

GREEN CLOUD COMPUTING: A REVIEW

Jasline Sharon Tauro, K Isha Hegde, Khateeja Safreena, Krishnitha and Ankitha Shetty

Dept of CSE

Alva's Institute of Engineering and Technology

Abstract: *Green computing is an approach to computing that conserves the environment through practices such as reducing the amount of energy used by a computer, server or device; recycling or degradable parts; and reducing the amount of waste created during product manufacture". The amount of electricity used by computers is growing quickly, which raises the atmosphere's carbon content. Green technology Techniques can assist us in creating a safe haven for ourselves to reside in. Green Cloud Computing is a well-known broad domain and a popular field for research because to the increasing rise of enormous data storage and computational demand. Cloud computing has created a supreme and impressive approach to virtualize servers and data centers and to make them energy efficient in order to leverage on diverse IT resources. Massive power and energy consumption by IT resources leads to an energy crisis and a change in the planet's climate. As a result, there is a need for green cloud computing, which can generate solutions that not only make IT resources energy efficient but also reduce operational expenses. Green IT is cited as a key step in the solution of environmental problems in the IT industry.*

Keyword: *Green computing, carbon, environment*

1. INTRODUCTION

Cloud computing refers to renting computer power, storage, or other resources from a remote data center. Whereas Green computing refers to computers that use renewable power sources and are designed to be energy efficient. Green Cloud Computing, a metaphorical juxtaposition of two already established terms, denotes that this type of computing is both energy and environment-efficient. Green cloud computing is the process describes the process of supporting computing environments in a more energy-efficient manner^[2]. The alternative to cloud computing is on-site data centers which consume far more power. Given its numerous advantages over traditional computing methods, cloud computing has been welcomed by. An increasing interest in "green" computing has spurred the development of technology that minimizes the impact of information technology on the environment. Although the ability of cloud computing to increase efficiency may improve the safety and health of the environment, the proliferation of cloud computing technology may be problematic: the changing circumstances during the production revolution are akin to the ever-evolving technology, which benefits the economy. The development of cloud computing has led to a shift in the way IT services are delivered. The concept of XAAS is now commonplace, with mid-level industrial units providing information technology as a service through a network of data centers. The Information and Communication Technology (ICT) industry accounts for a significant part of worldwide energy growth. Green cloud computing aims to encourage the recycling or biodegradation of outmoded items and industry waste by decreasing usage of hazardous compounds, enhancing energy efficiency throughout the product life cycle^[1]. The goal of this Green Cloud Architecture is to lower the power consumption of a data center. It offers features like online monitoring, virtual machine migration, and visibility placement that are ideal for this purpose. This structure Segmentation and performance guarantees can be hard to achieve without multiple applications coexisting in the data center, but one operating system, which is a key

component of HP Converged System, may help. Hardware vendors such as HP already offer software-defined solutions to extend battery life. Now that servers and data centres also employ or modify mobile device strategies, this form of program necessitates specific ways. The key to Green Computing is to effectively integrate Dynamic Voltage Frequency Scaling (DVFS) into a system, boosting resource utilization and reducing data bearers' energy consumption, thereby resulting in lower carbon footprint.

2. GREEN CLOUD COMPUTING APPROACHES

Green computing is the application of appropriate computing resources and methods to reduce waste and increase resource efficiency. Green computing can mean different things to different people. Typically, green computing refers to reducing the amount of energy consumed by an organization while maintaining or improving operational stability, efficiency and performance. Green computing aims to reduce the use of non-renewable resources by using renewable resources. It also strives to reduce consumption of energy, water, and other resources by creating solutions that are more efficient.

Virtualization:

Cloud computing is the application of distributed computing on the Internet that allows multiple businesses to utilize one physical server to store data in a virtual environment. The benefits of cloud computing include virtual environments. Here are some ways in which this is possible:

- Improves the efficiency of the system by assuring that resources are used effectively.
- The system is easy to use and provides accurate resource allocation tracking.
- Downtime is reduced by moving virtual computers between physical locations.
- Server load is distributed evenly^[4].

Dynamic Voltage Frequency Scaling (DVFS):

By integrating frequency scaling (a technique that adopts dynamic control of the voltage and frequency) with power management, DVFS decreases data center energy use and increases resource utilization. As a consequence, using green cloud computing enables reduction of carbon footprint.

Scheduling of Workloads:

Queuing theory ideas are applied in the scheduling of workload to servers. According to a server's operating expense, workload from other servers is distributed among them. By choosing the server with the highest utilisation, arrival rate, service rate, and response time—allows for efficient use of all the servers. An strategy to manage and distribute work among servers in order to achieve maximum utilisation was provided using an exponential relationship between power cost and server selection based on efficiency gains.

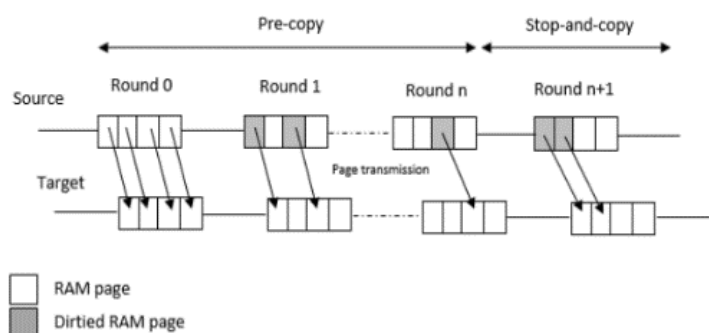


Figure 1: The Live Migration algorithm performs page-wise memory transfers.

Clustering:

Green cloud computing has been accomplished by creating cluster computing systems. One approach embeds small clusters of computers inside computer servers that otherwise would have been left inactive. Operating systems are modified to allow this to occur^[1].

3. AVANTAGES AND DISADVANTAGES

Saving energy reduces the cost of goods and resources. Reusing equipment and lowering computer power use are two ways that green computing reduces waste. It could lessen the risk posed by laptop chemicals, which can lead to cancer and other health issues. Problem: If a lot of PCs were purchased, green computing may be rather expensive. This situation has to be changed right now so that more individuals may take use of these new technology^[5].

There will be a significant reduction in carbon dioxide emissions as a result of using less green processing techniques. The decline in the use of fossil fuels in manufacturing facilities, transportation, and power plants results in an increase in emissions. Since less energy is needed to make, utilize, and organize some goods thanks to asset monitoring, this is truly a significant benefit. In the long term, consumers can really save money and resources.

There may be drawbacks, but many individuals think the benefits exceed them. Green computing may really be impractical, which is one disadvantage. Given that the PC will go through a green procedure with a certain end objective to produce the PC, When the PC is finished, there will often be some form of incorporated expense. Due to the significant amount of new innovation required for green computing, your new green PC may come at a higher price^[1].

Apple's premium laptop computer, the MacBook, is a great illustration of a green PC.

These machines are among the costliest PCs on the market; thus, they are not cheap. The most environmentally friendly computers could be significantly underpowered and unable to complete the functions that customers need from them. Some folks could need extremely power-hungry machines to handle their tasks. When buying a green PC, many customers with powerful PCs must also cope with this issue.

4. APPLICATIONS

Green computing is used in several organizations to reduce the environmental impact of a company's operations. Green computing is a term used to refer to the efficient use of electricity and other resources when it comes to data centers. It has been used as a way to save money on utilities, reduce carbon dioxide emissions and adopt more environmentally friendly technologies^[7].

5. ALGORITHMIC STRATEGIES

First come first serve:

The task assigned to the first-in-line execution slot is scheduled for execution first, and the resources required for it are allocated as soon as possible. Once that task has been completed, the next process in line is executed.

Round-robin:

The task will be executed until the time called a time slice or quantum expires, at which point the task will be placed in a queue. When the task reaches the front end again, it will begin executing again^[6].

Swarm Optimization:

This offers clever, multifaceted solutions for consolidating virtual machines that are conscious of their energy usage. These techniques enable the burden from heavily utilized equipment to be transferred to sparingly used ones, consequently lowering operational expenses through efficient work distribution. Ant colony optimization is one example of a distinct approach within this category; however, swarm optimization is more durable and extremely effective. Similar types of algorithms in this area include artificial bee colony optimization, particle swarm optimization, differential evolution, and many others^[8].

6. CONCLUSION

The benefits, usefulness, and beneficial effects of green computing are all overall positives. All of which are amazing for the individual and the entire world. By adopting "green" technology, we develop an eco-friendlier and cleaner world while also benefiting ourselves by lowering costs, preserving energy, removing trash, and reducing greenhouse gases. Green computing offers some incredible breakthroughs, however given the vast number of new developments in environmental protection, it is safe to claim that green computing is a fantastic advancement.

REFERENCES

- ^[1] Rubyga. G, Dr. Ponsy R.K SathiaBhama "A Survey of Computing Strategies for Green Cloud" 2016 Second International Conference on Science Technology Engineering and Management (ICONSTEM)
- ^[2] Reem I, Rahaf S. AlShamrani, Fatima S. Alghamdi, Sara A. AlRefai, Hemalatha M "Green Cloud Computing: A Review" International Journal of Computer Applications (0975 – 8887) Volume 167 – No.9, June 2017
- ^[3] Yashwant Singh Patel, Neetesh Mehrotra, Swapnil Sonar "Green Cloud Computing: A Review on Green IT Areas for Cloud Computing Environment" 2015 1st International Conference on Futuristic trend in Computational Analysis and Knowledge Management (ABLAZE)2015
- ^[4] Shweta Vikram "GREEN COMPUTING" 2015 International Conference on Green Computing and Internet of Things (ICGCIoT)
- ^[5] Biswajit Saha "Green Computing: Current Research Trends" International Journal of Computer Sciences and Engineering Vol.6(3), Mar 2018, E-ISSN: 2347-2693
- ^[6] Manoj Muniswamaiah, Tilak Agerwala and Charles C. Tappert "Green computing for Internet of Things" 2020 7th IEEE International Conference on Cyber Security and Cloud Computing (CSCloud)/2020 6th IEEE International Conference on Edge Computing and Scalable Cloud (EdgeCom)
- ^[7] Tanu Shree, Rajiv Kumar, Nikhil Kumar "Green Computing in Cloud Computing" 2020 2nd International Conference on Advances in Computing, Communication Control and Networking (ICACCCN)
- ^[8] Ankita Atrey, Nikita Jain and Iyengar N.Ch.S.N "A Study on Green Cloud Computing" International Journal of Grid and Distributed Computing Vol.6, No.6 (2013), pp.93-102 <http://dx.doi.org/10.14257/ijgdc.2013.6.6.08>