

An E-learning System in Malaysia based on Green Computing and Energy Level

Arif Ullah[#], Nazri Mohd Nawawi[#], Asim Shahzad[#], Sundas Naqeeb Khan[#], Muhammad Aamir[#]

[#] Faculty of Computer Science and Information Technology, Universiti Tun Hussein Onn Malaysia, Malaysia
E-mail: nazri@uthm.edu.my

Abstract— The increasing of energy cost and also environmental concern on green computing gaining more and more attention. Power and energy are a primary concern in the design and implementing green computing. Green is of the main step to make the computing world friendly with the environment. In this paper, an analysis on the comparison of green computer with other computing in E-learning environment had been done. The results show that green computing is friendly and less energy consuming. Therefore, this paper provides some suggestions in overcoming one of main challenging problems in environment problems which need to convert normally computing into green computing. In this paper also, we try to find out some specific area which consumes energy as compared to green computing in E-learning centre in Malaysia. The simulation results show that more than 30% of energy reduction by using green computing.

Keywords— Green computing, E-Learning, Energy reduction, Environments.

I. INTRODUCTION

Green computing is the study and practice or design, manufacturing and disposing computer servers and design subsystem such as monitor, printer device and networking and communication system efficiently and effectively with minimal or no impact on environment [1].

Green computing or green is the particle of implementing the rule and a system that improve the computing resource in such way that reduce the energy and friendly impact of environment [2]. Due to the rising of energy cost and growing of environment concerns green computing is receiving more and more attention. The concept of green computing has been spread in the past few years and gaining increasing popularity. A green networking is the new generation networking environment in which energy efficiency has pervaded as a whole infrastructure to such as the extent as to become a part of network design [3].

As we know that cloud computing is the next generation of IT infrastructure, enterprise of computing resource that reduce complexity and speed in a business environment. When we achieve these goals it definitely will affect our environment in making this kind of system that may be friendly to environment as required in green computing designed [4].

Figure 1 shows the green cloud architecture where an exploratory system is there which used for the monitoring the

system performance and it measures application load, resource utilization and power consumptions.

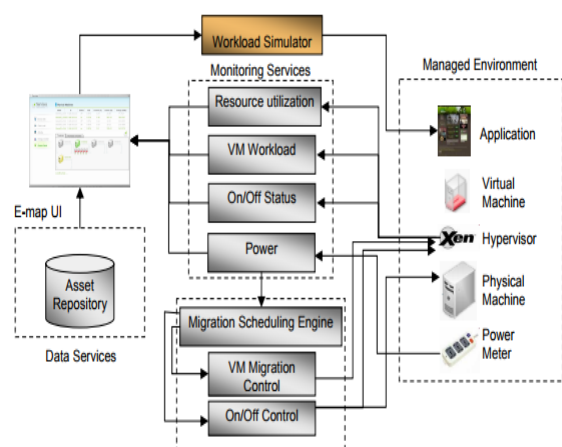


Fig 1: Green Cloud Architecture

The system contain dynamic adapt work load and resource utilization through virtual machine migration. Due to this approach green computing had managed to reduce unnecessary power consumption in the environment. The Monitoring Service is built on top of IBM Tivoli framework and Xen, where the IBM Tivoli framework is a CORBA-based system management platform managing a large number of remote locations and devices; Xen is a virtual machine

monitor (VMM). Migration Manager triggers live migration and makes a decision on the placement of virtual machines on physical servers based on knowledge or information provided by the Monitoring Service [4].

II. MATERIAL AND METHOD

In advanced and modern world nowadays, students need to know a vast learning method which is no more can be provided by the traditional system and traditional teaching methodologies. The technologies are becoming more integrated as an invisible and ubiquitous part of a global system. This study attempted to identify the students' awareness of E-learning in higher learning Institutions. The development of E-learning has revolutionized in content delivering and as well as social communication in learning activities. AS can be seen in Figure 2, E learning consists of multiple course and virtual resource and it also supports collaboration offer interaction implementation of web base [5].

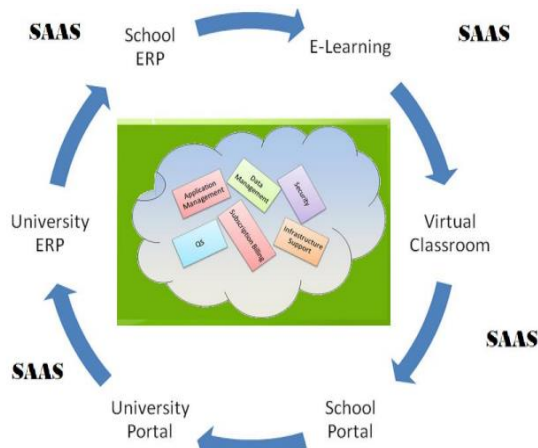


Fig 2 : E-learning architecture

E-learning MARKET IN MALAYSIA

E-learning had gained many attentions to society and is becoming one of the major markets in Malaysia. According to Malaysia Online Education Market Outlook 2023, the online education system is major market horizons in Malaysia. According to the expert the annual growth rate of rate of 16.4% over the forecast period, i.e. 2016-2023. It can be achieved through cloud computing tablets and mart pone. Malaysia Online Education Technology can be segmented by the basis of technology into the following categories [6].

- ✓ Rapid Online Learning
- ✓ Learning Management System (LMS)
- ✓ Mobile E-Learning
- ✓ Podcasts
- ✓ Virtual Classroom
- ✓ Application Simulation Tool
- ✓ Knowledge Management System
- ✓ Learning Content Management System

Malaysia government is taking initiatives to promote education through online platform in order to increase the adoption of technology among the younger generation and to provide affordable and convenient education to overcome the shortage of quality education. The strong government

initiatives are pushing students to enrol in the online education platform for higher education; this will further propel the market growth at ever-increasing rates [7].

Growing in E-Learning environment need of highly developed IT infrastructure and lack of professional academic staff are some of the factors that can restrain the market growth over the forecast period.

- ✓ Ey Players
- ✓ Studymalaysia.com
- ✓ Academiccourses.com
- ✓ Alison
- ✓ Shah Alam
- ✓ Kebangsaan Malaysia
- ✓ Sains Malaysia
- ✓ Teknologi Malaysia
- ✓ Putra University
- ✓ Utara University

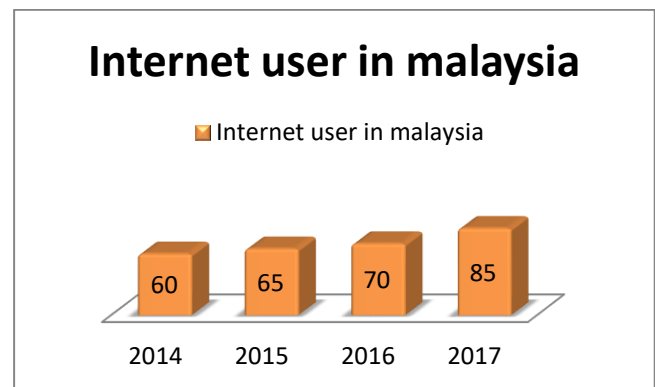


Fig 3: Comparison of E-learning

Figure 3 shows the annual growth of E-learning in Malaysia from 2014 to 2016. According to the result E-learning is increasing drastically.

III. RESUTS AND DISCUSSION

Energy Consumption

Energy consumption of modern computers can vary widely depending on the application or task that the computer and device is doing at the time. Both task for computer and software (both operating system and application being used) are major factors in the actual energy usage at any given time. The implementation of cloud computing and other computing system in E-Learning cases had loaded an amount of energy consumption. We had taken some example of hardware and software and their implementation and testing cases to show that it took more amount of energy. We also had taken some examples to show that green computing uses less energy as compared to other computing [8].

Table 1: Energy consumption for Email services by Green computing.

Institutions type	Single user	PUE	Total power used	The total energy used per annual
Small	200w	400	8 w	70 kWh
Medium	450 w	900	1.8 w	16kwh
Large	450w	5400	0.54w	4.7 kWh

Table 1 shows the energy consumption of green computing when uploading and downloading email from different device and how many people are using it at specific time. All these actions are calculated in the above table and the table also show the annual activity.

Table 2: Energy consumption for Email services by other computing.

Institutions type	Single user	PUE	Total power used	Annual energy 800per user
Small	500w	600	20 w	1200kwh
Medium	700 w	1100	2.8 w	1600kwh
Large	800 w	6400	3.54w	1800 kWh

Table 2 shows the energy consumption of other computing when uploading and downloading email from different device. The table also shows number of people that are using it at specific time and all these activities are calculated in the above table. According to the result it shows that green computing almost reduce energy consumption of almost 30 %.

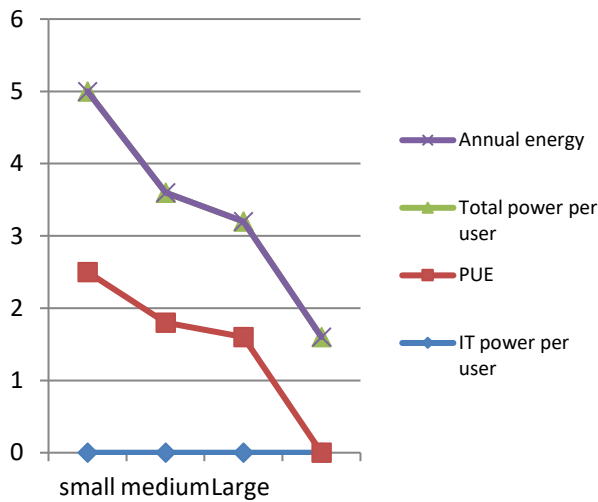


Fig 1: Comparison of energy level between green and other computing

Figure 1 compares between green computing and other computing energy level. According to the result green computing save almost 30 % of energy as compare to other computing even though all the results are conducted at he different education organization.

Table 3: Energy consumption for sharing video data on green computing .

Institutions type	Single user	PUE	Total power used	The total energy used per annual
Small	1000w	2.5	20 w	500 kWh
Medium	1200 w	1.8	3.2 w	800kwh
Large	1500 w	1.6	0.9w	1500 kWh

According to the Table 3, the data shows that there are different levels of energy consumption in green computing for different institutions. The results also show as per person and annual rate of energy consumption.

Table 4: Energy consumption for sharing video data on other computing.

Institutions type	Single user	PUE	Total power used	The total energy used per annual
Small	100w	5.5	60 w	3000 kWh
Medium	400 w	4.8	5.2 w	700kwh
Large	600 w	6.6	3.9w	1200kwh

Table 4 shows the use of energy in different institutions and different parameters that used energy to share data with each other. According to the result it shows that green computing is one of the latest marking areas which reduced energy consumption about 30 % as other computing.

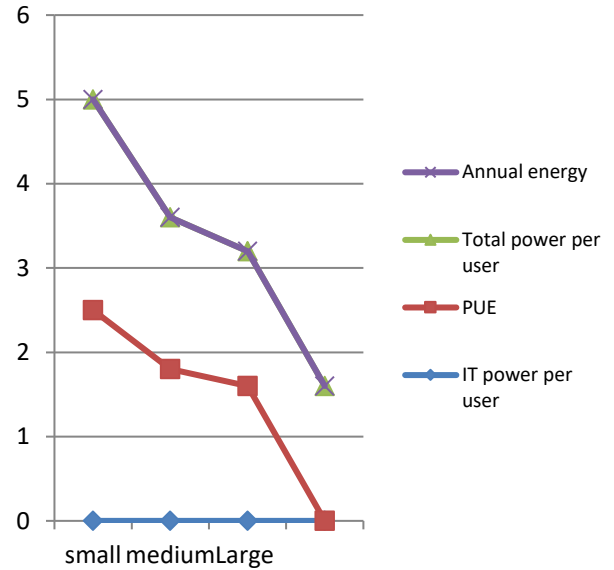


Fig 2 : Comparison of energy level between green and other computing

According to Figure 2 the rate of energy consumption in green computing is less than other computing and its almost 30 % reduced energy consumption as compared to other computing and other resources and more importantly that its eco-friendly as compare to other computing.

IV. CONCLUSION

Green computing is an emerging area and Eco-friendly for next generation computing. Green computing provides tremendous value in information sharing and size. The phenomenon is the key factor that influences many organisations to shift to cloud and other computing in E-learning system. This is because it saves money and provides better education. However, less research had been done to investigate the energy consumption of green computing in current environment. Therefore, our main concern in this paper is that we are comparing such kind of system that did not affect the environment and reliable with energy resource. In this paper, we just try to compare the energy level between cloud computing and other green computing. According to the result green computing is best option that can be adopted in different organization since it shows of saving energy consumption as well as reliability. Even though, there are still some challenges that need to be concern of in adopting green computing.

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