A True Green Cloud Data Centers

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Abstract- We are moving to a new cellebrum - the era of "e" which belongs to computers, electronics and its energy issues. Looking back to previous years, work done was manual that involves the analytical and statistical efforts of human mind. Moving down to the 21st centuary, the arm of the head has changed its position to "Technology", reducing the mind analysis of humans and better optimal decisions and computations as its main outcomes. Energy issues will get a serious ring in the coming days, as the public debate on carbon emissions, global warming and climate change gets hotter. The researches done by various corporates and academicians has been much anticipated by a world with an ever-increasing appetite for e- computing devices, as an alarm. There is a need of virtualized datacenters in cloud computing to increase the efficiency and services provided to the client. But with the growth of the cloud, however, comes an increasing demand for energy. Leaders in cloud computing market must advocate for policy change at the local, national and international levels to ensure that, as their appetite for energy increases, so does the supply of renewable energy. It is the end responisiblity of every individual to make a green IT.

 Keywords: Green Cloud Computing, Environmental sustainability, Data Centers.

1. INTRODUCTION

This research paper proposes an effort, needed to build a green IT. While new technology is helping us to understand IT infrastructure, a loyal commitment to a sustainable technology strategy is required at each level. Environmental systemic quality metrics need to be built into architectural cloud models, Programming cloud models and in Data Storage and Computational models. The potential of ICT technologies and cloud computing to drive low-carbon economic growth underscore the importance of building cloud infrastructure in places powered by clean renewable energy. [1]

2. CLOUDS: ENABLING GREEN COMPUTING

Year 2010 is named as the 'Year of the Cloud'. The arrival of the iPads and growth in net books and other tablet computers, the launch of Microsoft's Azure cloud Operating System for business, and the launch of the Google phones are compelling signs of a movement towards cloud-based computing within the business sector consciousness in a way never seen before. Clouds are virtualized datacenters and applications offered as services on a subscription basis. There are leaders like Amazon, Google, Apple, yahoo and facebook, who are providing services to their consumers competitively. There is a horse race between the big giants to fulfill the thirst of their clients. In a race of producing the optimal outcomes and services, "data centers - massive storage facilities that consume incredible amounts of energy" are needed. Google has more than ten datacenters located at different regions of the

world. Whether it is Berkeley County data center located at South Carolina, Mayes County, Oklahoma or Hamina located at Finland, each of the datacenter is using some different approach to reduce carbon emissions [2]. Each year we save millions of dollars on energy costs, and we use renewable energy whenever we can, Google says. Google regularly analyze the energy consumption by its equipments and design its own facilities to cool the servers. Cloud computing is playing a vital role in reducing the carbon footprints of gas emissions. If we have three datacenters, namely A, B and C, these three equipments consume a large amount of power; same amount of energy consumption will be required for the backup datacenters as well. As a result more cooling efforts are needed for the case. Figure 1 i.e. the energy consumption of the equipments is directly proportional to the energy consumption of the backup datacenters. By adopting a Cloud computing model the energy consumption and cooling efforts can be reduced to some extent.
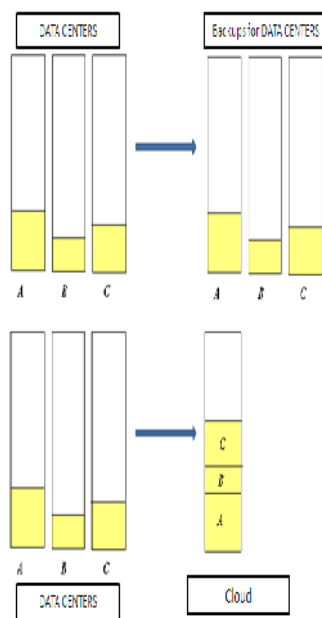

Figure 1

3.   DATA CENTRE EFFICIENCY

Apple developed its first environmental policy in 1990, they are committed to make their products more energy efficient, eliminating many toxic substances, and embracing renewable energy [3]. Apple is using different approaches and designs in its Maiden, North Carolina, data center. One of the main methodologies Apple uses is the chilled water storage system to improve chiller efficiency by transferring 10,400 kWh of electricity consumption from peak

to off-peak hours each day [3]. Construction processes that utilized 14 percent recycled materials, diverted 93 percent of construction waste from landfills, and sourced 41 percent of purchased materials within 500 miles of the site.

Google is using recycled water to cool its data centers. Water management opportunities are discussed at Google leads that evaporation is a key of cooling. Water used to cool data centers needs to be clean, but not nearly as clean as drinking water. Using recycled water, which Google clean just enough for cooling, saves pure water for other uses.Evaporation is a powerful tool that maintains body temperature even when ambient temperatures exceed the normal 98.6°F. When heat from its immediate surroundings changes water into vapor, the heat dissipates as well, causing a cooling effect. Google adopted same methodology design to cool towers of data centers [4]. In Belgium datacenter, Google is using the recycled water for environmentally friendly and highly efficient cooling. Dirty water from an industrial canal runs through a number of treatment steps, including large tanks that are filled with a fine sand to filter out small particles. At the end of the process, the water is completely clear and looks like regular water.

4. READINESS ASSESSMENT AND INTEGRATION TO BUILD GREEN DATA CENTER

Organizations who are serious about the environmental sustainability should first understand their current level of greenness through a green IT readiness assessment, [5] so they can identify new opportunities for investment and measure progress to determine their return on investment. A readiness assessment will enables to:

- Set an annual carbon emissions reduction target to be achieved by adopting various green initiatives.

- Identify opportunities to potentially reduce total annual energy consumption by 20% to 30%. Google identifies few steps to have an efficient computing environment. [6] How to deploy quick implementation to put green, reliable, high-efficiency data centers into operation and generate benefits?

- Minimize electricity used by servers.

- Reduce the energy used by the data center facilities themselves.

- Conserve precious fresh water by using recycled water instead.

- Reuse or recycle all electronic equipment that leaves our data centres.

Advanced Design Philosophy is the Foundation of an optimal and efficient data centre [7]. A leader Huawei conducted in-depth research in new information technologies like cloud computing, cloud storage, and virtualization to provide a Flexible, Mixed, and Modular Green Data Centre.

The rising cost of energy combined with environmental objectives to reduce the carbon footprints has led to much greater demand from both existing and new datacenters for methods to improve Power Usage Effectiveness (PUE) [8].

- Optimize the air condition system.

- Improving the efficiency of UPS and power conversion.

- Buying the green power and lowering the carbon footprints

5. CONCLUSION

Cloud computing is creating a hype in Industries. By simply improving the efficiency of equipment, Cloud computing cannot be claimed to be Green. What is important is to make its usage more carbon efficient both from user and provider's perspective. There should be some policies and guidelines regulated by the Government to reduce the usage of power consumption. When it comes to protecting the environment, everyone must demonstrate social responsibility and initiative.

6. REFERENCES

- Apple history progress towards environment sustainability http://www.apple.com/environment/progress/

- A green data center, Wilbert Ingles, Arvid Fossen, http://www.dacentec.com

- Efficient computing http://www.google.com/corporate/datacenter/efficient-computing/

- Focusing on integration to build green data center in the cloud-computing era, Liu Zhonglin, Fu Tao, Ding Chunming

- Greenpeace International, Make IT Green – Cloud Computing and its Contribution to Climate Change, March 2010.

- Overview of Google data centers. http://www.google.com/about/datacenters/

- Google's Water management opportunities http://www.google.com/about/datacenters/inside/efficiency/

- Green IT: Making the Business Case, Cognizant Report, January 2011