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A Detailed Analysis on Evaluation of Green Computing

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ABSTRACT

Abstract: Currently, computers are not only used in offices but utilized at home as well. The amount of energy consumed by the growing daily use of computers contributes to a rise in the atmosphere's carbon content. The IT sector is mostly to blame for 3% of the world's energy usage, which is rising by 20% annually. These days, green computing is a very emerging topic today. He is responsible for the use of computers and associated resources. It encompasses the application of energy efficient processors, servers and peripherals, along with less resource usage and appropriate electronic waste disposal waste. Enhancing the life cycle efficiency of IT devices and approving the recycling of wasteful items and manufacturing waste are the main objectives of green computing. The methods for conserving green energy and their potential applications are discussed in this article.

By "aligning all IT processes and practices with the core principles of sustainability, which are to reduce, reuse, and recycle; and finding innovative ways to use IT in business processes to deliver sustainability benefits across the enterprise and beyond," green computing can also create beneficial solutions.

Green computing and green chemistry share many of the same objectives, including minimizing the use of hazardous materials, optimizing energy efficiency over the course of a product's lifetime, and fostering the recyclable or biodegradable nature of factory waste and non-operational products .

Keywords: Energy Efficiency, Green Computing etc.

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Introduction:

The term "green computing" refers to the investigation, application, and safe disposal of computer equipment design and efficiently while having little to no negative environmental effects [1]. The classification of green computing is displayed in Figure 1.1 There are two components involved. "IT-for-Green" denotes the efficient use of IT, whereas "Green-IT" refers to well-organized IT. The first and most comprehensive study on computing demonstrates that emissions, including carbon dioxide (Co_2), are to blame for the deterioration to the environment and the global climate. Going green is therefore the most important thing that the modern world needs in order to reduce the total amount of energy used for communications, storage, and computation. Grid computing, cloud computing, virtualization, green data centers, and power optimization are the five

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main green computing technologies that GCI supports. Companies such as Via Technology provide reasonably priced green PCs., non-toxic and ultra low wattage. It takes responsibility of their outdated products by offering a PC recycling service.

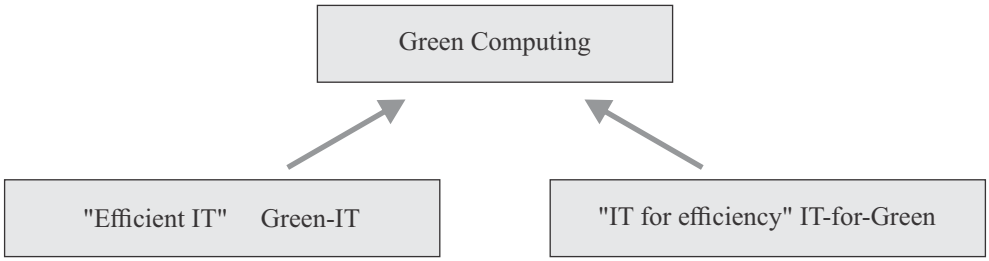

Fig- 1.1 Green Computing Classifications

This technology is advantageous because it:

- Lowers the amount of power used by computing resources when they are operating at their peak.
- Use sleep mode to save energy.
- Make use of green energy resources.
- Diminish the negative consequences of IT resources.
- Cut down on computer trash.

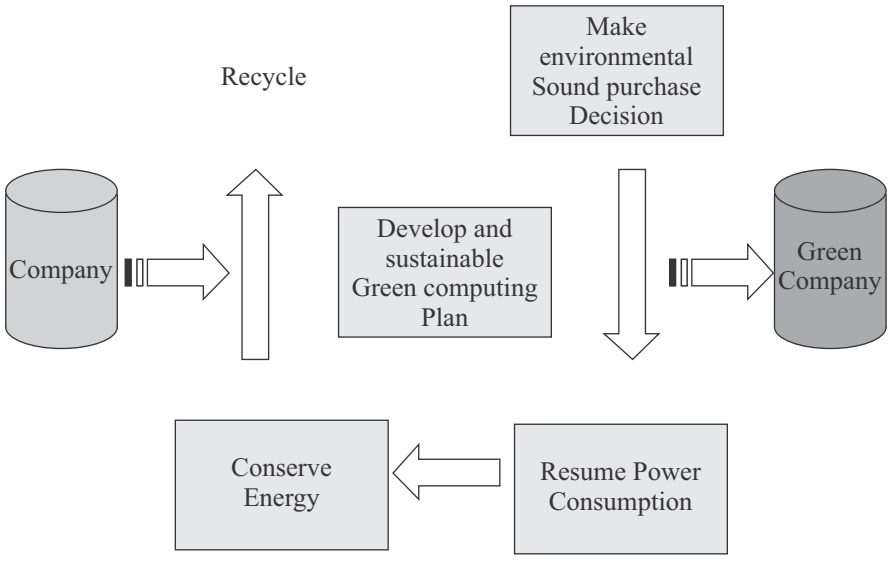

Fig-1.2: Green Computing Framework

Need of Green Computing

Life has become more comfortable and easier with the usage of computer systems and computer services. Both the processing speed and power consumption rise as a result. Both pollutants and greenhouse gas emissions rise as a result of this high energy use. Additionally, when power usage rises, the system continues to operate even while not in use. IT wastes a lot of energy since data centers

require a lot of energy and a sufficient cooling capacity, both of which pollute the environment when they are unavailable. Green computing focuses on cutting down on energy use and recycles materials to remove harmful aspects. It also lessens the need for cloud-based business travel and optimization

Only by bearing the following in mind can one reap the benefits of green computing. Every point contributes to lowering the energy usage of computing resources.

- Using Energy Star certified goods is a great way to save energy.
- Use organic LEDs in place of conventional monitors.
- One benefit of green computing is that it allows gadgets to be powered off when PCs are switched off.
- Old computers and other peripherals donated lower the pace of electronic trash generation, which lowers pollution levels in the environment.
- Using computers significantly reduces the need for paper documents because computers' hard drives can store a lot of data instead of paper.
- Printers can be used to save documents on paper in computers, but we should consider our options three or four times before using a printer to cut down on paper waste.
- Games that were previously only accessible online are now accessible through the Internet, thanks to the quick advancement of computing. This lessens the need for expensive disks and software.
- The processor's activity is constantly monitored by local cooling software, which also controls power consumption and instantly switches the processor to standby when it is idle [5].To drastically cut energy use and its negative effects on the environment, many basic steps can be performed. The elements of green computing that are covered below are depicted in Figure 2.1.

  - *Energy Consumption :*

The Environmental Protection Agency estimates that between 30% and 40% of computers are left running on the weekends and even after work, with 90% of these machines being inactive. An application developed in a green computing environment will make best use of its physical resources.

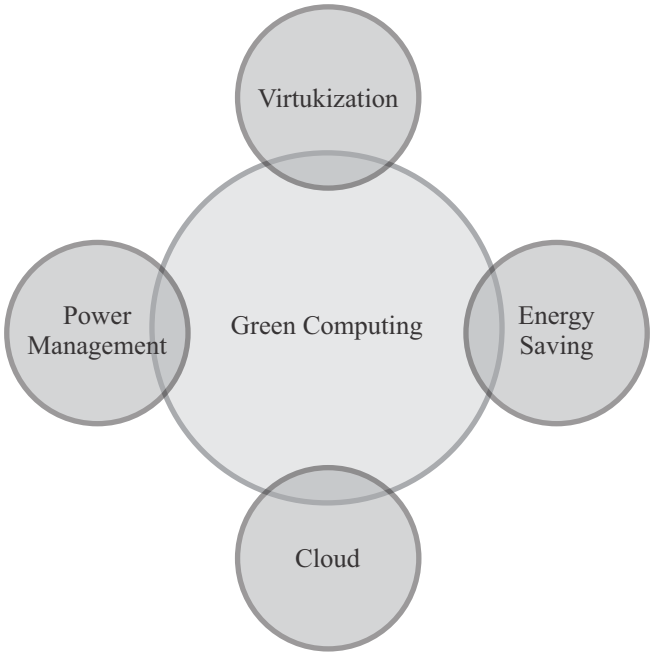

Fig- 2.1: Essential Methods for Green Computing

E-waste recycling:

Because technology is more advanced in many industrialized nations, a large number of computer systems and related items are being discontinued on a daily basis. These goods are supplied to additional developing nations. Electronic product recycling is made possible in this method. In addition, materials like tin, silicon, iron, aluminum, etc. that are utilized in the manufacturing of computer equipment are recycled. It is possible to replace equipment that would have otherwise been built thanks to the recycling of computer equipment that contains elements like lead and mercury. Reusing such equipment lowers environmental impact and saves energy, both of which may be caused by electronic trash .

Virtualization:

A system administrator can run several operating systems and increase the capability of a single server by combining many physical systems into virtual ones through the use of virtualization. Reducing the number of physically linked devices can lead to energy efficiency and lower power and energy consumption. A number of open source initiatives and businesses already provide software packages that enable the shift to virtual computing..

It's the reality that virtualization by itself is unable to maximize resources and energy efficiency. Thus, automation maximizes the efficiency of energy and resources server virtualization by minimizing the need for physical infrastructure when combined with the appropriate skills and operational and architectural standards.

Cloud as a Green computing:

Because cloud-based systems offer acceleration and reduction, pay-as-you-go, and speedier access to cloud services without requiring the purchase or operation of on-site infrastructure, businesses are rapidly migrating from traditional systems to cloud-based systems. In addition to encouraging users to utilize only the resources necessary, the

cloud-based, dual-purpose architecture concurrently saves energy and resources.

By shifting the workload from regular servers to cloud servers, an IT company can meet sustainability and energy efficiency targets. However, the majority of the electricity used by the computer industry comes from fossil fuels, including coal, which release greenhouse gases and have a large carbon impact. Cloud companies must make investments in renewable energy sources if they hope to make their services environmentally friendly. This can be accomplished through producing generating energy from renewable energy sources, such as hydroelectric power. More space, power, and cooling capacity can be provided in the same envelope through resource consolidation, which can also increase utilization.

Evolution of Green Machine

The computer system's power management feature helps you save both money and energy. You can use the SLEEP and HIBERNATE parameters to optimize the computer environment for ease of usage. The operating system's power management settings or manual activation methods can be used to enable these features.

Standby Mode: A computer system automatically switches to a lower power mode after a period of inactivity. We refer to this as sleep mode. By turning off the power, display, hard disk, and peripherals, this state conserves energy. The system goes back to its initial condition and disables sleep mode when you press a key on the keyboard. This mode primarily preserves a laptop's battery life.

Hibernation mode: When activated, the machine is totally shut down and the initial set of data is moved to the hard drive. All files and documents seem just as they did before the system is turned on. You can save a significant amount of energy by putting the system back into hibernation.

Recent advancement of Green Computing

Blackle:

Google Search powers the Blackle search engine website. The idea behind Blackle was that your computer uses 74W while the screen is blank and displays a blank word or Google Home. Just 59W are used while the screen is off. Mother Earth would save 750 MW annually if everyone switched from Google to Blackle, claims this theory. It was an excellent example of green computing in action. The Blackle principle states that different colors on computer screens use varying amounts of energy to display.

Fit-PC:

a tiny computer that uses just 5 watts: The Fit-PC is a paperback book-sized device that runs Linux or Windows XP and is completely silent. Fit-PC is made to match a typical PC that is too large, loud, and energy-consuming. The fit-PC is for you if you've always wanted a small, silent, and environmentally friendly PC. With a 5 Watt consumption, the Fit-PC uses less energy in a day than a regular PC does in an hour.

The Zonbu Computer:

This brand-new PC is incredibly energy-efficient. Just one-third as much power is used by the Zonbu as by a standard lightbulb. The device uses a 1.2 GHz processor and 512 MB of RAM to run the Linux operating system. In addition, it has a fan and no moving parts. One may be had for as little as US$99, but a two-year subscription is required.

Sun Microsystems' lightweight desktop client Sun Ray, according to Subodh Bapat, vice president and chief engineer of Sun's Eco Responsibility office, is showing an increasing amount of customer interest. According to him, thin clients like the Sun Ray use a lot less electricity than traditional computers. A Sun Ray desktop computer uses 4 to 8 watts of power because servers handle the majority of the computationally intensive tasks. According to Sun, Sunrays works especially effectively in budget-conscious settings like call centers, schools, hospitals, service providers, and finance. PCs have harder disks and more powerful processors than thin clients do. Because of this, traditional PCs always use a lot more quantity of energy. Desktop computers in the US need to use 50 watts or less when in sleep mode in order to be certified as Energy Star appliances.

The Asus Eee PC and further incredibly small notebooks:

The "ultra-portable" category of personal computers is distinguished by its small dimensions, low power consumption, small screen, affordable price, and turntable-driven advances. They can function more effectively and consume less energy than a typical form factor laptop thanks to the combination of these features. A good illustration of an ultraportable is the Asus Eee PC. It employs flash memory rather than a hard drive, is the size of a paperback book, weighs less than a kilogram, and has an integrated Wi-Fi connection. Linux users can also use it [5].

Conclusion

To make the computer company we must take the following actions in order to fully green the computer company. Components for computers should be donated to those in need when they are not being used. Upgrade computers' components to make them new rather than discarding them. Recycling these components is preferable because some of the parts used to construct the motherboard of the computer are highly costly and hazardous. Various wallpapers use a lot of power. Rather than customizing many wallpapers, make Blackle your homepage. Because blackle is a website that uses Google Custom Search and has a primarily black screen with gray text. Very little energy is used in this setup. So,

Go green is a concept that some organizations use, but it might benefit everyone if all of its components are used. It's obvious that green computing has advantages. The potential savings from energy usage, CO2 emissions, and e-waste are evident, especially considering that there will be close to 2 billion PCs worldwide in 2015. Thus, effective use of green computing will contribute to energy conservation and the eradication of pollution.

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