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A Study on Green IT Solutions

M. Manasa Manjunath

Assistant Professor, Dept. of Computer Science, Kristu Jayanti College, Bangalore, India

ABSTRACT: Green IT has become an important issue in the information technology. Power consumption of data centers and IT infrastructures increased immensely in recent years. Not at least because of the continuing relocation of data into various cloud-services. Regular PCs still engage a high energy demand. Green computing can also be termed as Go-Green practice that assists lessening the carbon foot-print. Green computing facilitates us to a secure, safe and sound environment for the mankind. Moreover, high environmental burden are caused by the production of common PCs and after their end of live (EOL) the disposal of them causes also environmental damages. Data centers demand even more power consumption and therefore, they cause even more environmental pollution. This paper will mainly focus on two of the major solutions to Green IT- Docker, Load balancer and addresses the basic concerns in designing PCs which helps in environmental friendly disposals later.

KEYWORDS: Docker; Cloud Computing; Green Computing; Load Balancer; Virtualization;

I. INTRODUCTION

Green computing is the study and practice of environmentally sustainable computing. It is an eco-friendly strategy that can be implemented in our daily life to reduce the environmental impact. Green computing has drawn its attention in business and industries too for the reason that the ideas of green computing can reduce the cost of computing and can also extend the lifespan of IT products because green computing is about using the computer and its related resources in an environmentally responsible way. It involves implementing energy-efficient computer, CPU, Server and other peripherals to reduce the resource consumption. Data center is the major source of energy consumption. It consumes an incredibly large amount of energy, i.e. It consumes 50 times more the energy per square foot than the energy consumed by companies. As a consequence it discharges a huge amount of heat and detrimental gases that brings impairment to environment and human. According to an American survey, the energy consumption of the data center all over the world will double in next few years. Green computing can reduce this problem by introducing energy-efficient computing. Industries and Companies are increasingly focusing on developing and using such devices. One such technique employed by companies is Docker. In Distributed Systems like cloud computing one more important technique which can support Green Computing is Load Balancer. These two techniques are the major elucidation to Green IT.

II. RELATED WORK

Green computing, the study and practice of efficient and eco-friendly computing resources, is now under the attention of not only environmental organizations, but also businesses from other industries. Followings are few of the significant books and journals published on Green IT.

Christian ReimsbachKounatze (June 2009)

This paper describes the ways to improve the environmental performance, tackling global warming and enhancing resource management are high on the list of global challenges that must be addressed urgently. The information and communications technology (ICT) industry needs to further improve its environmental performance (it is responsible for around 2-3% of the global carbon footprint), and ICT applications have very large potential to enhance performance across the economy and society (the remaining 97-98%). Governments and business associations have introduced a range of programmes and initiatives on ICT and the environment to address environmental challenges, particularly global warming and energy use. Some government programmes also contribute to national targets set in the Kyoto



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Protocol (e.g. Denmark's Action Plan for Green IT and Japan's Green IT Initiative). Business associations have mainly developed initiatives to reduce energy costs and to demonstrate corporate social responsibility.

Fatima Zahra Hanne (July 2011)

This paper highlights the importance of the role played in reducing carbon emissions by the developing countries of the world. A crucial part of any global strategy is the role of developing countries, particularly the rapidly growing ones: the BRICS, 3 others in the G20, and some other large and systemically important countries. The high growth developing countries now include more than half the world's population. If they succeed in continuing (post crisis) their pattern of sustained growth as seems likely, then by mid century or shortly thereafter, they will be approaching advanced country levels of income with associated patterns of consumption, energy use, and carbon emissions. What those patterns will be and how we get to them is the central issue before us. If the patterns are like the present ones, the climate change battle will have been lost.

III. GREEN COMPUTING

Green computing, Green ICT (Information and Communication Technology) as per IFG International Federation of Green ICT and IFG Standard, green IT, or ICT sustainability, is the study and practice of environmentally sustainable computing or IT. This can include "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 less or no effect on the environment. At a time where business runs continuously, there is an obligatory need to collect, store and analyse the large amount of data generated in business. All this comes at a cost for both business and environment because this big amount of data is stored in Data Centers and Data Warehouses. Data center use so much power to run the servers that house these data and releases so much heat which has to be cooled down so that servers are not affected by this heat. So the actual problem here is to reduce the amount of energy consumption. This is indeed in the minds of IT industries as they are the ones to use large number of computers and servers. Hence, the Industry and Business people are moving to approaches that use energy-efficient system, efficient cooling system, virtualization and more recently Docker. The combination of these techniques can reduce the data footprint, reduce the number of resources and in overall the management and maintenance also reduces. The attention on computers has turned towards efficient and less energy consumption from speed and cost. Though computers are the need of the hour, they also create problems such as causing pollution, producing e-wastes and increasing the Green House Gases. Employing Green computing will alleviate these problems. Green IT is a tag in the IT market. It is certainly not a new technology but a supplementary stratagem to the existing Green technologies. The goals of Green IT is the same as Green Computing, as they both belong to the same family of Green Technology. As said, Green IT helps reduce energy consumption, cost of computing and augments the performance. In a survey conducted in US, 75% IT industry presses on the need for Green IT, out of which, 20% have already deployed Green IT techniques and technologies. And only 15% of IT industry feels that Green IT is just a temporary. This survey demonstrates that Green IT has already entered the minds of IT Industry. Basically the enterprises in the IT market are categorized as;

1. Industries that based on Data center's design
2. Industries that are based on compute power
3. Industries that are based on their Green Commitment

Out of these three categories, the third class is the one to focus primarily on Green IT and this forms that 75%. Industries use some of the following high level choices to implement the Green IT; Server and desktop virtualization, Server Consolidation, Application Optimization and Data Center design .

IV. CLOUD COMPUTING

Cloud Computing is an important paradigms which lies in between Grid Computing and Supercomputing. The important feature of cloud computing is it can run any job as a host service. These services are broadly classified into three types: Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). Most of the industries are adopting cloud services due to the benefits of self-provisioning, allocation based on requirements which can cut costs in unwanted allocation of resources.

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V. GREEN CLOUD COMPUTING



Virtualization is the main key factor for Cloud Computing to attain sustainability from the cost and energy efficient point of view. Even though there are different types of virtualization, two types are widely distributed. They are: Server and storage virtualization

A) SERVER VIRTUALIZATION:

Virtual server allows several machines to share the same physical server to run instead of having their own server that leads to less cost in terms of hardware, management for their infrastructure facilities and space.

B) STORAGE VIRTUALIZATION:

Many applications produce lots of data that cannot be stored in a single server due to storage capacity. Another problem is that multiple users can access the same data at the same time which could cause traffic over the network. For this reason data should be virtualized to avoid access problem and improve the data management along with reducing cost.

VI. LOAD BALANCING IN CLOUDS

Load balancing in clouds is a mechanism that distributes the excess load evenly across many servers. This technique is used to achieve high user satisfaction and resource utilization this helps in high performance improvement. Proper load balancing can help in utilizing the available resources optimally, thereby minimizing the resource consumption. Load balancing also required to achieve green computing in clouds. Which can be done two types?

1. Reducing Energy Consumption:

Load balancing helps in avoiding overheating by balancing the workload across many servers. By which we can reduce the amount of energy consumed.

2. Reducing Carbon Emission:

Energy consumption and carbon emission are hand in hand. The more the energy is consumed, higher the carbon emission. As the energy consumption is reduced by load balancing. So we can reduce the carbon emission by which we can achieve green computing.

VII. DOCKERS

Docker is a newer technology that aims at building, shipping and running distributed applications. It is a Virtual Machine technique without the overhead of Virtual Machine. This does not have any starting overhead as in Virtualization techniques. One of the components of Docker is Docker Hub. It is a cloud service for sharing applications. The distribution part of Docker is handled by Docker Registries. The running part of Docker is



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handled by DockerContainers. Docker is known for its inexpensiveness, fast booting and shutting down, low CPU and memory requirement and finally it is fast and elegant. Docker is efficient in the sense that Docker Container runs on the kernel level so that containers can efficiently share resources. Moreover, Docker Containers promises to provide better portability across cloud. Linux Containers, the forerunner of Docker is established, while Docker is not.

VIII. CONCLUSION

Neither Docker Containers nor Virtualization technique can provide complete performance. They are not adequate for an application in their own stand. Containers are good at providing portability of application. Even multi-level applications can also be easily ported. Moreover, Dockers provide a template for this purpose. But, portability is not the only criteria for an application to run successfully. Other operational factors like flexibility, security, performance and much more has to be considered. Such high-level factors can be provided only by a matured technology like Virtualization. Besides, the application can be first put in a Docker Container and then they can very well run inside Virtual Machine, though they both seem to be absolutely different technologies. This way the container can get the benefits of Virtualization.

So far, we have Containers that are basically suited for Linux system. But, Windows based Containers are still under investigation. It is said that, Windows based Containers are normally suited for Desktops and they will not depend on any Virtualization technique, not even Hypervisor. They have their customized virtualization system. Spoon is one such technology to offer Windows based Containers.

Appropriate algorithms have to be used for a good load balancing and that helps in green concept with less dirty wastes. In this paper we have seen two major solutions for Green IT and with proper implementation we can have optimum results in achieving Green IT. In future however Green IT concentrates only on maximum utilization of the resources and minimal or zero wastes out of it. Not only industries, we humans should also have our own contribution in achieving green IT.

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BIOGRAPHY

M. Manasa Manjunath is an Assistant Professor in Computer Science Department, Kristu Jayanti College, Bangalore. She received Master of Technology (M.Tech) degree in 2013 from JNTUA, Andhra Pradesh, India. Her research interests are Cloud Computing, Computer Networks etc.