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Need of Green IT- Challenges and Countermeasures

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Abstract:- Energy is one of the most valuable and scarce resources available to humanity, a significant portion of which is now being consumed to power up computers and their accessories. In particular, high performance parallel and distributed computing systems, including data centers, supercomputers, clusters, real-time systems, embedded architectures, and grids not only consume considerable amounts of power but also require extensive air-conditioning. Power is a resource we have generally taken for granted in the ICT world. But power is no longer the silent partner of ICT. It is the principle measurement of operational CO2 emission, and it is also becoming an ever increasingly costly resource. It therefore makes sense to use it efficiently, meet both CO2 footprint obligations and also manage operational costs as a business.ICT of course is not only a contributor to CO2, it is also a vehicle for a business to address saving significantly on CO2 emissions by facilitating sustainable behavior change. Flexible working / home working / video conferencing are examples where ICT is an enabler, allowing business management to execute policies that reduces commuting needs, impacting positively on transport related CO2 costs. The term 'GREEN IT ' is used for green practices aimed at reducing the impact the IT has on the environment. In fact, it includes all practices that aim to reduce the environmental impact of IT use. It is mainly about energy efficiency, environment friendly products and its proper disposal .However, energy saving usually comes at the expense of performance. Power-aware "green" computing requires a comprehensive and multi-disciplinary approach that involves myriad research challenges. The aim of this paper is to emphasize on the need of Green IT as 18 percent of world energy is consumed by IT. Further , various challenges faced by green or energy-efficient computing in the various aspects like Power Consumption, Power savings features, printing and document workflows, deployment time necessary to fully complete a process installation are depicted. Therefore reducing energy consumption is the area that needs most attention. The past few years have seen significant growth in both the adoption of power reduction solutions and the development of new energy efficient technologies, and the future of Green IT practices promises to further improve cost savings and IT efficiency for the broader global IT community. Computer systems are becoming increasingly ubiquitous and a part of the global infrastructure, resulting in large installations of computer systems to provide multiple services. With the advancement of computing applications and need of IT among people the efficient technologies are being developed. Computers and other computing applications have certainly made a big impact globally but the other part of the technology usage is alarming. The steps which can taken by individuals and business organizations to make "IT GO GREEN" are given in the end followed by conclusion.

Index Terms: Green-IT, e-waste, green procurement, energy efficiency, sustainability, Data centers, green initiatives

1. INTRODUCTION:-

Green IT is all about reducing wasted energy, wasted space and wasted materials. Green IT, or Green Computing, traces its origins back to the early 1990s when the U.S. Environmental Protection Agency (EPA) launched the "Energy Star" program intended to identify and promote energy-efficient products. At the time, the focus was on reducing greenhouse gas emissions and so the phraseology around "Green IT" came. It is the analysis and practice of environmentally sustainable computing or IT. According to San Murugesan, it is 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. According to Forrester Research, green IT is 'emerging as the next driver of business innovation and growth for many companies, driven by rising regulatory and customer pressures, the need to enhance their brands, and competitive differentiation.' Forrester's also wrote that IT hardware is getting green fast. "It estimates that the 1 billion PCs in place worldwide in 2007 used 320 tera-watt-hours of electricity that year. Fast-forward to 2014, when the installed base will have doubled to 2 billion PCs; they will use 1/2 the energy (151 Twh) while delivering 17 times the computing capability

2. NEED OF GREEN IT

The need of green computing is to diminish the use of harmful equipment, increasing energy efficiency, and to promote the reusability of computing devices and IT waste. It includes the scope of environmental sustainability, the economics of energy efficiency, and the total cost of possession, which includes the cost of disposal and recycling. The three most important needs of GREEN IT are:-

2.1 **Energy consumption**: Power needed to operate IT, especially computers and datacenters, is significant. Gartner estimated that IT industry accounts for approximately 2% of global carbon dioxide (CO_2) gas emissions. Consequently, IT is a part of the global warming issue.

2.2 **Use of toxic substances***:* IT industry uses toxic substances in manufacturing and packaging of hardware and software products example lead, mercury, cadmium and polybrominated flame retardants. Those substances present risk to human health and the environment

2.3 **Electronic waste (e-waste)**: Due to the increasing demand for IT devices and the continual innovations in this field, the life span of IT equipments is decreasing while e-waste is rising . The developing countries are highly concerned by e-waste problem and that Green-IT offers opportunities and allows for economic, social and environmental benefits.

3. CHALLENGES TO GREEN IT:-

However, despite the growing interest and activity, there is a significant challenge to realizing the benefits of green IT:-

3.1 **Data Center Power Consumption**.

3.1.1. A typical server draws considerably more power than an individual workstation because of the scale of the architecture and high availability demands require servers to operate a greater percentage of time, but the sheer number of workstations deployed in most organizations easily outweigh server utilization in terms of total energy consumption. According to EMA study, it is found that the average percentage of time servers are kept fully operational is 88%. The same data indicated that 2/3 of the time servers are actually powered down were placed in hibernation mode. Further it showed showed 81% of respondents indicated that the reason servers are kept operational during evening and weekend hours is to support a 24x7 business production environment. Automated power management solutions in this case provide little improvement for reduction of power in the data center since the opportunity for down time is relatively small. Second to servers, HVAC (heating, ventilation and air conditioning units) constitute, on average, the second most power consuming component in data centers.

3.1.2. The survey conducted by EMA on the use of workstation found that desktops and laptops were used by 79% of respondents, thin clients and diskless clients identified 39% and 31%. To further examine the actual utilization of these workstation types, it was found that the powered on and active use of these workstation varies. Desktops showed 16% powered but non-use time. Laptops were powered on less during an average work day, only 60% of the time .This likely is accounted for by the ease in which most laptops can be placed in hibernation – simply by shutting the lid. Interestingly, the data also showed that thin clients and diskless clients were powered on a relatively short period of time – respectively, on average, 24% and 12% and only utilized for specific and limited tasks.

3.2 **Less use of power savings features** –The end users are sometimes uncomfortable with utilizing power saving features as they can reduce the responsiveness of the system when they are active. EMA research indicated that 24% of respondents kept desktops fully operational 100% of the time and 43% of non-work hours. If these systems are not using power savings features, this equates to an unnecessary annual electricity cost. The challenge for IT administrators and end users is setting these variables for optimal response. If the inactivity time period is set too short, the process could be a business impacting nuisance to the user and if set to be too long or deactivated, energy savings is not achieved.

3.3 **Printing and document workflows:-** Printing is vital to any business. In many enterprises the imaging and printing fleet is a jumble of outmoded, redundant equipment that lacks an easy way to centrally monitor performance. Optimizing paper use is another challenge for green IT.

3.4 **Outdated technology:-** It is often noticed that outdated technology poses a big threat to Green IT. People often discard the present model as soon the new product with extra features are launched in the market thereby adding to e-waste problem.

3.5 **Lack of social responsibility:-**It is a bigger challenge to green IT in which people lack in responsibility knowingly without realizing the effects of CO2 emissions and harmful radiations emitted by electronic devices that disturbs the ecological balance and lead to various health hazards.

4. COUNTER MEASURES:-Included below are descriptions of the most popular modern approaches to achieving energy efficiency.

4.1 **Improving cooling initiatives in the data center**:- This is achieved by improving the data center cooling configuration, eliminating considerable amount of energy leaks. IT can result in efficient data centers by following leading practices in data centre layout and rack and server arrangements. Effective approach include raised floors to improve airflow, moving cooling systems closer to servers to concentrate cold air in the right place, alternating hot and cool server passageway to improve airflow and using water-based air conditioning systems

4.2 **Use of Cloud Computing**:- In a new study commissioned by Microsoft Corp. and conducted by Accenture and WSP Environment & Energy, businesses that choose to run business applications in the cloud can help reduce energy consumption and carbon emissions by a net 30 percent or more versus running those same applications on their own infrastructure.

4.3 **Controlled printing:-**The technological sector is one of the principle players in this arena. Print control system installation is one alternative. There are multifunctional machines available that can print, scan, photocopy and send / receive all kinds of documents electronically. Businesses can save up to 30% in their document processing costs applying document output control by installing such office automation solutions in their offices and use the control of 'print on demand' features effectively. DocPath is an international document technology software company, specialized in providing Document Output Management and Control software enabling users to easily design and multi-channel distribute document outputs. Also one centrally located printer may be used to handle all printing tasks virtually eliminating numerous machines consuming energy and driving up costs.

4.4 **Automated Power Management**

4.4.1 Some systems management and automation software are able to force system shutdowns during hours of inactivity. The more advanced of these solutions can take advantage of today's intelligent chip sets, such as the Intel® vPRO™ technology, to also force system startups. By utilizing both remote shutdown and startup procedures, very intricate schedules can be created to work around out-of-hours backups, production times and maintenance windows. Additionally, software-based solutions can enforce organizational policies regarding the use of power saving features (turn off monitor, turn off hard drive, put system in sleep mode) so that power consumption will be minimized during operational hours.

4.4.2 **CPU Power Throttling:-** Also referred to as "Dynamic Frequency Scaling," CPU throttling techniques allow processors to be slowed down during times of low use or when high performance is deemed unnecessary. Not only does this directly reduce power consumed by the CPU, it also reduces the heat generated by the chips and thereby reduces the amount of power-consuming cooling required.

4.5 **Consolidation of Servers:-**Servers are rarely utilized to their full capacity. By reallocating resources so that a smaller number of servers are being utilized at greater capacity, the unused systems can be retired along with their associated power consumption. Basic server consolidation can be one of the easiest Green IT processes to implement – simply move data and services from one low use server to large capacity servers, such as Blade Servers and Mainframes, which are designed to draw proportionally less power and operate with greater efficiency .

4.6 **Replace Hardware with More Power Efficient Platforms:-** Upgrading technology can provide significant opportunities for reducing power consumption. Hard disks, chip sets, power supplies, and cooling systems are continually being redesigned to achieve greater standards in energy efficiency. Some effective solutions are :-

- Deploying "Energy Star" certified units:- The U.S. Environmental Protection Agency (EPA) launched a controlled labeling program" Energy Star" in 1992, that is planned to promote and recognize energy-efficiency in monitors, climate control equipment, and other technologies.
- Replacing desktops with laptops.
- For storing data large capacity drives can be used and performing data center audits to eliminate redundancies in the system can be done
- Swapping tube monitors with LCD displays
- Removing or trimming back unnecessary graphics processing units (GPUs).

4.7 **Use of thin clients:-** Thin clients are workstations with minimal hardware configurations. Services, such as desktops, Web and applications are hosted on a central server and then transmitted to the thin client via a proprietary network communication process or virtualization implementation. Its purpose is to just act as a simple terminal – sending and displaying data back and forth to the central server where the real processing and data storage takes place. Thin clients do not necessarily require a full operating system in order to function, the central server can maximize data storage and processing power by only providing the services necessary for the end user's job function

4.8 **Energy Efficiency in the Data Center:**-IT operations need to maintain high-availability of critical systems while reducing power consumption. They also need to implement solutions that better utilize existing resources while dealing within the confines of organizational structures. The EMA study strongly indicated the need to overcome these challenges in determining server utilization. Reducing HVAC power consumption does not necessarily mean raising temperature settings on cooling units, but more effectively involves reducing heat dissipation from IT components. This can be achieved by upgrading existing hardware to more heat efficient systems or by consolidating servers so that the number of heat producing equipment can be reduced.

4.9 **Explore Alternative Sources of Energy:** The efficient resource utilization leads towards efficient methods to evolve. With time renewable and natural energy sources are being used to power data centers, such as nuclear or hydroelectric power, solar energy etc. This saves money and generates fewer CO2 emissions. Use energy saving settings and encouraging employees to turn off equipment at the end of the work day and on weekends can be of big use**.**

4.10 **Proper Disposal and Recycling**: This is so important because it potentially eliminates the threat of harmful toxins being released into the environment and allows for the reuse of equipment reducing the amount of waste.

CONCLUSION:-

Environmental protection requires a holistic approach; hence the importance of coordinated efforts between developing and developed countries to bring an overall solution to environmental issues related to the use of IT. Actions should be taken at different levels (governments, non governmental organizations) to solve e-waste management problem and to enable more green practices while using IT. The future of Green IT looks very bright as 100% of all knowledgeable IT respondents indicated plans for their organization to implement solutions in the upcoming years. It is certainly encouraging to see strong commitments to achieving energy efficiency. As new technologies are developed and the value of existing solutions continues to grow in acceptance, adoption rates of Green IT initiatives are sure to increase, improving the value of IT investments for a broader community and helping to achieve long-term global energy sustainability. To achieve higher percentages of energy efficiency across an IT infrastructure, a holistic approach involving multiple Green IT disciplines should be adopted. The solutions should be implemented across the enterprise to ensure all departments and projects are optimally utilizing IT investments.

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