International Journal of Advanced Computer Research (ISSN (print): 2249-7277 ISSN (online): 2277-7970)
Volume-2 Number-4 Issue-6 December-2012

Study of Efficient Utilization of Power using green Computing

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Abstract

Green computing or green IT, basically concerns to environmentally sustainable computing or IT. The field of green computing is defined as "the knowledge and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems which include printers, monitors, and networking, storage devices and communications systems efficiently and effectively with minimal or no impact on the environment. This computing is similar to green chemistry that is minimum utilization of hazardous materials and, maximizing energy efficiency during the product's lifetime, and also promote the recyclability or biodegradability of defunct products and factory waste.

Keywords

Introduction, framework, architecture, Steps towards green computing.

1. Introduction

Green computing is basically attached to the flow, which represents an environmentally responsible way to reduce power and environmental waste. Our world is making an effort to make everything greener. Green computing is just like more than sticking a nice green plant in the corner. This computing actually relates to understanding and managing the environmental impacts of IT systems which basically includes materials and resources required for equipment, energy and also materials used in OS, potential health effects on humans from using equipment, and responsibility for the waste products that are created from IT systems. Green computing is mainly focused on super computers and cluster system.

Literature Review on Green IT

Green computing is now under the attention of not only environmental organizations, but also businesses from other industries. In June, 2009 **Christian Reimsbach Kounatze** 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. **In (2010)** Dr**. Lanjewar, Prof. Sheikh** describes Green Computing and the impact of ICTs on the environment. One of the earliest initiatives toward green computing in the United States was the voluntary labelling program known as Energy Star. It was conceived by the Environmental Protection Agency (EPA) in 1992 to promote energy efficiency in hardware of all kinds. The Energy Star label became a common sight, especially in notebook computers and displays. In July 2011 **Fatima Zahra Hanne** 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. In **(Sep-Dec 2011) Govindasamy, Joseph** points out the green aspect of computing at its very heart, the operating system, how its capabilities can be nurtured for green benefit , and how it can be extended to fit our green architecture model in a optimum way. As per a recent review, Linux was highlighted as an operating system that has the been in line of operating under the green approach. Linux is considered an environmentally friendly operating system, relative to proprietary systems.

2. Framework of green computing

This script presents a Green computing framework which is used in the Cloud paradigm in order to meet with the goal of reducing power consumption. The framework is basically mean for defining efficient computing resource management. This computing technology can be adapted and applied to Cloud systems, but concepts are applicable to various other data center usages. Cloud computing data centers are focused mainly for several reasons. First, the Cloud is one of the new concepts, which is able to accept input and be defined most readily. Second, one of the technologies that is on the rise with exponential growth, thereby yielding significant gains. Finally, this technologies i.e.is cloud computing allow for the flexibility and precision needed.

Figure shows a Green Cloud framework for maximizing performance per watt within a Cloud. Framework, consist of two major areas which can lead to improvements in efficiency: virtualization and machine system level designs. The framework tries to overcome ways to expand upon the baseline functioning of virtual machines in a cloud environment. This is first performed with deriving a efficient scheduling system for VMs. The Scheduling part mainly addresses the placement of VMs within the Cloud infrastructure with the goal to maximize the working capacity while simultaneously minimization of operating cost. Which is achieved by optimizing either power of the server equipment itself or the overall temperature within the data center? With the Due reason to the inherent disposability and mobility of stateless VMs within a semi-homogeneous data center, we can use the capability to move and manage the VMs to further improve efficiency. This type of intelligent image management can attempt to control and change the characteristics such as size and placement of VM images in no of ways for conserving power and reducing the size of images. This design of the VM images can also lead to a drastic power savings, if architected correctly.

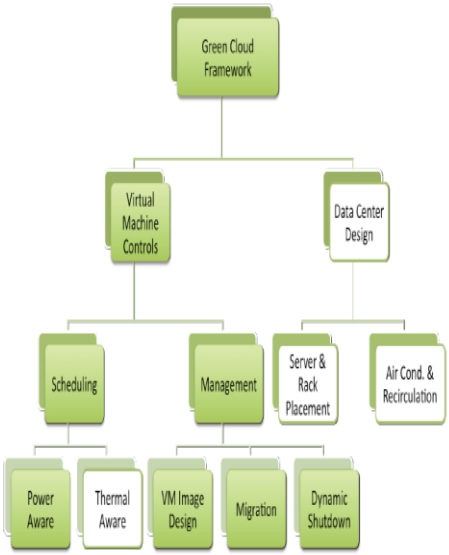

Fig 1: Green Cloud Framework

These operational and runtime chances can have a impact that is to drastic however more fixed data center level design decisions are also important for improving energy efficiency. Use of more efficient air conditioning units with employing exterior free cooling, and also using completely separated hot and cold isles, or simply picking more efficient power supplies for the servers can lead to incremental but with substantial improvements. These practices can be further improved with more radical design, such as a cylindrical or spiral data center design that brings cool air form the outside in, and exhausts it up through chimney. This excess heat energy of data centers should not be wasted. This type of exhaustion could be used to heat water or provide ambient heat for surrounding. The potential is greatly to combine the factors together in such unified framework and deploying it to a large scale Cloud poses many challenges. Technique before used may be outside the scope of this manuscript, the integrated components of the Green Cloud framework .It provide a sustainable (acceptable) development platform which shows the largest potential impact factor with drastically reducing power requirements within a Cloud data center. This framework is not only meant to be a solution, but rather, a set of paths, or guidelines, to reach a solution. In which only a subset of these tasks are addressed head on throughout the remaining sections. This work will lead to a growth in amount of research. This new field is used to address the growing energy demands within our newest and greatest data centers.

3. Green Cloud Architecture

Cloud computing act as platform for the next generation IT infrastructure that enables enterprises to consolidate for computing resources, reduce management complexity and speed the response to business dynamics. Improvement of the resource utilization and reduction of power consumption are key challenges to the success of operating a cloud computing environment. To address with such challenges, we design the Green Cloud architecture and the corresponding Green Cloud exploratory system. Monitors a number of system factors and performance measures including application workload, resource utilization and power consumption, hence the system is able to dynamically adapt workload and resource utilization through VM live migration. Henceforth the Green Cloud architecture leads to minimization of unnecessary power consumption in a cloud computing environment. Figure demonstrates the Green Cloud architecture and shows the functions of components and their relations in the architecture**.**

Monitoring Service This section monitors and collects comprehensive factors such as application workload, resource utilization and power consumption, etc. This 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 (VMM) where it stands for virtual machine monitor .This Service serves as the global information provider and provides on-demand reports by performing the aggregation and pruning the historical raw monitoring data to support to intelligent actions taken by Migration Manager.

Migration Manager triggers live migration and it makes decision on the placement of VMs on physical servers based on knowledge or information provided by the Monitoring Service. The migration scheduling engine basically searches for the optimal placement by a heuristic algorithm, and associately sends instructions to execute the VM migration and turn on or off a server. A heuristic algorithm is one of them to search an optimal VM placement. The output of the algorithm is an action list in terms of migrate actions (e.g. Migrate VM1 from PM2 to PM4) and local adjustment actions (e.g. Set VM2 CPU to 1500MHz).

Managed Environment section includes virtual machines, physical machines, resources, devices, remote commands on VMs, and applications with adaptive workload, etc.

E-Map is one of the web-based services with Flash front-end. Which provides a user interface (UI) to show the real-time view of present and past system on/off status, resource consumption, workload status, temperature and energy consumption in the system at multiple scales, from high-level overview down to individual IT devices (e.g. servers and storage devices) and other equipment (e.g. water- or air-cooling devices). E-map is connected to the Workload Simulator, which predicts the consequences after a given actions adopted by the Migration Monitor through simulation in real environment. Workload Simulator accepts no of user instructions to adapt workload, for e.g. CPU utilization, on servers, and also enables the control of Migration Manager under various workloads. Then, E-Map also collects the corresponding real-time measurements, and also with demonstrating the performance of the system to users. Hence, users and system designers will verify the effectiveness of a certain algorithm or adjust parameters of the algorithm to achieve better performance.

Asset Repository is a database to store the static server information, such as IP address, type, CPU configuration, memory setting, and topology of the servers. This framework is running and accessible with the help of green cloud IDC management to IBM internal staffs and customers. This can be viewed up-to-date with the help of status of resources, configure their applications, allocate resources, and experience the live management system.

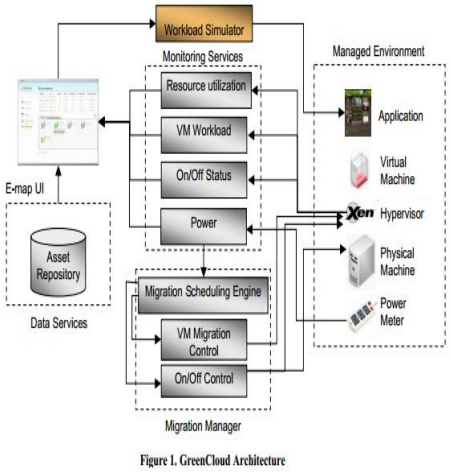

Fig 2 : Green Cloud Architecture

4. Benefits and first step towards green computing

1. Plan to develop a sustainable green computing

So Far discussed with business leaders the elements that should be factored into such a plan, including organizational policies and checklists. This type of a plan should basically include recycling policies, recommendations for disposal of used equipment, government guidelines and recommendations for purchasing green computer equipment. This computing best practices and policies should cover power usage, reduction of paper consumption, as well as recommendations for new equipment and recycling old machines. Organizational policies should basically include communication and implementation.

2. Recycle

Removal of used or unwanted electronic equipment in a convenient and environmentally responsible manner. Computers have toxin metals and pollutants

that can emit harmful emissions into the environment. Discardation of computers can be avoided with the help of Recycling them instead through manufacturer programs as there are number of which includes HP's Planet Partners recycling service or recycling facilities available Or donate computers(still-working) to a non-profit agency.

3. Sound purchase decisions should be made environmentally

Purchasing and marketing of Electronic Product Environmental Assessment Tool registered products. EPEAT is a acquirement tool promoted by the nonprofit Green Electronics Council to:

•Helping institutional purchasers leads to evaluate, compare and accordingly select desktop computers, notebooks and monitors based on environmental attributes

•It provides a clear, consistent set of performance and criteria for the design of products

•Recognization of manufacturer efforts basically to reduce the environmental impact of products by reducing or eliminating environmentally sensitive materials, designing for longevity and reducing packaging materials.

All EPEAT-registered products should meet minimum requirements in eight areas of environmental impact and be energy efficient to reduce emissions of climate-changing greenhouse gases. To experimentally demonstrate corporate social and environmental performance, manufacturers must offer safe end-of-life management and recycling options. When products become unusable. "Development of environmentally sound products has long been given a priority for HP's design and engineering teams," its proud to be that our business-class products already meet, and also in some cases exceed, the basic EPEAT standards without any alteration to their existing design."

4. Reduce Paper Consumption.

There are no of easy, ways and means for reduction of paper consumption which includes e-mail, electronic archiving, use the "track changes" feature in electronic documents, When you do print out documents, make sure to use both sides of the paper, recycle regularly, use smaller fonts and margins, and selectively print required pages.

5. Conserve energy.

Shut down computer when we know we won't use it for an extended period of time. Utilize power management features during shorter periods of inactivity. This management allows monitors and computers to enter low-power states when sitting idle. By just hitting the keyboard or moving the mouse, the computer or monitors awakens from its low power sleep mode in seconds. This management ways can save energy and help protect the environment.

Sustaining the Future "The greatest area of challenges for businesses trying to be eco-responsible are understanding what that really means and accordingly then making changes that are to be sustainable over time, while addition of business value," second challenge we have is balancing the needs of various stakeholders who have different ideas of what changes should be made.". One major problem is that the substitute replacement must be verified to ensure that environmental and health impacts are lower than the original material somehow , since placements are fairly new, they have not been necessarily assessed with the same rigor applied to the original materials. Green computing presents a responsible way to address the issue of global warming. With the adoption of green computing practices, leaders can contribute positively to environmental stewardship and protect the environment as well as also reducing energy and paper costs.

Advantages Energy Saving, Environmentally Friendly, Cost –Effective (pays over time), save more money per year, can give you a tax right off.

Disadvantages: High startup cost, not readily available, still in experimental stages sacrifice performance for battery life, not for everyone.

Ways for Green Computing

Reduce Power Consumption The use of electricity in our computer is very essential. We make use of the systems efficiently to save the power and cost. By managing our resources effectively, we can save the power. Here are some of the techniques of power saving by using Power Option in your Control Panel, you can save the power

Turn off monitor This method allows you to turn off the monitor, if the system is idle for more time of duration .make Use LED, LCD monitors instead of CRTs because it will reduce a lot of power. By turning monitor off you can save half the energy that system is using. So when download in progress or when it is in idle for some minutes turn off the monitor. You can automate through this option.

Turn off hard disks This technique allows you to turn off hard disks if it is idle. You can automate this and what we suggest is to set the turn off time to 30 minutes or to some different value depending upon your usage.

Hibernate This method allows you to shut everything down. But the basic difference from sleep/ standby mode is its way of storing your information in the RAM; which will write all the information to the hard drive and shuts everything down. Which allows you to shut down memory as in standby by you cannot. But remember that memory doesn't use much power. So, we suggest this option for only wireless laptop if it is running on battery. You can automate this idle after 30 minutes.

Reduce Toxic Waste
Reduction of e-waste is very much important. By practicing Green Computing, we have to know how to properly dispose the computers and other hardware devices. Firstly, check the manufacturer information that they may take back your old product back. In recent days many concerns take the old gadgets from you to get them recycled. Depending on where we live we can take the old parts of your computers to retailers, electronics repair shop so that they can dispose your products easily to recycler.

5. Conclusion

Green computing is a mindset that asks how we can satisfy the growing demand for network computing without pressurizing the environment. it is not about going out and designing biodegradable packaging for products. It also whitlist performance and breadth of application .computing developments can enable individuals and businesses to adopt green lifestyles and work styles**.** This paper offered a review of current thinking and suggested factors that should be considered for a sustainable IT strategy. Future research should address the relationship between customer value, business value, and societal value and how sustainable IT strategies will impact each. More research is needed to fully understand the market impact of a sustainable IT services strategy. Beyond cost savings are there benefits from sustainability oriented business strategies that customers are willing to pay for? Does sustainability for IT services create competitive advantage? Finally, a model for the development and implementation of sustainable IT services needs to be developed. This model will likely involve the integration of the IT organization's sustainability initiatives with the enterprise-level.

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