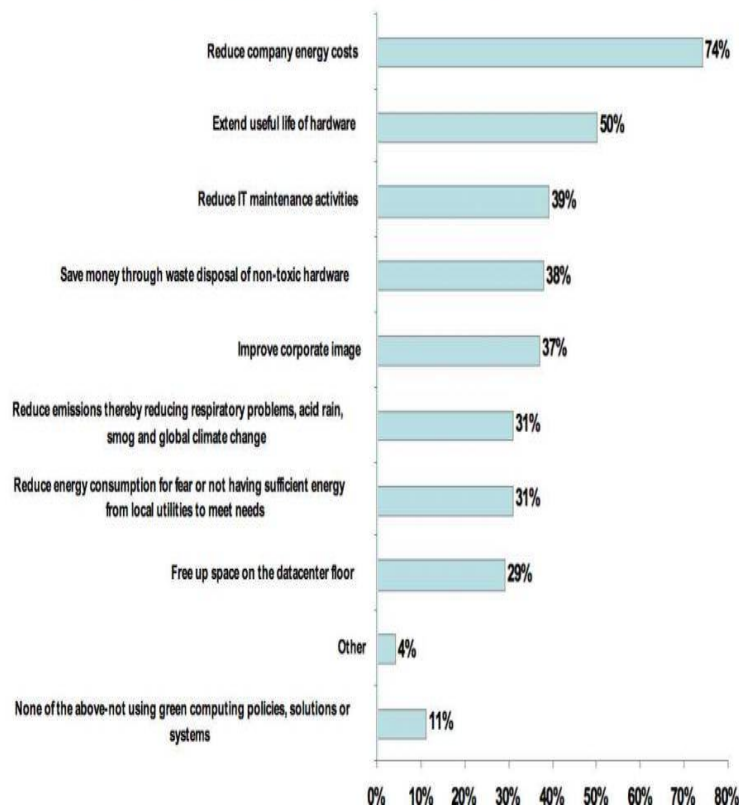
**Why Green Computing:**

**Environmental Awareness:** The concern is not only about the health of the system but it's also about the health of our environment. Every single computer requires about 1.8 tonnes of chemicals, fuels and water for its manufacture. And once in use, it emits about 0.1 tonne of carbon dioxide in a year. According to a research, computers generate an estimated 35 million tonnes of carbon dioxide each year. The emissions by computers account for 2 per cent of world's total carbon dioxide emissions. The carbon emissions by computers are causing in the increasing global warming scenario, we should always ensure energy efficient computing. So please turn off your computers, monitors and other peripherals when not in use.

**Increasing demand and cost of energy:** At present the Green Computing concept not only accepted by the environmental organizations rather than that IT industries are also very much keen to take this forward. As it is less energy consumable concept and also low cost expense.

**Social Responsibility:** To make aware the society about the Environment and how to protect the environment by accepting this new concept into their daily life styles. And to show its better impact on environment & human health from climate change.

### Reasons for adopting green solutions





**Objectives of Green Computing**

1. **Green Use:** In this we have to reduce electricity usage. Which means when the devices are in idle mode we always should turn it off instead of keeping it in sleep or hibernate mode?
2. **Green Disposal:** Here we should recycle all the materials which could help us to build another system.
3. **Green Manufacturing:** Reduce wastage during manufacturing of Computers and other sub systems.
4. **Green Design:** We should design such types of Computers, Servers Printer which will consume less electricity.

**Approaches of Green Computing:**

1. **Longevity of Product:** Fujitsu introduces a Life Cycle Assessment (LCA) of a desktop which helps us to understand desktop's ecological footprint by showing the manufacturing and end of life accounts. Therefore, the biggest contribution to green computing by providing lifetime of the equipment's.
2. **Data Center Design:** The U.S. Department of Energy estimates that a proper design data center can reduce up to 100 to 200 times more energy than standard office buildings. Data Center Design Paradigm that includes the architecture of processor and other computer appliances. The most important objective in green computing is to design a processor with low consuming power energy, followed by designing of Data Centre of many servers that consumes less energy to prevent harmful effect of our environment. There are five major areas on which we should emphasize for an efficient data center design:

Information technology (IT) systems:

Environmental conditions

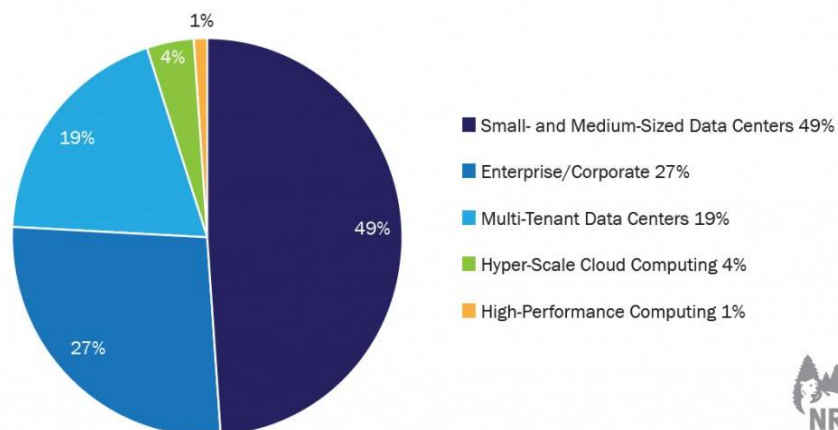
Air management

Cooling systems

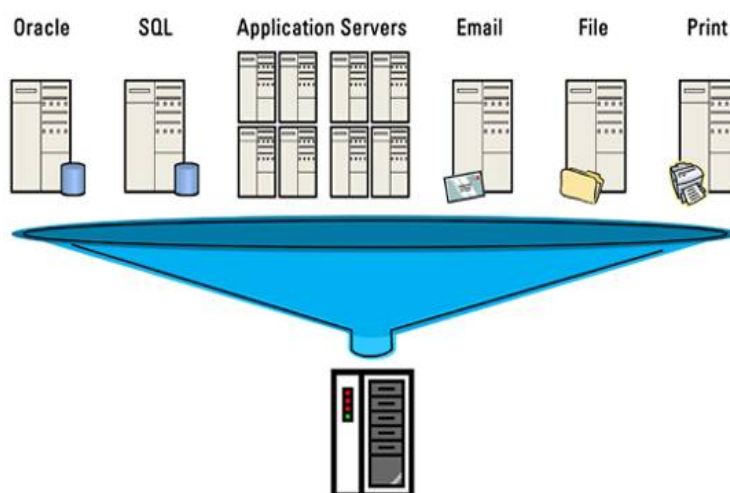
Electrical systems

Energy efficient data center design should help to better utilize a data center's space,

**Estimated U.S. data center electricity consumption by market segment (2011)**



- Algorithmic efficiency:** An algorithm must be analyzed to determine its resource usage. For maximum efficiency we wish to minimize resource usage. The efficiency of algorithms affects the amount of computer resources required for any given computing function. Algorithm changes, such as switching from a slow (e.g. linear) algorithm to a fast (e.g. hashed or indexed) algorithm that can reduce resource usage for a given task. In 2009, a study by a physicist at Harvard estimated that the average Google search released 7 grams of carbon dioxide (CO<sub>2</sub>)
- Resource allocation:** Algorithms can also be used to route data to data centers where electricity is less expensive. Researchers from MIT, Carnegie Mellon University, and Akamai have tested an energy allocation algorithm that successfully routes traffic to the location with the cheapest energy costs. We present a concept to allocate data center resources dynamically based on application demands and support green computing by optimizing the number of servers in use.
- Virtualizing:** One of the primary goals of virtualization is to make the most efficient use of available system resources. With virtualization technique, a system administrator could combine several physical systems into one single machine, powerful system, therefore reducing power and cooling consumption is easy to make applicable. Virtualization can assist in distributing work so that servers are either busy or put in a low-power sleep state.



- Power Management:** This allows a system to automatically turn off the running programs and components such as monitors and hard drives when these are no in active mode. In addition, a system may hibernate, when most components (including the CPU and the system RAM) are turned off. Some programs allow the user to manually adjust the voltages comes to the CPU, which reduces both the amount of heat produced and electricity consumed. This process is called "Undervolting". Some CPUs can automatically undervolt the processor, depending on the workload; this technology is called "SpeedStep"
- Operating system support:** Microsoft Windows, has included limited PC power management which refers to the mechanism for controlling the power use of personal computer hardware. This is typically through the use of software that puts the hardware into the lowest power demand state available. It is an aspect of computing. Linux started to provide laptop-optimized power-management in 2005,

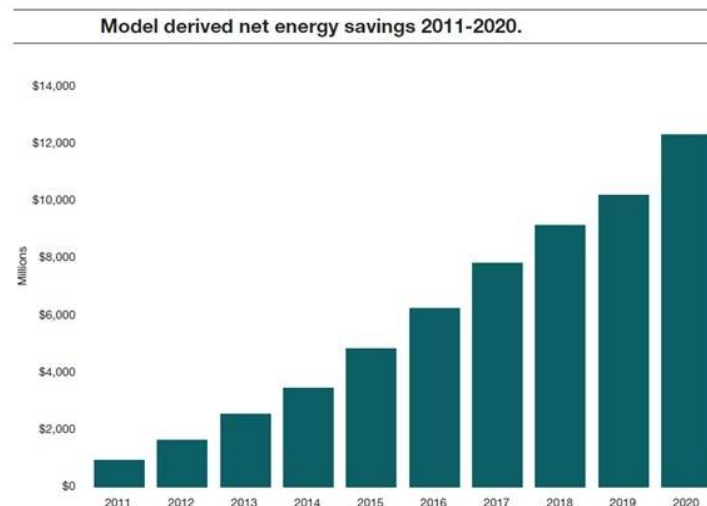


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8. **Storage:** Smaller form factor hard disk drives often consume less power per gigabyte than physically larger drives. There are three types of storage devices which vary from each other in terms of cost, capacity and speed. With green storage, the goal is to include lower costs, preserving energy and improving efficiency.
9. **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. Some displays use light-emitting diodes (LEDs) in place of the fluorescent bulb, which reduces the amount of electricity.
10. **Cloud Computing:** Cloud computing addresses two major ICT challenges related to Green Computing – energy usage and resource consumption. Cloud computing is enabling lower carbon emissions and energy usage up to a great extent. Large enterprises and small businesses can reduce their direct energy consumption and carbon emissions by up to 30% and 90% respectively by moving certain applications into the cloud. One common example includes Online shopping that helps people purchase products and services over the Internet without requiring them to drive and waste fuel to reach out to the physical shop, which, in turn, reduces greenhouse gas emission related to travel.



11. **Telecommuting:** Teleconferencing and telepresence technologies are often implemented in green computing initiatives. The advantages are reduction of greenhouse gas emissions, people don't have to travel, so at the same time there will be savings of cost and time and also work will get done. 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.



- Supercomputers:** Now a day's new supercomputer which emerged as the most energy-efficient (or greenest) supercomputer in the world. The unveiling of the Green500 ushered in a new era where supercomputers can be compared by performance-per-watt. The Green500 list ranks the top 500 supercomputers in the world by energy efficiency. The focus of performance-at-any-cost computer operations has led to the emergence of supercomputers that consume vast amounts of electrical power and produce so much heat that large cooling facilities must be constructed to ensure proper performance.

## II. CONCLUSION

We are concluding with the help of Green Computing it's possible to build an eco-friendly environment for long year. But it will not be successful miraculously only in one day. It will be the product of years of improvement. Green Computing can lead to a large amount of energy savings, It will reduce the emission of CO<sub>2</sub> and CFC that leads to environmental protection. It also lead us to serious cost savings overtime.





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