Needs of Green Computing: A Step For Saving Global Environment

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Abstract

Cloud Computing is most prominent internet based computing technology, wherein almost all IT companies are planning and designing their software. It stands-out as the ever-growing and competent technology due to advancement in computing hardware, economically feasible and simplicity in use for technophile engineers over the world. In today's world where use of computer systems are increasing day by need the need of energy management and care for environment is also a need. Therefore, the need to focus in Green Cloud Computing is of high priority. Green Computing is defined as the study of designing, engineering, manufacturing, using and disposing of computing devices in a way that reduces their environmental impact. This paper discuss about the details, needs, some successful implementations, advantages and disadvantages of Green computing.

Keywords : Cloud Computing, Green Computing, Energy-saving

Introduction

Computing technology is emerging day by day for the last few decades. It has became an essential part in the life of people and the global infrastructure because it is leading to the rise in data usage and computing devices. Green computing is a pathway which opens up a new world in which computing resources are becoming useful in a more environmentally friendly way. Because even though technology is making our world advance in many ways the need for protecting environment is still a necessity which can't be replaced. In this era 70 percentage of energy is consumed by computers which is not properly used and that is a major reason for CO_2 emission [1]. That's when the need of Green Computing becomes more evident. It can be defined as designing, manufacturing or engineering, using and disposing of computing devices in a way that reduces their environmental impact. This paper will first give some basic details about Green Computing, Cloud Computing and it's services, then Green IT

barriers and benefits of it will be discussed.

What is Cloud Computing?

Cloud Computing, as name suggests, is basically a service-oriented architecture that involves delivering hosted services over internet. It delivers faster and accurate retrievals of applications and data. It is most efficient and better for promoting strong workflow and is more cost effective than traditional computing solutions.

What is Green Computing?

Green Computing is the term used to denote efficient use of resources in computing. It is known as Green IT. Green Computing is where organizations adopt a policy of ensuring that the setup and operations of Information Technology produces the minimal carbon footprint. Green Cloud is the study and practice of designing, manufacturing, using and disposing of computers, servers and associated subsystems.

Difference Between Cloud Computing and Green Computing

Cloud Computing	Green Computing
It delivers computing services including servers, storage, database, networking etc.. over internet.	It is energy efficient use of computing devices.
It offers utility-oriented IT services to users worldwide.	It helps in using least amount of computing resources for doing most amount of work.
Its main goal is to provide magnitude improvement in cost effective, dynamic provisioning of IT service.	Its main goal is to attain economic viability and improve way of how computing devices are used.
It reduces energy consumption, waste and carbon effective, dynamic provisioning of IT services.	It reduces use of hazardous materials, increase energy efficiency during product's lifetime, manage power and energy efficiency, create sustainable business processes etc.
It increases revenue of business organizations and help them to achieve business goals, provide faster communication, secure network collaboration, promote efficient utilization of existing resources, etc..	It reduces carbon footprint of business and provide a reputation boost, helps business responsibly use energy and keep business running on energy-lean diet.
It lower IT costs, maintain business	It lowers energy bills, lower overall power

continuity, provide scalability, allows automatic software integrations, etc.	usage, cost-effective due to less energy usage and cooling requirements, etc.
It allows company to diversify its network and server infrastructure.	It allows companies to improve disposal and recycling procedures.
It is less cost effective as compared to green computing.	It is more cost effective as compared to cloud computing.

Table 1.1[2]

Services Models of Cloud Computing

1.SaaS

Software as a Service offers applications that are accessed over the web and are not managed by your company, but by the software provider. This relieves your organization from the constant pressure of software maintenance, infrastructure management, network security, data availability, and all the other operational issues involved with keeping applications up and running. SaaS billing is typically based on factors such as number of users, usage time, amount of data stored, and number of transactions processed.

2.PaaS

Platform as a Service is halfway between Infrastructure as a Service (IaaS) and Software as a Service (SaaS). It offers access to a cloud-based environment in which users can build and deliver applications without the need of installing and working with IDEs (Integrated Development Environments), which are often very expensive. Additionally, users can often customize the features they want included with their subscription.

3. IaaS

Infrastructure as a service offers a standardized way of acquiring computing capabilities on demand and over the web. Such resources include storage facilities, networks, processing power, and virtual private servers. These are charged under a "pay as you go" model where you are billed by factors such as how much storage you use or the amount of processing power you consume over a certain timespan. In this service model, customers do not need to manage infrastructure, it is up to the provider to guarantee the contracted amount of resources and availability[3].

Cloud Computing And Environment

Is Cloud Computing Environmentally friendly? The answer for this question is a clear YES. It is environmentally friendly and sustainable too. It has a greater potential in fostering environmental friendliness of business fields. Cloud computing helps in reducing the use of paper, electricity, packing materials and so much more. Shifting of some companies from traditional servers to cloud services helped in reducing the emission of carbon footprint and emission and it helped in increasing the use of renewable energy.

Companies use cloud computing to reduce the amount of carbon released into the air

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by 88%. They're also using 77% fewer servers and 84% less power than they were previously. SaaS helped to move common applications from individual computers to the cloud and thereby reducing carbon footprint. Accessing and sharing stored information among employees became efficient. It eliminated the need to print contracts as it provided the way to sign contracts digitally using software like DocuSign. Large companies that use a cloud server typically need 60% to 70% of the space on it. But smaller companies tend to use only 5% to 10%. This means more of them can use a single data center. Shared data centers can be kept at an ideal temperature while still using energy efficiently. Public cloud servers can be placed anywhere renewable energy is available. Companies using public cloud run their operations at peak efficiency. This prevents them from taking up more space on the server than they need to.

Cloud Computing indirectly decrease automobile emission too. Because it facilitates remote work. Remote employees help companies run more effectively. Lesser the number of employees there in office lesser will be the use of resources and energy. Companies can function with less office space. By condensing the workspace, companies can remain productive and be environmentally responsible at the same time. The world's environmental ecosystem is stronger and more secure, partly because of cloud computing. Using cloud servers means companies produce half the amount of carbon emissions they otherwise would[4].

History of Green Computing

Have you ever thought how much energy does your computer uses? If not go for a research and surely you'll get wonder. That's when importance of Green computing emerges. If you do study about those old computers which were required more space while consuming more energy, so more time was taken in managing those computers.

In the starting Green Computing was named as Energy Star, and it began in 1992. Even though it was used in printers, televisions and refrigerators initially it was not used in computers at that time. After some times the name got changed into Green Computing and started to use in the case of computers too.

Why Go Green?

According to Pranav Prakash, the presales consultant at Photon,

"Seventeen percent of the total carbon footprint caused by technology is due to data centers. The electricity that is needed to run these data centers is nearly 30 billion watts. These servers waste 90 percent of the energy they use because they run on full capacity all day long"[5].

The extensive use of computers and IT made our life easier and it eventually led to the increase in need of computers in every sector. This eventually led to greater power consumption. Greater power consumption means greater emission of greenhouse gases like CO_2. From the studies it has been found that most of the energy is often wasteful. This is because we leave computer ON even when the system is not in use. The CPU and fan consume power; screen savers consume power even when the system is not in use.

Insufficient power and cooling capacities can also results in loss of energy. Most of the data centers do not have sufficient cooling capacities and this finally led to environment pollution. This can be because of defects in Manufacturing techniques, packing, disposal of computers and components. There are toxic chemicals used in the manufacturing of new computers as well as disposal of old computers and its components which can create adverse effects on environment.
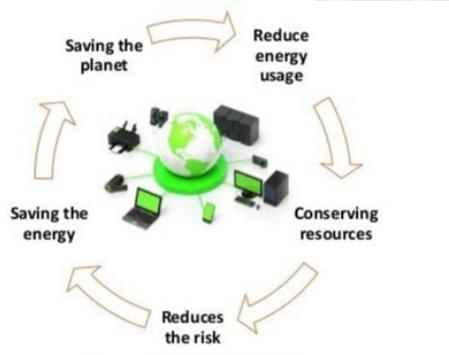
Core Objectives of Green Computing

- To reduce the power consumption.
- To reduce the harmful effects to the environment through the use of hazardous materials.
- To increase the time of the product.
- To promote recyclability of defunct products and factory waste.
- To maximize energy efficiency during the product's life time.[6]

Green IT Barriers and Benefits

Barriers	Benefits
Initial costs	Reduction in power and resource consumption
Challenges of	Better resource

reengineering processes and business practices.	utilization.
Reluctance to change cultural and behavioral practices.	Improved operational efficiency.
Enterprise green initiatives are not aligned properly.	Reduced environmental impact and carbon footprint.
Lack of management drive and support.	Total cost savings
Need and reluctance to learn new skill.	Improved corporate image.
Lack of motivation among stakeholders.	Meeting compliance and regulatory requirements.
Fear of loss of job or need for retraining.	Meeting sustainability demands of consumers and employees.

Table 1.2[7]

Implementations Of Green Computing

1.Blackle

Blackle is an internet search engine powered by Google. Blackle was created by Tony Heap of Heap Media Australia, which aims to save energy by displaying a black background with a grayish - white text color on search results. It came into being based on the concept that when a computer screen is white presenting an empty word page or the google homepage, your computer consumes only 59W. Based on this theory if everyone switched from

Google to Blackle, mother earth would save 750W each year. This was a really good example of implementation of Green Computing.

2.Zonbucomputer

The Zonbu is a new, very energy efficient PC. The Zonbu consumes just one third of the power of a typical light bulb. The device runs the Linux operating system using a 1.2 gigahertz processor and 512 meg of RAM. It also contains no moving parts, and does even contain a fan.

3.Fit PC

The fit-PC is a small, light, fan-less nettop computer manufactured by the Israeli company CompuLab. Many fit-PC models are available. fit-PC 1.0 was introduced in July 2007, fit-PC Slim was introduced in September 2008, fit-PC 2 was introduced in May 2009, fit-PC 3 was introduced in early 2012, and fit-PC 4 was introduced in 2014. The device is power-efficient (fit-PC 1 was about 5 W) and therefore considered to be a green computing project, capable of using open source software and creating minimal electronic waste. If you ever wished for a PC to be compact, quiet and green-then fit-PC is the perfect fit for you.

4.Sun Ray thin client

Sun Microsystem is reporting increased customer interest in its Sun Ray, a thin desktop client, as electricity prices climb, accordingly to Subodh Bapat, vice president and chief engineer in the Eco Responsibility office at Sun. Thin clients like the Sun Ray consume far less electricity than conventional desktops, he said. A Sun Ray on a desktop consumes 4 to 9 watts of power, because most of the heavy computation is performed by a server.

5. Eee PC

The "ultra-portable" class of personal computers is characterized by a small size, fairly low power CPU, compact screen, low cost and innovations such as using flash memory for storage rather than hard drives with spinning platters. These factors combine to enable them to run more efficiently and use less power than a standard form factor laptop. The Asus Eee PC is one example of an ultraportable. It is the size of a paperback, weighs less than a kilogram, has built-in Wi-Fi and uses flash memory instead of a hard drive. It runs Linux too.

Advantages of Green Computing

1.Energy Savings

Green computing makes sure that very less amount of energy is consumed by the IT processes. Thus, this can save plenty amount of energy overtime.

2.Cost Savings

Green computing is highly cost effective that helps people save money. Since lots of energies are saved when using a green computing solution, it also substantially leads to financial gains. Even though green computing is with high upfront costs, still it is cost effective in the long run.

3.Recycling process

Green computing encourages recycling process by reusing and recycling electronic wastes. Most parts of the computer are constructed using eco-friendly materials

instead of plastic so that it can have less environmental impacts. This makes all the electronic wastes to get separated efficiently. Hence by implementing green computing strategies, companies overall can improve their recycling process.

4.Brand Strengthen

Some customers are so well concerned about the environment that they are solely preferring to go with companies that support green computing. Green computing is capable of creating public images so that they can strengthen their brand and market position all around the world.

5.Less Pollution

Through conventional computing, lots of pollution issues take place in the environment. For an example, if not properly recycled all the electronic wastes from the computer may end up circulating on land. Thus, leading to soil as well as water pollution. By using green computing, the users can minimize the impact created by pollution at least to some extent.

6.Green House Gas Emission

During the production of IT hardware, tremendous amount of green house gases are released to the atmosphere. Especially, since harmful gases such as carbon dioxide are emitted, it could lead to global warming. Hence, for lowering the amount of green house gases emitted, the production of hardware components must be reduced as well. This is how green computing works effectively.

7.Chemical Exposure

In most of the electronic devices, harmful chemicals such as mercury is used. If a human happens to get contacted with those substances, he/she will probably suffer from health risks. Some of the known health risks are triggering of immune responses, nerve damage or even cancer. The companies which practice green computing potentially avoid the use of non-toxic substances during the production of computer hardware.

Disadvantages of Green Computing

1.Perfomance

For those companies that are green are always considered to be underpowered both in terms of system performance and network. This is especially true, if it is not implemented properly. For the companies that relies upon powerful computers, this can drastically decrease their employee productivity which in turn affects the company's profit.

2.Maintenance

Besides implementation, the maintenance of a green computing system is considered to be highly difficult that can be costly as well as time consuming. This is because the technology behind green IT is entirely new and changing rapidly which makes the maintenance efforts eminent.

3.Implementation Cost

Although green computing is cost effective in the long term, still many companies refrain from switching to green computing due to its high upfront cost. When implementing a green computing system,

it takes lots of time and research, all that costs plenty of money. This makes the technology more expensive than the average model.

4.IT Knowledge

In order for using the green IT infrastructure, IT experts who has well knowledge about the technology needs to be deployed. Those experts are rare to find, and if found they need to be paid plenty of money. If not appointed, your systems could eventually experience downtimes and other technical issues.

5.Security Leaks

When using a green computing system, there are some serious concerns regarding security. The employee who work under companies that practice green computing regularly exchange their workstations and other devices. This eventually opens up many security leaks such as hacking. Therefore, the companies have to take necessary measures for avoiding such problems.

6.Adaptation

The success of green computing does not solely depend on an individual person. It is based on the effort and preferences of each staff members. They must adopt to this new system. If one the members does not corporate to this, the implementation idea may go in vain. So just because of those people, firms must decide migrating to green computing.

7.System Support

Day after day, the technology is evolving at high speed. Whatever the changes that is done today, needs to be updated soon.

Same applies to green computing as well. The companies are always with an insecurity that when they switch to green computing, they are not left finished. Very soon they will be in need of migrating to an advanced system.[8]

Conclusion

Green Cloud Computing is the emerging technology and topic for research in this technocratic world of technical enthusiast. Now a days, IT companies are advancing towards the cloud computing due to increase in the large data storage and computational demands leading to the growth of the cloud infrastructure with ecological and frugal balance. Cloud Computing has designed and developed a top-notch approach to virtualize servers and data centers with maximum energy efficiency. This paper reviews brief discussions on green cloud computing, it's advantages, disadvantages, the need it offers to the world and how environmentally friendly is Cloud computing. The paper conclude that in this emerging technical world the need for Green Computing is undeniable. For the better implementation of Green Computing in many areas we still have to over come some barriers or disadvantages of it.

Reference

[1] Mavinder Singh, Anup Singh Sidhu, Green Computing Vol 7, No-6 special issue, IJARCS,ISSN No 0978-5697, Nov-2016

[2] Madhurihammad, Difference between Cloud Computing and Green Computing

[3]https://www.openintl.com/the-three-service-models-of-cloud-computing/

[4]Adam Goulston, Is Cloud Computing Environmentally friendly?, Bussiness 2 Community

[5]https://www.colocationamerica.com/blog/data-center-environmental-impact

[6] Sr.Jainy Jacob M, Reelevance and Impact of Green Computing in IT, IJERT, IJERTCONV31S30007,Volume 3- Issue 30

[7]https://www.enterpriseai.news/2013/06/10/green_it_barriers_versus_benefits/

[8]https://environmental-conscience.com/green-computing-pros-cons/

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