

# Green Computing and Power Management

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## ABSTRACT

Green computing is the environmentally responsible and eco-friendly use of computers and their resources. In broader terms, it is also defined as the study of designing, manufacturing/engineering, using and disposing of computing devices in a way that reduces their environmental impact.

**Keywords:-** Greet IT, e-waste, Disposing of Computers, Eco-friendly

## I. INTRODUCTION

Green computing is a 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. Green computing can also develop solutions that offer benefits 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.

## II. GREEN INFORMATION TECHNOLOGY

Many IT manufacturers and vendors are continuously investing in designing energy efficient computing devices, reducing the use of dangerous materials and encouraging the recyclability of digital devices and paper. Green computing practices came into being in 1992, when the Environmental Protection Agency (EPA) launched the Energy Star program. Green computing is also known as Green Information Technology (Green IT).

### A. Environmental Response

- *Green Computing and Green Information Technology also refer to the environmentally responsible use of computers and any other technology related resources.*
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- *Green computing includes the implementation of best practices, such as energy efficiency central processing units (CPUs), peripherals and servers.*
- *Green technology aims to reduce resource consumption and improve the disposal of electronic waste (e-waste).*

## III. REGULATIONS

The Organization for Economic Co-operation and Development (OECD) has published a survey of over 90 government and industry initiatives on "Green ICTs"

### • Survey Report

*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.*

## IV INDUSTRY INITIATIVES

A. 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 its member organizations, and information for reducing PC power consumption. It was started on 2007-06-12. The name stems from the World Wildlife Fund's Climate Savers program, which was launched in 1999. The WWF is also a member of the Computing Initiative.

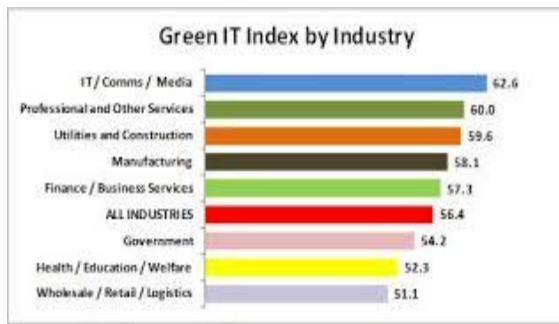


Fig.1:The Green IT Index by Various Industries

- B. 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.
- C. The Green Grid is a global consortium dedicated to advancing energy efficiency in data centre and business computing eco- systems. It was founded in February 2007 by several key companies in the industry – AMD, APC, Dell, HP, IBM, Intel, Microsoft, Packable 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 centre infrastructure efficiency (DCIE).
- D. The Green500 list rates super computers by energy efficiency (megaflops/watt), encouraging a focus on efficiency rather than absolute performance.
- E. Green Computing Challenge is an organization that promotes the development of energy conservation technology and practices in the field of Information and Communications Technology (ICT).
- F. The Transaction Processing Performance Council (TPC) Energy specification augments existing TPC benchmarks by allowing optional publications of energy metrics alongside performance results.

## V. DATA CENTER DESIGN

Data center facilities are heavy consumers of energy, accounting for between 1.1% and 1.5% of the world's total energy use in 2010. The U.S. Department of Energy estimates that data center facilities consume up to 100 to 200 times more energy than standard office buildings.

Energy efficient data center design should address all of the energy use aspects included in a data center: from the IT equipment to the HVAC equipment to the actual location, configuration and construction of the building.

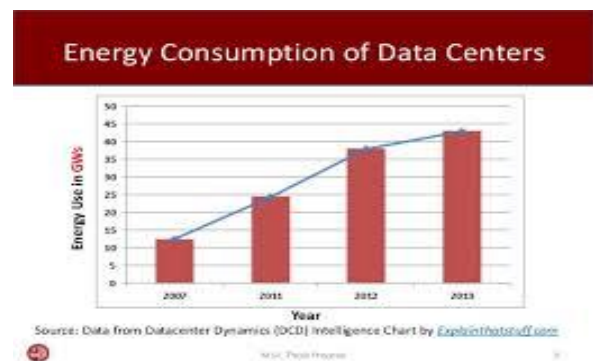


Fig.2: The Graphical Representation of Energy Consumption of Data Centers

The U.S. Department of Energy specifies five primary areas on which to focus energy efficient data center design best practices:

- Information technology (IT) systems
- Environmental conditions
- Air management
- Cooling systems
- Electrical systems

Additional energy efficient design opportunities specified by the U.S. Department of Energy include on-site electrical generation and recycling of waste heat. Energy efficient data center design should help to better utilize a data center's space, and increase performance and efficiency.

## VI. GREEN DATA CENTER

Green is the hot topic these days, and the concept is having an impact on the way people think about data centers. Companies around the world are announcing ways to save energy and reduce costs by

buying new hardware and services. Yet, there is little guidance on how you can take action to control energy costs.

In the past, electricity has been treated as an overhead expense, like the cost of space. But with rising power costs and issues regarding reliability, supply, and capacity, electricity requires its own specific strategy.

Projects regarding performance optimization and cost reduction are a part of everyday best practices in nearly every area of business. So why not treat energy costs in the same way? As IT pros, many of us make decisions about the configuration and setup of servers, the specifications on the equipment our organizations purchase, and the requirements for data center upgrades and construction.

We even provide early design input during application development. When it comes to these projects, we obviously have a golden opportunity to be green and influence the energy efficiency of any data center.

The first part of any strategy is to know your current energy usage. You need to know where your energy is used and by what specific equipment, as well as what usage is efficient and what is wasteful in the data center.

Unfortunately, it's rare to find power-consumption metering in place that can break down usage to a level where people can see the results of their actions. Most organizations typically only see a monthly power bill that rolls up consumption into an overall bottom line.

This offers little incentive for saving energy since individuals never see the impact of their decisions, and there is no way for them to prove that their changes have actually saved energy.

## VII. 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.

In addition, a system may hibernate, when most components (including the CPU and the system RAM) are turned off. ACPI is a successor to an earlier Intel-Microsoft standard called Advanced Power Management, which allows a computer's BIOS to control power management functions.

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. This process is called undervolting.

Some CPUs can automatically undervolt the processor, depending on the workload; this technology is called "SpeedStep" on Intel processors, "PowerNow!" / "Cool'n'Quiet" on AMD chips, Long Haul on VIA CPUs, and Long Run with Transmeta processors

## VIII. CONCLUSION

In this paper, we conclude that green computing is the emerging technology which will reduce IT waste. The main objective of this technology is to reduce the energy consumption of computer related products.

One of the first issues people confront when considering a green data center initiative is whether they have executive support. Executive support requires a serious commitment that provides resources and budget for our initiative. And while there is a lot of talk about green data centers, the reality is that there is still often a lack of serious support at the executive level. If we did already have such executive support, we would probably be running a green data center right now.

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