RESEARCH ARTICLE

STUDY ON BENEFITS OF GREEN COMPUTING

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ARTICLE INFO	ABSTRACT
	The green computing is one of the recent and prominent research field where many researchers are working on finding the efficient way to use energy in an efficient manner. The two ways in which the researchers look into green computing are mainly concentrating on the energy efficiency and power consumption and other way is making the green software to thrive the industry and make innovatory products. The number of challenges faced while migrating from classing computing to green computing are very high. But if the hurdles of implementation is crossed effectively the result will help in the environmental development and safety too. Most of the top companies are nowadays working seriously on migrating their project towards green computing.

1. INTRODUCTION

The green computing is an interesting and also efficient research area which has grabbed the attention of many in recent days. It is because the pollution or effect of harmful rays in the environment has started to affect the health of the individuals directly. So the use of the green computing techniques and the alternative options which consumes less energy can help the people in saving the environment. In this paper, a thorough study on the various causes and the remedies that can be followed to live in a green world has been discussed. There are certain green applications which will replace the energy consuming applications in an efficient manner. The number of difficulties that are faced by the individuals while going for the implementation of the green computing technology is high. It is because the green computing is totally new to the society and is creating confusion among the individuals on what green computing actually is. The green computing concentrates mainly on the software development without consuming more time and energy along with the selection and usage of hardware which will not need high support of power resources (Gung and Hence, 2009). Each and every application or changes made in the existing system resulting in the ultimate energy saving motto is considered to be part of green computing journal. The demand for researchers in this field of green technologies has increased to a greater extent. Here we are discussing the various ways in which one can avoid power consumption, approaches relating to green initiatives and the common applications which will serve the environment in its best way for contributing a little in saving the energy consumed.

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2. Power Consumption through Software

2.1 Efficient Algorithm / Green Algorithm

It is quite common for calling a programmer who program shortly as a good programmer when compared to the one who writes program for pages (Developing Green Software, 2011). It is because the efficiency is obtained in speed and saving energy also when the number of lines of codes to be considered and the load on the processor is less. Thus the algorithms or data structures that are concentrating on the research in computer science will look forward the algorithms that can make a vast difference in factors like the performance of an application. In other words, in some cases the programmers can use the stack instead of queue and can even go for B-tree than binary tree or a hash function. The best algorithm or data structure selection itself covers most of the achieving steps of efficiency of the programs. The green algorithm is one such sort of algorithm which his concentrating only on this sort of selection of better algorithm or data structure to achieve the efficiency in a power saving and heat conserving manner.

2.1.1 Multithreading

When the time taken for computing a task takes more time then the energy consumed for completing that task will also take longer time. Instead of computing the long or complex programs in a single thread, it will probably a better idea for any individual to go for multithreading. The multithreading is a very well known concept where the same complex process can be run parallel thus conserving the energy and the time needed for computation of the same problem. The use of Graphic Processing Unit (GPU) instead of CPU for computing larger data mass is considered to be a wise and green idea

which is also highly needed in the current scenario for the world. The efficiency of the system is also considered to be increasing with the introduction of multithreading in a complex system as in other program.

2.1.2 Pre-Fetching and Caching

From the study conducted by Intel in (Developing Green Software, 2011), it is found that the process of pre-fetching and caching of instruction is helping in saving lots of energy. The prefetching and caching is one such sort of process where the instructions which needs to be executed for the next process will be fetched from its memory and is sent to the cache. Thus the instruction will be stored temporarily and can be accessed directly from the cache without searching in the memory. The green computing comes here when the energy is saved in the time reduction of searching for the instruction in the internal memory architecture of the system.

2.1.3 Context Awareness

The context awareness in the smart devices is actually giving the greatest deal of significance when it comes to saving energy (Royte and Elizabeth, 2006). It is actually a process where the system of device will detect the environment in which it is residing through the sensors will act according to the environment. Some prominent example of such sort of devices are the personal computers which are consuming or switching from AC power to DC power when there is change in the temperature of the environment. There is need for guidance of the embedded system applications which involves the inclusion of many sensors in sensing the system environment and adapting according to the environment. Thus the energy saved in a much efficient manner and greenness in the system is established in an effective manner.

2.1.4 Plattform Power Policies

There are certain Operating system platforms which are actually having very efficient power saving options by default. One such sort of platform is Microsoft Windows which is having its own policies on power saver. There are many application which are also helping the system in saving power (Segan and Sascha, 2007). There are mobile applications also which saves the power in the mobile device and to make it efficient.

Green Initiative IN Green Approaches

3.1 Virtualization

The virtualization concept came into existence only because of the need to saving the excessive use of individual systems. The virtualization is one such sort of technology which is giving provision or the users in accessing the servers from a remote area. The advantageous factor regarding this is that the individuals can combine many physical systems into a single integrated system and hence the original hardware and system can be unplugged resulting in reducing power and cooling consumption. Instead of setting a server and a cooling system for that, it will be better to access a big system server in a

virtualized manner (Green Computing, 2013). The concept of virtualization is best suitable in the Green computing area because it can save power and can also cut costs breaking the link between the applications, application components, system services and storage systems. The existence of virtualization is supporting green computing in many forms. Green initiative nowadays moved into the concept of virtualization where cloud computing plays a major role in that. The statistics of cloud users based upon the benefits provided by them has been increased sufficiently for last two years. The image shown below explains clearly about the cloud benefits for the year 2014 vs 2013.
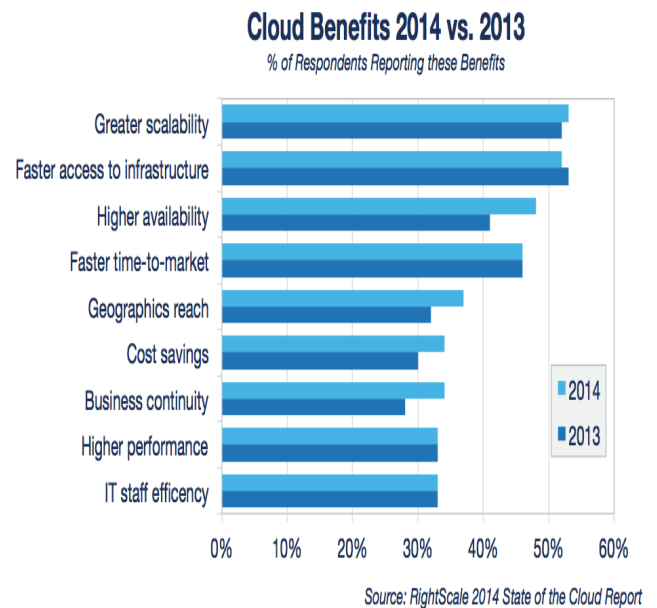

Fig 3.1. cloud benefit 2013 vs. 2014 [source: Rightscale]

3.2 Power Management

The need for power management in any computer system is highly insisted because of the prolonged battery life, reduction in the cooling requirements, noise also. The costs needed for operation of the system is also considered to be one of the main reason for the individuals to concentrate more on the power management support in the system resulting in the stability of the system leading to probable maintenance of the impact that it can create on the environment. The hibernate option available in the system is one such kind of power management technique which is been supported in a wide and efficient manner as it will automatically switch off the RAM and CPU of the system reducing the amount of background working of the system. There are certain programs available nowadays that can actually alter even the voltages of the system probably resulting in the reduction of the heat produced and electricity consumed in the system which is generally called as under volting.

3.3 Power Supply

Power supplies is also one such factor which will actually help in achieving the green computing concept by implementing the green systems. The drain of more power is supportive in designing a system in an efficient manner. The idea of

purchasing and using the power suppliers which has "80 plus" certification is considered to be the best way in which the individuals can save the power in the system (State Legislation on E-Waste, 2008). The use of this sort of useful and efficient power supplies can probably reduce the wastage of energy consumed and also the heat that is been generated in the system.

3.4 Displays

The displays emits heat directly thus consuming more power to the system. Hence the idea of replacing the LCD monitors with LED monitors which are light emitting diodes is considered to be the best idea. It is because the fluorescent bulb that is been used is using more energy and is emitting high heat. A survey suggests that the LCDs are 66% more energy efficient and are also 80% highly qualified in the reduction of size and weight of the system. In comparison it is found that the CRT is actually consuming around 120W power which is double the power that is been used by 22" LCD. Hence it is highly important for any individual to look for the components of the system before purchasing including the displays which will probably help in reducing the power consumed.

3.5 Video Cards

The reduction in the use of video card is considered to be a wise idea as it cannot use shared terminal, think client or cannot even have desktop sharing properties which are highly helpful in saving the energy consumed in the system. The reuse of older video cards are considered to be a wise idea as it will consume only lesser power thus reducing the heat sinks or fans. The selection of GPU with average wattage or performance per watt is also considered to be a much wiser idea in the idea of selecting the green system implementation.

Chilling of Data

4.1 Material Recycling

The green computing is not something that stops with reducing the heat emission and radiation from the computer systems used. It also mainly concentrating on the recycling of the components and parts of the computer systems. It is because the unused or extinct components that are used are sort of toxic or harmful material which will poison the environment because of its contents like lead, mercury, hexavalent chromium (What exactly is the Climate Savers Computing Initiative?", 2007). The reusable products are highly supported in recent trends. There are many countries which are supporting the cost-effective way of responsibly recycling the products as it is giving them a safe environment to live with without toxic substance.

There are companies which are having programs and incentives in the name of "take-back" for the employees when they have written the programs with recyclable working technologies. There are many companies which are completely dedicated in helping the corporate computer disposal services in compliance with the laws and regulations of the local government.

4.2 Telecommuting

People generally wonder how telecommuting involving teleconferencing and telepresence technologies be a part of green computing process (Rear don and Marguerite, 2009). The result of using this telecommuting technologies is supporting the users in a very efficient way like the users need not travel for a long distance which in turn will reduce the gas emission due to travel and will increase the profit also in a parallel manner for the systems use. The VoIP is a kind of telephony which is acting as main part of the wiring infrastructure sharing the medium in an effective manner and also supporting the telecommuting in a much effective manner.

Application Can Save Power

There are many applications which are developed and introduced in the market for the ecologically healthy environment with the use of green computers and device applications.

5.1 Blackle

The presence of search-engine like Blackle that is powered by google search is not known to main individuals. In this the background of the search-engine will be in black color as the white screens consumes more power of around 74W while being used (Research reveals environmental impact of Google searches, 2009). The idea of using different color reducing the amount of energy consumed by the computer monitor is considered to be a green idea which has to get its welcome and support from all the green workers.

5.2 Zonbu Computer

The energy efficient Zonbu computer is another milestone in the research area of green computing. It is mainly because these computers will consume only one third of the total power used by a typical light bulb. Gigahertz processor and 512 Meg of RAM.

Use of Sustainable Power Resources

The need for the individuals to understand the idea of using the sustainable power resources can be a way in which the individuals can achieve the green world.

6.1 Sleep Proxies

In modern operating systems, the use of features using which the individuals can make a system to automatically switch to its sleep mode when the system is left idle. This is one of a very useful and good idea that can actually be used as a powerful management tool in the industry (Energy benchmarks: a detailed analysis, 2006). There are certain IT departments which will disable these feature in the system so that they can easily make patching, maintenance and backup in a much easier manner without any sort of interruption. It needs to be avoided to achieve green computing. Sleep proxies always resides on the host in the same LAN and will intercept the packets which are targeted to a sleeping host. Somniloquy is

one such kind of device which will definitely help the system in green computing by providing the desktop with a low-power embedded computer sleep proxy. It will run as a stripped down version of the applications that are commonly used and will save around 65% of the total power that is generally used by the same application. Thus the use of this sort of sustainable resources can save power up to 60%.

Conclusion

We know that all companies are moving towards the green computing in order to improve the efficiency of resources they have and to reduce the hazardous pollutions creating by the companies. Last few years, because of these problems companies are forced to migrate into the cloud computing which is a form of green computing. A lots of researches are going in order to improve the quality of the green computing by developing the low power consuming software's and recycling the electronic wastes. If we want to really support the green computing it's our individual responsibility to GO Green.

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