

GREEN CLOUD COMPUTING

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Introduction

Cloud computing is the delivery of different services through the internet. These resources include tools and applications like data storage, servers, databases, networking, and software. Instead of keeping files on a proprietary hard drive or local storage device, cloud-based storage makes it possible to save them to a remote database. As long as an electronic device has access to the web, it has access to the data and the software programs to run it.

key features of cloud computing

On-demand self-service

Reliability

Rapid elasticity

Security and Compliance:

Broad network access

Scalability and Performance

Cloud computing comes in three main types

1. Public cloud: Services are delivered over the public internet and available to anyone who wants to purchase them. Resources are shared with other customers, and you manage your account using a web browser.
2. Private cloud: Services are delivered from a business's data center to internal users. This model offers versatility and convenience while preserving management, control, and security.
3. Hybrid cloud: A business operates some resources in-house and has others provided externally. For example, an organization might use a public cloud service for archived data but keep operational customer data in-house in a private cloud.

Green CC

Green cloud computing is an approach to designing, building, and implementing computing resources and infrastructures that aim to reduce environmental impact. This is often achieved by maximizing energy efficiency and reducing carbon emissions, along with using renewable energy sources wherever possible. The term "green" is used to reflect its eco-friendly nature.

Green cloud computing not only covers the hardware and infrastructure but also addresses the efficiency of software optimization, algorithms, and data storage practices. All these aspects can significantly contribute to the overall carbon footprint of cloud computing



Why Green?

Here's why it's important:

1. **Environmental Impact:** Traditional data centers consume enormous amounts of energy, much of which is wasted due to inefficiencies. By optimizing the energy usage of these centers, green cloud computing can significantly reduce their environmental impact. The energy saved can be used for other purposes, and the resulting decrease in carbon emissions contributes to combating climate change.
2. **Economic Efficiency:** Green cloud computing is not just about environmental sustainability but also about economic efficiency. By reducing the energy consumption of data centers, companies can save significant amounts of money over time. Energy-efficient hardware, virtualization, and better use of resources all contribute to lower operational costs.



Why Green?

3. Regulatory Compliance: With increasing awareness of climate change and environmental issues, governments and regulatory bodies worldwide are implementing stricter regulations around energy consumption and carbon emissions. Implementing green cloud computing can help companies comply with these regulations.

4. Corporate Social Responsibility (CSR): Many companies are recognizing that they have a role to play in combating climate change and are adopting more sustainable practices as part of their CSR. Green cloud computing can be an important part of a company's CSR strategy.

5. Innovation and Competitive Advantage: Green cloud computing encourages innovation as it requires developing and applying new technologies and methods to reduce energy consumption. This can provide companies with a competitive advantage.

what's in the paper?

1. Virtual Machine (VM) Consolidation:

VM consolidation is one of the most effective methods for enhancing energy efficiency in cloud computing. It involves the process of aggregating multiple VMs onto fewer physical servers. By minimizing the number of active servers, it significantly reduces the energy consumption of idle or underutilized resources. Various algorithms have been proposed for VM consolidation, with factors such as performance, quality of service (QoS), and power management taken into account. Advanced machine learning techniques like reinforcement learning and deep learning have also been employed to predict resource demands and enable efficient VM migration and consolidation.

what's in the paper?

2. Task Scheduling:

Task scheduling is a crucial strategy in green cloud computing, affecting both system performance and energy consumption. It involves assigning tasks to resources in a manner that optimizes specific objectives, such as minimizing energy consumption, execution time, or cost. Traditional scheduling algorithms have been improved with heuristics, metaheuristics, or machine learning methods to consider energy efficiency. Recent techniques involve multi-objective scheduling, considering various aspects such as load balancing, energy efficiency, and QoS simultaneously. Evolutionary algorithms, like Genetic Algorithms (GA), Particle Swarm Optimization (PSO), and Ant Colony Optimization (ACO), are also gaining prominence for their ability to find near-optimal solutions in a large solution space.

what's in the paper?

3. Optimizing Energy Consumption Levels:

Energy consumption optimization involves leveraging software and hardware techniques to minimize power usage without compromising the performance of cloud services. On the software side, dynamic voltage and frequency scaling (DVFS) is widely used to adapt the energy consumption according to the workload. Various power models and machine learning algorithms have been proposed to predict the power consumption of servers and make energy-efficient scheduling decisions. There's also been an emergence of containerization technologies like Docker that help optimize resource usage and consequently reduce energy consumption.

Thank You

