ENERGY CONSERVATION AND SECURITY ISSUES IN CLOUD COMPUTING: A REVIEW

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Abstract— In today's World, ICT(Information communications technology)is growing with full swing for every small or large scale businesses and this has given a boost to the technology like "Cloud Computing". In implementation, it is a very challenging technology in itself. Out of different challenges, energy conservation and security issues are the most demanding in cloud computing in the present scenario. Energy conservation includes the concept of "Green Computing" which further supports majorly virtualization, load balancing and scheduling .In this paper, we are presenting the essential needs and factors of energy conservation and security in a cloud with previous studies.

Keywords— Energy Efficient, Security, Cloud Computing

I. INTRODUCTION

The major focus of today's World is to reduce the complexities in computing for business enhancement over the World Wide Web. Cloud Computing is emerging as a greatest boon to the IT industry, with its services on infrastructure, platform and software. Examples include Google Docs, Amazons Elastic compute cloud and simple storage services Microsoft Windows azure platform, IBM 's Smart business services, Sales force .com, WebEx) have given a better platform for the IT growth.

Cloud computing is a way for increasing the capabilities of a software/ hardware without any extra investments on it. It helps in extending the information and resources that already exist on it. These days the opportunities for the cloud Providers have been increased in the market. There are many Challenges which a cloud provider is currently facing in providing services to the Clients such as: Security aspects, Energy Efficient issues, low costs etc are the major ones. Cloud provides several benefits such as fast deployment, pay-for use, lower costs, scalability, rapid provisioning, rapid elasticity, ubiquitous network access, greater resiliency, hypervisor protection against network attacks, low-cost disaster recovery and data storage solutions, on-demand security controls, real time detection of system tampering and rapid re-constitution of services but risks in all these are also to be better understood. Security in cloud data centre is one of the major challenges as security on the very large networks from different attacks is required. Lots of research is going on in this area still much more secure network is needed in the present scenario. Many concepts are covered under security issues some of them are: Security at service level, security at the data centre level, security from DDOS attacks and security at ISP's, 74% of IT executives and CIO's cited security as the top challenge preventing their adoption of the cloud services model named Clavister in 2009. [3-4]. With the increase in the computing resources as a service there is a huge need to manage the energy consumed by the servers. With this idea the green computing has emerged as a new field in the area of energy conservation. The Green Computing refers to the energy efficient branch of cloud computing which considers the carbon emission concept, environmental – energy considerations in IT equipments and green brokers. Energy Consumption is the largest operational cost of cloud environment. With the increase in the demands of energy in ICT (Information communications technology) sector, cost of energy is also increasing and simultaneously resulting in the decrease in the natural resources. This area has gained very high focus for few years in the research in cloud environment. The assumption for the net energy consumption consisting of the net total energy consumption from all devices in the near future is significantly high. Also Green computing supports many features like Virtualization, Dynamic Provisioning, Server Utilization, Multi- tenancy, Data Centre Efficiency.

In this paper we are giving a review picture of Cloud Computing, Challenges in Security and Energy – Efficient aspects and few proposed measures for it. In this Paper, first Section consists of The Introduction, second Section related to the literature survey, third section deals with Comparative study of existing techniques and the fourth section comprises of the proposed measures and the conclusion.

II. RELATED WORK

A. Energy Efficient in Cloud Computing:

The Energy – Efficient deals with performing the same tasks as before while consuming less energy, resulting in lower costs: It helps to reduce the carbon

emissions, to attain a greener environment. Energy efficiency is not energy conservation. Energy conservation is reducing or going without a service to save energy.

Andreas Berl torched many aspects related to energy consumption at different levels like hardware, servers other network devices, different wired and wireless networks. He also surveyed that maximum energy is consumed for cooling of devices rather than actual utilization. Author discussed about power minimization in cluster of servers, networks, Energy reduction in protocols. The GHG and CO2 reduction and over all energy consumption at data centre level.

In Kyong highlighted the problem of power reduction, Acc to the author power consumption can be minimized at service level in VM's. Author also shows it experimentally with a load balancing algo: DVFS and scheduling Technique. Author concludes with the proved proposed technique which reduces the power consumption and increases the profit.

In [8] Tejinder, Shows and proposes a better algorithm for live migration of load to virtual machine. Author finds the problem of underutilization and over utilization of resources and thus proposes the same for underutilization of resources and improving the data transfer cost. He proposes EEA (Energy-Efficient Algorithm) and compares it with already existing algorithms in CloudAnalyts (software based on cloud sim, used for analyzing the performance).

In Junaid, Finds that lots of electricity is consumed by a typical data centre, thus his research focuses on workload prediction, virtualization and automatic power management. Author discusses about both server and switch devices for energy efficiency. Message queue pre-emption at switches and wireless transmission scheduling techniques are proposed as a solution for different scenarios.

In Ana writes down about the Fuel cells, author has presented a picture of data centers powered by fuel cells instead of electricity. She talks about different challenges for using fuel cells, placements of fuel cell at different levels, Cost study at fuel rack. She concludes with the analysis showing less energy usage than electricity.

B. Security in Cloud Computing:

Security in cloud computing refers to data security on the cloud network. As lots of devices are connected on a cloud network, so the data integrity and data security is very challenging and essential. For full prevention of any attack, whole network is needs to be secured at every connecting device and many preventive measures to be taken for data security on the network.

In S. Subashini explained the role and placement of security module and different major issues in providing security on cloud environment. She had surveyed different issues related to security at different service levels especially at SAAS and IAAS level; she had also discussed security challenges in identity management and sign-on process. She considers and gives practical security solutions. She also talks about the model focused on providing data security by storing and accessing data based on meta-data information.

In Author proposes a secure energy-aware provisioning of cloud computing resources in virtualized platforms. He discusses about secure migration guards against TOCTTOU, VM Resumption Ordering and Replay Attacks.

In Author talks about the security at ISP's and at data centre level, Also he ensures the prevention from attacks if data centre level security is Implements . Manly he discusses about the prevention from DDOS attacks by providing firewall at data centre level.

From the above sections of related work, it is concluded that Energy Efficiency and Cloud Security in a cloud environment is quite difficult but essentially needed for the coming future. As well if the major parameters like reduction in CO2 emission security at data central level and considered them some technique can be proposed which can give a solution for both the challenges to some extent.

Comparative Study of Existing Techniques

Some of the techniques are commonly used in Cloud Computing such as Virtualization, Load Balancing, and Scheduling. These techniques are effectively helpful in different projects related to cloud computing. Virtualization is the main and undivided aspect of cloud computing.

3.1 Virtualization:

Virtualization is a technology that allows two or more different operating systems running side-by-side on just one PC or embedded controller. It is being adopted in the engineering world at a very high rate. It helps in better utilization and building of more efficient systems. As multi-core processors are replacing single-core processors, many processor cores are likely to be underutilized in a typical system. Most applications will have only a finite amount of parallel tasks that can be executed at a given time, leaving many processor idle.

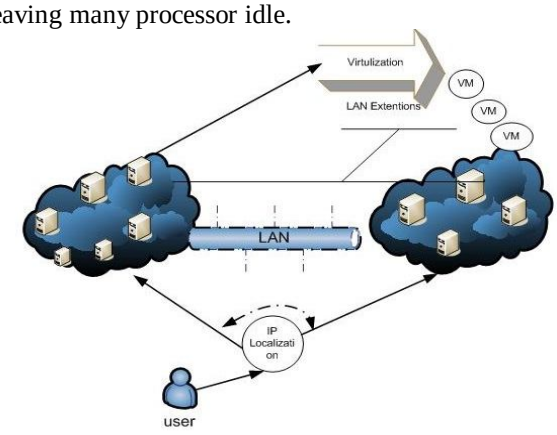

Figure 1: Virtualization Mechanism

Figure 1 depicts the virtualization mechanism. The benefit of the mechanism include improved fault and performance isolation between applications sharing the same resource; ability to relatively easy move VMs between physical hosts applying live or offline migration; support for hardware and software heterogeneity. Virtualization is being implemented in most of the cloud environments and contributes the systems with its benefits.

3.2 Load Balancing

Load Balancing is a process of reassigning the total load to the individual nodes of the collective system to make resource utilization effective and to improve the response time of the job, simultaneously removing a condition in which some of the nodes are over loaded while some others are under loaded. This load considered can be in terms of CPU load, amount of memory used, delay or network load.

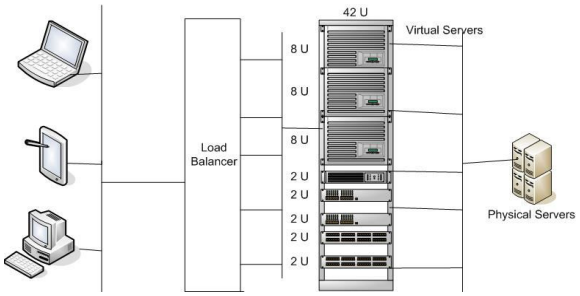

Figure 2: Load Balancing Mechanism.

Figure 2 depicts the load balancing mechanism. The benefit of this mechanism include: Improving the performance substantially. It is having a backup plan in case the system fails even partially. It accommodates future modification in the system and maintains the system stability.

3.3 Scheduling

Scheduling is done mainly to enhance the performance and memory space of system. There are many existing scheduling techniques which solve the problem of task allocation, memory storage.

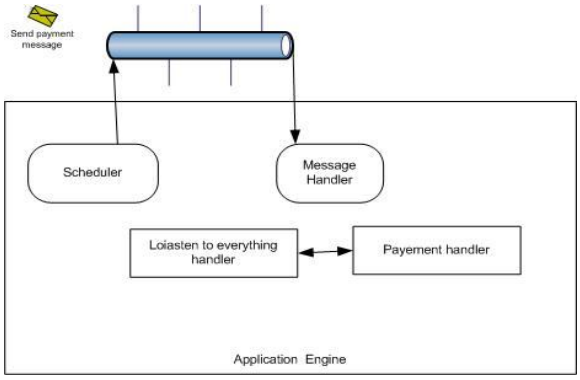

Figure 3: Scheduling Mechanism

Figure 3 describes the scheduling mechanism. The importance of using this mechanism is fast execution and proper utilization of the available resources in a better way. This mechanism not only enhances the performance but also the efficiency and effectiveness of the system.

All in all these techniques are quite helpful in the implementation of cloud computing and green cloud computing in the practical environments, Still lots of other techniques are needed for the better, efficient and eco friendly .Computing which can take care for energy and security simultaneously.

In Table 1 below there is an analysis of the maximum work is carried of performance enhancement and power reduction but very few consideration is been given to CO2 emission which is the increasing factor for the energy consumption.

Table: Data Center research work

Literature Name	Techniques used		Goals Achieved	
	Power Saving techniques	*Virtualization*	*Energy Conserved*	*Security*
Load Balancing and Unbalancing for Power and Performance in Cluster-Based System, Pinheiro et al.[15]	Server power switching	No	Yes	No
Energy-Efficient Server Clusters, Elnozahy et al.[16]	DVFS, server power switching.	No	Yes	No
Environment-Conscious Scheduling of HPC Applications, Gaga et al. [17]	DVFS, leveraging Geographical distribution of data centers.	No	Yes	No
Virtual Power: Coordinated Power Management in Virtualized Enterprise Systems, Nathuji and Schwan[18]	DFVS, soft scaling, VM consolidation, server power switching.	Yes	Yes	No
Power and Performance Management of Virtualized Computing Environments via Look ahead Control, Kusic et al.[19]	DVFS, VM consolidation, server power switching.	Yes	Yes	No
Power-Aware Provisioning of Virtual Machines for Real-Time Cloud Services, Kim et al. [7]	Adaptive-DVFS and Advanced-DVFS.	Yes	Yes	No
Energy-efficient data centers, Sajjad et al. [9]	DPM, DVFS on servers and switching devices	Yes	Yes	No
Energy Efficient Security Preserving VM Live Migration In Data Centers For Cloud Computing. Sammy et al [11].	Dynamic Round robin algorithm for server consolidation, VMM encryption.	Yes	Yes	Yes

From the above Tables it is clear that maximum work is carried of performance enhancement and power reduction but very few consideration is been given to CO2 emission which is the increasing factor for the energy consumption.

CONCLUSION

With all the study so far, we analyze that no existing techniques is fully supported with reduced energy consumption and security. Thus an algorithm should be proposed in which both these parameters are considered .Reducing carbon factor alarmingly helps the reducing energy consumption. As well security at data centre level prevents the data from DDOS attacks which are most disastrous. Some algorithm is need to be prepared which comprises of parameters that include firewall- For protection against DDOS attacks; reduction of CO2 at data central level; scheduling on virtual machines considering the energy factor

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