Green Libraries on Cloud Computing Platform

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INTRODUCTION

Libraries since ages have been exclusively dedicated to serving the user needs through information management and collection activities. However, modern age needs have altered the role and responsibilities of librarians. However, present day librarians have to indulge in the process of information creation and management as well as data services through digital libraries and institutional repositories. Added to these is the need of involvement in Web 2.0 technologies and social networking and linking commercial and open access contents. Most striking is the fact that the rapid indulgence in ICT technologies have led to adverse environmental and economic implications. According to The Climate Group (2008) ICT contributes to about 2% of greenhouse gas emissions and which is likely to rise in the coming future. Gartner estimated that the Information and Communication Technologies (ICT) industry generates about 2% of the total CO_2 emissions (Rivoire, 2007). Further studies carried out by European Union point out that a decrease in emission volume of 15 – 30% is required before 2020 in order to keep the global temperature below two degree.

Under such circumstances cloud computing technology promises both economic and environmental savings (Mell & Grance, 2011). It is now also widely accepted that the higher education sector, like any other business sectors, can bring a significant amount of economic and environmental benefits by adopting green IT and cloud computing technologies (Chowdhury, 2012a,b; JISC, 2011). A recent research by Accenture (2010) highlights the fact that while moving the applications and software into the cloud referred as cloud computing, carbon footprint of organizations will be substantially reduced. According to the report, small businesses saw the most dramatic reduction in emissions – up to 90 percent while using Cloud resources. Large corporations can save at least 30-60 percent in carbon emissions using Cloud applications, and mid-size businesses can save 60-90 percent.

Despite huge environmental and energy savings through cloud computing the rate of adoption has been unevenly scattered. A survey conducted by Tata Consultancy Services reveals that the rate of adoption of cloud computing applications is 19% in US, 12% in Europe, 28% in Asia Pacific and 39% in Latin American countries. Most of the scholars have argued that by 2020 most of the services will be available in cloud which mandates the preparedness for shifting to cloud. Apart of commercial avenues, medical care, agriculture and education, libraries in US and Europe are widely adopting the cloud computing technology seeing its merits. The basic intention of the present study was based against this background aimed at developing a conceptual model for Green libraries for higher education sector. The conceptual model is an outcome of constructive research based on the critical analysis of researches in Green and Cloud Computing.

BACKGROUND

Green Computing

Green computing can be defined as the study and practise of designing, manufacturing, using and disposing of computers, servers and associated subsystems with negligible impact on the environment. The essence of green computing lies in proximity with green chemistry which is directed towards the reduction in the use of hazardous materials, maximization of the efficiency of energy during the lifetime of the product and lastly, the promotion of recyclability or biodegradability of computer waste products. Some of the approaches central to green computing are:

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1. Longevity of the product
2. Algorithmic efficiency of the product
3. Efficient and Effective resource allocation
4. Virtualization medium
5. Judicious Power management

Need of Green Computing

Data centres operating under the cloud computing model are powerful enough to entertain several requests and run several applications at a same time on the shared hardware. On an average data centre consume as much energy as of 25,000 households. Further reports claim that during 2010 data centres consumed about $11.5 billion and energy costs are likely to double after every five years. In spite of being expensive data centres are unfriendly to the environment. Therefore, the present scenario demands for green computing strategies for the sake of environment. 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.

Studies on Green Computing

Scholars have studied green computing from various perspectives. Some of the prominent ones are:

1. Studies focusing on the software development lifecycle (Huang, 2008), and on eliminating the negative environmental impacts of information systems (Haigh & Griffiths, 2008);
2. Studies that focus on environmental reporting, measurement, and accounting systems (e.g., Brown, Dillard & Marshall, 2005; Goodman, 2000; Isenmann, Bey, & Welter, 2007; Moller & Schaltegger, 2005; Rikhardsson, 1998; Shaft, Sharfman, & Swahn, 2001);
3. Studies focussing on the knowledge management systems for environmental sustainability initiatives (e.g., Jain, George, &Webster, 2008; Manning, 2007);
4. Studies that focus on the concept of designing for the environment (e.g., Lenox, King, & Ehrenfeld, 2000; Yang et al 2007);
5. Studies that are more concerned with describing technologies, such as Green supercomputers (e.g., Schaffhauser, 2008) and Green data centers (e.g., West, 2008),

CLOUD COMPUTING

Novelties are imperative to float with the inescapable drift of change. In the recent years Information Technology sector has witnessed technological turmoil in the form of thunders of cloud computing. Cloud computing has been a subject of contested project among the savants. It has been defined from various perspectives depending on the area of implementation, core services and the associated features that it unravels. There are divergent non-consented views and winding up the definitions leads to a mess in understanding the concept. In lack of consensus of opinions it is fair to look into the interpretations active in play.

Cloud computing is an alternative to traditional computing where the operating systems, hardware and software are rented over the Internet. It can be considered as an integrated package of computing services and applications on web offered as a utility ensuring throughout abstraction. The most cited NIST (Mell & Grance, 2009) definition of Cloud computing reveals that "cloud computing is a model for enabling, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction". According to (Yuvaraj, 2013) cloud computing is a strategy to access utility based intangible computing resources which can neither be seen nor felt but can be only accessed through internet.

The use of cloud element in the cloud computing has been further explained voraciously. According to (Yuvaraj, 2013) although cloud element of Cloud computing has further witnessed divulging viewpoints. These propositions more or less account for a single ideology. Tadwalker (2009) opines that cloud computing derives its name from Cloud which represents data centres, technologies, infrastructure and services