

## Green Computing- A New Trend in It

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**Abstract-** In past decades, computing has become the real thrust of the world. It has reduced the time consumption and is known for speedy calculations, faster analysis and more complex problems. But no one has ever known that these computers are also responsible for the environmental degradation. It is responsible for generating tons of e-waste, carbon emissions and carbon foot prints. It is the very serious problem that the world is facing in present scenario.

This is where we use the concept of green computing i.e. using the computers and related resources in environment friendly manner. This technology is one of the major concerns that needed to be implemented as early as possible. This study focuses on the production and the operation phases of the product life cycle and demonstrates what actions will result in overall carbon footprint reduction for personal and business computing under various operational conditions and environments.

**Keywords:** Green computing, Eco-friendly technology, Carbon emissions, Carbon foot print, E- waste, Degradation.

### Introduction

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. Green computing is important for all classes of systems, ranging from handheld systems [1] to large-scale data centres [2]. Many corporate IT departments have green computing initiatives to reduce the environmental impact of their IT operations [3].

Green computing is the utilization of computer related resources in an environment friendly manner. This includes the implementation of energy-efficient central processing units, servers and peripherals as well as proper disposal of electronic waste or e-waste. It is also known as the green technology. It ensures that the use and the setup of the IT sectors in the world should produce the minimum of carbon foot print [4].

### Regulations and industry initiatives

- Climate savers computing initiative (CSCI) is an effort to reduce the electric power consumption of PCs in active and inactive states [5]. The CSCI provides a catalogue of green products from its member organizations, and information for reducing PC power consumption. It was started on 2007. The name stems from the World Wildlife Fund's Climate Savers program, which was launched in 1999[6]. The WWF is also a member of the Computing Initiative [5].
- The Green Electronics Council offers the Electronic Product Environmental Assessment Tool (EPEAT) to assist in the purchase of "greener" computing systems. The Council evaluates computing equipment on 51 criteria - 23 required and 28 optional - that measure a product's efficiency and sustainability attributes. Products are rated Gold, Silver, or Bronze, depending on how many optional criteria they meet. On 2007-01-24, President George W. Bush issued Executive Order 13423, which requires all United States Federal agencies to use EPEAT when purchasing computer systems [7],[8].
- The Green Grid is a global consortium dedicated to advancing energy efficiency in data centers and business computing ecosystems. It was founded in February 2007 by several key companies in the industry – AMD, APC, Dell, HP, IBM, Intel, Microsoft, Rackable Systems, Spray Cool (purchased in 2010 by Parker), Sun Microsystems and VMware. The Green Grid has since grown to hundreds of members, including end-users and government organizations, all focused on improving data center infrastructure efficiency (DCIE).
- The Green500 list rates supercomputers by energy efficiency (megaflops/watt), encouraging a focus on efficiency rather than absolute performance.
- Green Comm Challenge is an organization that promotes the development of energy conservation technology and practices in the field of Information and Communications Technology (ICT).
- The Transaction Processing Performance Council (TPC) Energy specification augments existing TPC benchmarks by allowing optional publications of energy metrics alongside performance results [9].

- SPEC power is the first industry standard benchmark that measures power consumption in relation to performance of server for server-class computers. Other benchmarks which measure energy efficiency include SPEC web, SPEC virt,[10] and VM mark[11].

### What is carbon foot print in IT sector?

The carbon foot print in the Information technology sector is total set of the greenhouse gases emissions caused by computers and the other related resources. Computing is not currently very environmental friendly. Indeed, in the May 2010 edition of the Greenpeace Guide to greener electronics shows that only 2 out of 18 of the PC manufacturers listed obtained a reasonably green rating. Therefore it needs to be a very serious concern in the modern world full of technology.

### Negative effects of computers on environment

We all have been aware of about how the computers now have been technologically advanced. But this technological advancement is not at all environment friendly as it should have. The continuous use of these computers is responsible for the carbon emissions from the computers.

As the hardware of the computers are chemically manufactured and on continuous use and high temperatures, the chemicals start to react and radiate carbon emissions which are wholly responsible for the degradation of environment and secondly the e- waste generated because of the used hardware is hard to decompose and affects the environment in a very big manner.

### Why green computing?

Performance-wise, computer design has progressed staggeringly well and astonishingly fast but looking at it from a green perspective, the work is at its origin or we can say has not started the way it was to be. Conventionally, manufacturing computers includes the use of lead, cadmium, mercury, and other toxics in general. Usually, computers can contain 4 to 8 pounds of lead alone, according to green experts. It is surprising to know that on one typical PC alone takes up to use of 1.8 million tons of chemicals, water and fossil fuel. It's no wonder that computers and other electronics make up two-fifths of all lead in landfills. To counter this growing pollution threat all over the world due to the growing use of electronic device and computer in particular there is need for eco- friendly technology - that is **Green computing!**

### Ways to green computing

The work habits of computer users and businesses can be modified to minimize adverse impact on the global environment. Here are some steps that can be taken:

1. Virtualization is one of the most effective tools for more cost-effective, greener-energy efficient computing where

each server is divided into multiple virtual machines that run different applications and in this way companies can increase their server utilization rates.

2. More-efficient processors are another critical energy-saving element, as Intel, Advanced Micro Devices, and Sun Microsystems all have adopted the green religion. Sun's betting on multicore chip efficiency to fuel interest in new high-end servers. Its 32-thread Niagara 1 chip, Ultraspac 1, consumes 60 to 62 watts, while the Niagara 2 chip due in the second half will have 64 threads yet run at 80 watts only.

3. Setting the Power Options of computer to switch to sleep mode when it's not active is a good practice. We can find the power options settings in PC's Control Panel. It enables PC's to go to stand-by mode and turn off the monitor when the PC is idle for a few minutes.

4. It is better to do computer-related tasks during contiguous, intensive blocks of time, leaving hardware off at other times.

5. Flat panel monitors use less energy than traditional CRT monitors. Avoidance of the use of screen savers contributes to energy savings by allowing a monitor to enter in stand-by mode.

6. Smaller form factor (e.g. 2.5 inch) hard disk drives often consume less power than physically larger drives. Unlike hard disk drives, solid-state drives store data in flash memory or DRAM. With no moving parts, power consumption may be reduced somewhat for low capacity flash based devices

7. Print only what we need and use of recycled content paper whenever possible is another good practice. Recycled used ink and toner cartridges may also be used.

8. It is important to design computers which can be powered with low power obtained from nonconventional energy sources like solar energy, pedalling a bike, turning a hand-crank etc.

9. Use motherboard video output - typically low 3D performance and low power. Reuse of older video card that uses little power; many of which do not require heat sinks or fans [12], [13].

### Advantages of green computing

1. Reduced energy usage from green computing techniques translates into lower carbon dioxide emissions, stemming from a reduction in the fossil fuel used in power plants and transportation.

2. Conserving resources means less energy is required to produce, use, and dispose off products.

3. Saving energy and resources saves money.

4. Green computing even includes changing government policy to encourage recycling and lowering energy use by individuals and businesses.

5. Reduce the risk existing in the laptops such as chemical known to cause cancer, nerve damage and immune reactions in humans.

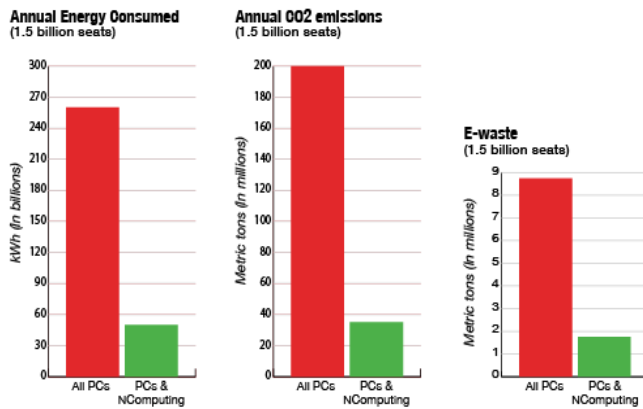


Figure1 :Annual trends for green computing

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## Conclusion

So far, consumers haven't cared about ecological impact when buying computers, they've cared only about speed and price. But as Moore's Law marches on and computers commodities, consumers will become pickier about being green. Devices use less and less power while renewable energy gets more and more portable and effective. The greenest computer will not miraculously fall from the sky one day; it'll be the product of years of improvements. The green computing can bring a revolutionary change in the method of using the computers and also making it environment friendly and will always be the key to reduce the carbon foot print, bring the energy efficiency and properly manage the e-waste.

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