



GREEN – MOBILE CLOUD COMPUTING AND ITS APPLICATIONS 3G/4G

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Abstract— Cloud computing provides computing power and resources as a service to users across the globe. This scheme was introduced as a means to an end for customer's worldwide, providing high performance at a cheaper cost when compared to dedicated high-performance computing machines. This provision requires huge data-centers to be tightly-coupled with the system, the increasing use of which yields heavy consumption of energy and huge emission of CO₂. [1] Since energy has been a prime concern of late, this issue generated the importance of green cloud computing that provides techniques and algorithms to reduce energy wastage by incorporating its reuse. In this survey we discuss key techniques to reduce the energy consumption and CO₂ emission that can cause severe health issues. [3] Cloud Computing has become a scalable services consumption and delivery platform in the field of Services Computing. The technical foundations of Cloud Computing include Service-Oriented Architecture (SOA) and Virtualizations of hardware and software. The goal of Cloud Computing is to share resources among the cloud service consumers, cloud partners, and cloud vendors in the cloud value chain. The resource sharing at various levels results in various cloud offerings such as infrastructure cloud (e.g. hardware, IT infrastructure management), software cloud (e.g. SaaS focusing on middleware as a service, or traditional CRM as a service), application cloud (e.g. Application as a Service, UML modeling tools as a service, social network as a service), and business cloud (e.g. business process as a service). [2] This paper will help the researchers and administrators to have a clear understanding of Green Computing and Mobile Computing and the differences between Green Cloud Computing and Mobile Cloud Computing. It also defines the security issues and the solution methods to these issues.

Introduction

I. INTRODUCTION

The ever-increasing demand is handled through large-scale datacenters, which consolidate hundreds and thousands of servers with other infrastructure such as cooling, storage and network systems. [2] Many internet companies such as Google, Amazon, eBay, and Yahoo are operating such huge datacenters around the world. The commercialization of these developments is defined currently as Cloud computing, where computing is delivered as utility on a pay-as-you-go basis.

The emergence of Cloud computing is rapidly changing this ownership-based approach to subscription-oriented approach by providing access to scalable infrastructure and services on-demand. Users can store, access, and share any amount of information in Cloud. Cloud computing also offers enormous amount of compute power to organizations which require processing of tremendous amount of data generated almost every day. [3] According to IDC (International Data Corporation) report, the global IT Cloud services spending is estimated to increase from \$16 billion in 2008 to \$42 billion in 2012, representing a compound annual growth rate (CAGR) of 27%. Attracted by this growth prospects, Web-based companies (Amazon, eBay, Salesforce.com), hardware vendors (HP, IBM, Cisco), telecom providers (AT&T, Verizon), software firms (EMC/VMware, Oracle/Sun, Microsoft) and others are all investing huge amount of capital in establishing Cloud datacenters.

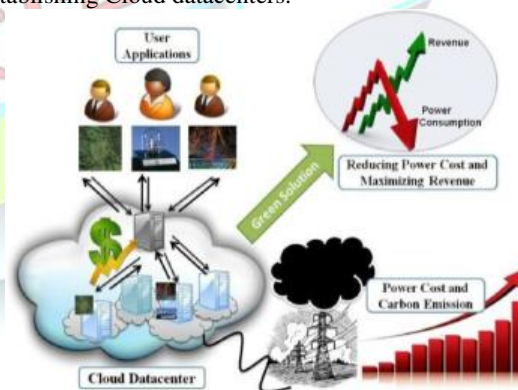


FIG .1 CLOUD AND ENVIRONMENTAL SUSTAINABILITY

II. CLOUDS ENABLING GREEN COMPUTING

Even though there is a great concern in the community that Cloud computing can result in higher energy usage by the datacenters, the Cloud computing has a green lining. There are several technologies and concepts employed by Cloud

providers to achieve better utilization and efficiency than traditional computing. [2] Therefore, comparatively lower carbon emission is expected in Cloud computing due to highly energy efficient infrastructure and reduction in the IT infrastructure itself by multi-tenancy.

The key driver technology for energy efficient Clouds is "Virtualization," which allows significant improvement in energy efficiency of Cloud providers by leveraging the economies of scale associated with large number of organizations sharing the same infrastructure. Virtualization is the process of presenting a logical grouping or subset of computing resources so that they can be accessed in ways that give benefits over the original configuration. [4] By consolidation of underutilized servers in the form of multiple virtual machines sharing same physical server at higher utilization, companies can gain high savings in the form of space, management, and energy. According to Accenture Report, there are following four key factors that have enabled the Cloud computing to lower energy usage and carbon emissions from ICT. Due to these Cloud features, organizations can reduce carbon emissions by atleast 30% per user by moving their applications to the Cloud. These savings are driven by the high efficiency of large scale Cloud data centers.

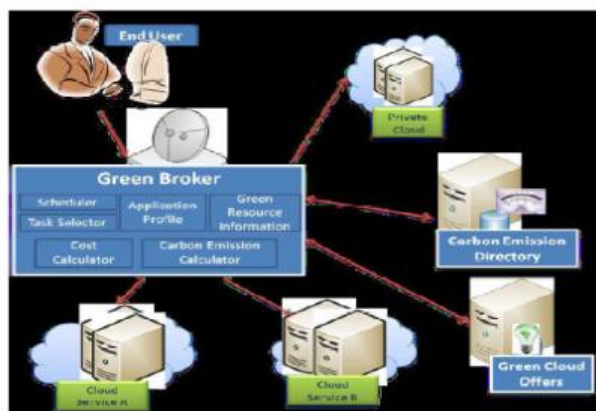


FIG .2 GREEN CLOUD ARCHITECTURE

III. BENEFITS OF GREEN CLOUD COMPUTING

- ✓ Reduced Cost
- ✓ Automatic Updates
- ✓ Green Benefits of Cloud computing
- ✓ Remote Access
- ✓ Disaster Relief
- ✓ Self-service provisioning
- ✓ Scalability
- ✓ Reliability and fault-tolerance
- ✓ Ease of Use
- ✓ Skills and Proficiency

- ✓ Response Time
- ✓ Increased Storage
- ✓ Mobility

SECURITY ISSUES IN GREEN CLOUD COMPUTING

The chief concern in cloud environments is to provide security around multi-tenancy and isolation, giving customers more comfort besides "trust us" idea of clouds. There has been survey works reported that classifies security threats in cloud based on the nature of the service delivery models of a cloud computing system. However, security requires a holistic approach. Service delivery model is one of many aspects that need to be considered for a comprehensive survey on cloud security. [4] Security at different levels such as Network level, Host level and Application level is necessary to keep the cloud up and running continuously. In accordance with these different levels, various types of security breaches may occur.

There are four types of issues raise while discussing security of a cloud.

- ❖ Data Issues
- ❖ Privacy issues
- ❖ Infected Application
- ❖ Security issues

IV. MOBILE CLOUD COMPUTING

Mobile cloud computing is the combination of cloud computing and mobile networks to bring benefits for mobile users, network operators, as well as cloud providers. Cloud computing exists when tasks and data are kept on the Internet rather than on individual devices, providing on-demand access. Mobile apps may use the cloud for both app development as well as hosting. A number of unique characteristics of hosted apps make the mobile cloud different from regular cloud computing. [5] Mobile apps may be more reliant upon the cloud to provide much of the computing, storage, and communication fault tolerance than regular cloud computing does.

Benefits of Mobile Cloud Computing

- ❖ Extending battery lifetime
- ❖ Improving data storage capacity and processing power
- ❖ Improving reliability

Security Issues in Mobile cloud Computing

Cloud computing as opposed to standard computing has several issues which can cause reluctance or fear in the user base. Some of these issues include concerns about privacy and data ownership and security. Some of these concerns are especially relevant to mobile devices. [3] In this section, the

paper discusses some of these issues, including both incidents involving them and techniques used to combat them.

- ❖ Privacy
- ❖ Data Ownership
- ❖ Data Access and Security

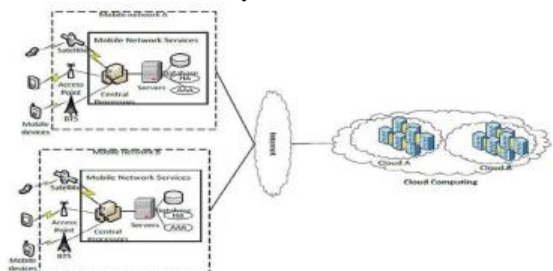


FIG .3 MOBILE CLOUD COMPUTING

V. CONCLUSION

Cloud computing business potential and contribution to already aggravating carbon emission from ICT, has lead to a series of discussion whether Cloud computing is really green. In conclusion, by simply improving the efficiency of equipment, Cloud computing cannot be claimed to be Green.

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