A STUDY ON ORIENTED IT SERVICES USING CLOUD COMPUTING

Nishant Jakhar
Assistant Professor,
Indus Degree College, Jind-Rohtak Road,
Kinana, Jind
Email- nishant.jaks@gmail.com

Abstract: Cloud computing is offering utility oriented IT services to users worldwide. It enables hosting of applications from consumer, scientific and business domains. However data centres hosting cloud computing applications consume huge amounts of energy, contributing to high operational costs and carbon footprints to the environment. With energy shortages and global climate change leading our concerns these days, the power consumption of data centres has become a key issue. Therefore, we need green cloud computing solutions that can not only save energy, but also reduce operational costs. The vision for energy efficient management of cloud computing environments is presented here. A green scheduling algorithm which works by powering down servers when they are not in use is also presented.

Keywords— IT service, Energy Saver, Data Centre.

1. INTRODUCTION

In 1969, Leonard Kleinrock, one of the chief scientists of the original Advanced Research Projects Agency Network (ARPANET) which seeded the Internet, said: “As of now, computer networks are still in their infancy, but as they grow up and become sophisticated, we will probably see the spread of „computer utilities” which, like present electric and telephone utilities, will service individual homes and offices across the country.” This vision of computing utilities based on a service provisioning model anticipated the massive transformation of the entire computing industry in the 21st century whereby computing services will be readily available on demand, like other utility services available in today’s society. Similarly, users (consumers) need to pay providers only when they access the computing services. In addition, consumers no longer need to invest heavily or encounter difficulties in building and maintaining complex IT infrastructure. In such a model, users access services based on their requirements without regard to where the services are hosted. This model has been referred to as utility computing, or recently as Cloud computing. The latter term denotes the infrastructure as a “Cloud” from which businesses and users can access applications as services from anywhere in the world on demand. Hence, Cloud computing can be classified as a new paradigm for the dynamic provisioning of computing services supported by state-of-the-art data centers that usually employ Virtual Machine (VM) technologies for consolidation and environment isolation purposes. Many computing service providers including Google, Microsoft, Yahoo, and IBM are rapidly deploying data centers in various locations around the world to deliver Cloud computing services. Cloud computing delivers infrastructure, platform, and software (applications) as services, which are made available to consumers as subscription-based services under the pay-as-you-go model. In industry these services are referred to as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) respectively. A recent Berkeley report stated “Cloud Computing, the long-held dream of computing as a utility, has the potential to transform a large part of the IT industry, making software even more attractive as a service”. Clouds aim to drive the design of the next generation data centers by architeccting them as networks of virtual services (hardware, database, user-interface, application logic) so that users can access and deploy applications from anywhere in the world on demand at competitive costs depending on their QoS (Quality of Service) requirements.
2. NEED OF CLOUD COMPUTING

The need of cloud computing can be explained with the help of an example. The following graph shows the number of users who log on to the Australian Open web page.

spikes correspond to the month of January during which the tournament is going on. The site remains almost dormant during the rest of the year. It would be wasteful to have servers which can cater to the maximum need, as they won’t be needed during the rest of the year. The concept of cloud computing comes to the rescue at this time. During the peak period, cloud providers such as Google, Yahoo, and Microsoft etc. can be approached to provide the necessary server capacity.

In this case, Infrastructure is provided as a service (IaaS) through cloud computing. Likewise, cloud providers can be approached for obtain software or platform as a service. Developers with innovative ideas for new Internet services no longer require large capital outlays in hardware to deploy their service or human expense to operate it. Cloud computing offers significant benefits to IT companies by freeing them from the low-level task of setting up basic hardware and software infrastructures and thus enabling focus on innovation and creating business value for their services.

3. GREEN COMPUTING

Green computing is defined as the study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems—such as monitors, printers, storage devices, and networking and communications systems—efficiently and effectively with minimal or no impact on the environment. The goals of green computing are similar to green chemistry: reduce the use of hazardous materials, maximize energy efficiency during the product’s lifetime, and promote the recyclability or biodegradability of defunct products and factory waste. Research continues into key areas such as making the use of computers as energy-efficient as possible, and designing algorithms and systems for efficiency-related computer technologies.

There are several approaches to green computing, namely

- Product longevity
- Algorithmic efficiency
- Resource allocation
- Virtualizations
- Power management etc.

4. NEED OF GREEN COMPUTING

Modern data centers, operating under the Cloud computing model are hosting a variety of applications ranging from those that run for a few seconds (e.g. serving requests of web applications such as e-commerce and social networks portals with transient workloads) to those that run for longer periods of time (e.g. simulations or large data set processing) on shared hardware platforms. The need to manage multiple applications in a data center creates the challenge of on-demand resource provisioning and allocation in response to time-varying workloads. Normally, data center resources are statically allocated to applications, based on peak load characteristics, in order to maintain isolation and provide performance guarantees. Until recently, high performance has been the sole concern in data center deployments and this demand has been fulfilled without paying much attention to energy consumption. The average data center consumes as much energy as 25,000 households [20]. As energy costs are increasing while availability dwindles, there is a need to shift focus from optimizing data center resource management for pure performance to optimizing for energy efficiency while maintaining high service level performance. According to certain reports, the total estimated energy bill for data centers in 2010 is $11.5 billion and energy costs in a typical data center double every five years.

Data centers are not only expensive to maintain, but also unfriendly to the environment. Data centers now drive more in carbon emissions than both Argentina and the Netherlands. High energy costs and huge carbon footprints are incurred due to massive amounts of electricity needed to power and cool numerous servers hosted in these data centers. Cloud service providers need to adopt measures to ensure that their profit margin is not dramatically reduced due to high energy costs. For instance, Google, Microsoft, and Yahoo are building large data centers in barren desert land surrounding the Columbia River, USA to exploit cheap and reliable hydroelectric power. There is also increasing pressure from Governments worldwide to reduce carbon footprints, which have a significant impact on climate change. For example, the Japanese government has established the Japan Data Center.
Council to address the soaring energy consumption of data centers. Leading computing service providers have also recently formed a global consortium known as The Green Grid to promote energy efficiency for data centers and minimize their environmental impact. Lowering the energy usage of data centers is a challenging and complex issue because computing applications and data are growing so quickly that increasingly larger servers and disks are needed to process them fast enough within the required time period. Green Cloud computing is envisioned to achieve not only efficient processing and utilization of computing infrastructure, but also minimize energy consumption. This is essential for ensuring that the future growth of Cloud computing is sustainable. Otherwise, Cloud computing with increasingly pervasive front-end client devices interacting with back-end data centers will cause an enormous escalation of energy usage. To address this problem, data center resources need to be managed in an energy-efficient manner to drive Green Cloud computing. In particular, Cloud resources need to be allocated not only to satisfy QoS requirements specified by users via Service Level Agreements (SLA), but also to reduce energy usage.

5. CONCLUSION

Applying green technologies is highly essential for the sustainable development of cloud computing. Of the various green methodologies enquired, the DVFS technology is a highly hardware oriented approach and hence less flexible. The result of various VM migration simulations show that MM policy leads to the best energy savings: by 83%, 66% and 23% less energy consumption relatively to NPA, DVFS and ST policies respectively with thresholds 30-70% and ensuring percentage of SLA violations of 1.1%; and by 87%, 74% and 43% with Thresholds 50-90% and 6.7% of SLA violations. MM Policy leads to more than 10 times less VM migrations than ST policy. The results show flexibility of the algorithm, as the thresholds can be adjusted according to SLA requirements. Strict SLA (1.11%) allows the achievement of the energy consumption of 1.48 KWh. However, if SLA is relaxed (6.69%), the energy consumption is further reduced to 1.14 KWh. Single threshold policies can save power up to 20%, but they also cause a large number of SLA violations. Green scheduling algorithms based on neural predictors can lead to a 70% power savings. These policies also enable us to cut down data centre energy costs, thus leading to a strong, competitive cloud computing industry. End users will also benefit from the decreased energy bills.

6. REFERENCE


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[XI] [www.intel.com/cloudcomputing]