Virtualization Impact for Green Technology

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Abstract: virtualization is changing landscape of IT.Virtualization is a green technology that is rapidly growing in both acceptance and importance. A benefit of virtualization that often goes unnoticed is Green IT. IT is essentially software that sits under the operating system ("OS") and allows physical servers or desktop systems to become 'virtual' equipment.   A further benefit of server virtualization in particular is the saving of approximately 7000kWh of electricity annually (equating to around $700 per year) which eventually affects our environment positively as electricity is less used. With a reduction in operational cost virtualization can also help achieve reduced carbon emissions.Today's business environment is environmentally conscious. Virtualization is being used by a growing number of organizations to reduce power consumption and air conditioning needs and trim the building space and land requirements that have always been associated with server farm growth. .Virtualization is one method that you can potentially impact both your bottom-line and the environment in positive ways.. It will be right if we state a statement that "Adopting virtualization is away to say we care for environment".

This paper details various benefits that virtualization offer from purelyenvironmental perspective. Apart from the obvious reduction in power consumption, the paper also highlights the other green benefits such as reduced e-waste from less disposal output and longer computer lifespan, reduced resource consumption in manufacturing and incidental benefits such as reduced shipping and distribution requirements

Index Terms: virtualization, datacenter, VMware, GreenTechnology, Environment, virtualization aware storage, E-waste.

1. INTRODUCTION:

The socio-political ramifications of global warming requiring good corporate citizens to meet greenhouse gas reduction targets, creates an added incentive for virtualization. Virtualization is being used by a growing number of organizations to reduce power consumption and air conditioning needs and trim the building space and land requirements that have always been associated with server farm growth. Virtualization also provides high availability for critical applications, and streamlines application deployment and migrations. Virtualization can simplify IT operations and allow IT organizations to respond faster to changing business demand

2. WHAT IS VIRTUALIZATION?

2.1 Virtualization is a combination of software and hardware engineering that creates Virtual Machines (VMs) - an abstraction of the computer hardware that allows a single machine to act as if it where many machines.

2.2avirtualversion of a device or resource, such as a server, storage device, network or even an operating system where the framework divides the resource into one or more execution environments. Even something as simple as partitioning a hard drive is considered virtualization because you take one drive and partitionit to create two separate hard drives. Devices, applications and human users are able to interact with the virtual resource as if it were a real single logical resource.[1]

2.3 Without VMs: A single OS owns all hardware resources

2.4 With VMs: Multiple OS's, each running its own virtual machine, share hardware resources Virtualization enables multiple operating systems to run on the same physical platform.

3. OPERATION

3.1 While computers over the years become moreenergyefficient, the continuing increase in demand has resulted in the net power consumption by computers to double in past 5 years. In addition to the high power requirements, the operating ambient

temperature of a computer needs to be control to prolong its operational life.it is estimated that for large data centers every watt of power consumed by the computer requires an additional watt for cooling.

3.2 In 2007 EPA's data center report to US congress it was forecasted that y 2011, the peak load generated on the grid by datacenters in US alone would be close to 12GW which is equivalent to output from 25 base load power plants.[3]

3.3 Virtualization software such as VMware Server offers many features that companies can take advantage of. For example, the software has a 'snapshot feature' which allows you to roll back to a clean system at any time. In other words, if something gets messed up when trying out new software/programs, you can easily reconfigure the system to its' original state prior to the testing.

4. MANUFACTURING AND DISPOSAL

4.1 virtualization reduces carbon emissions due to lesser amount of materials consumed in manufacturing for instance, 'zero clients' contain no processor, memory or other moving elements(hard disks).

4.2 E-waste reduction, as opposed to e-waste recycling, is a step towards greener environment. 'Zero-clients' can last for 8-10 years are opposed to 3-4 years for a conventional PC[3]

5. PACKAGING AND SHIPPING

5.1 a thin/zero client (used in desk toped virtualization) weighs roughly 10-20% of a normally PC desktop. Packaging material requirement for a thin client is around 2.2-4.4lbs while it is 5-10kgs for a PC[2]

5.2 The reduced size of a thin clients also cuts down the carbon emissions caused in transportation

6. STRENGTHEN YOUR GREEN CREDENTIALS

6.1Going green is a great marketing strategy. Many people are passionate about the environment, and when these people are shopping for your product or service, and they come across a blog article or a page

on your website touting your green achievements, you will be able to connect with them on a personal level. They will then feel compelled to buy from your business, even if you aren't the least expensive.

6.2It's kind of the same idea as organic groceries; they cost more money, yet there are health-conscious consumers that love filling their reusable shopping bags with anything labeled "organic".

7. COMPLIMENT YOUR OVERALL ENVIRONMENTAL STRATEGY

7.1 Installing green technology on your network is a huge part of your company's overall environmental strategy. While buying a few Energy Star devices won't automatically make you a green company, implementing a green technology on your network does go a long way in going green because many of your operations revolve around your network. When trying to plan a comprehensive green strategy for your company, overhauling your network is a great place to start.

8. GO GREEN AND SAVE GREEN

8.1 One of the best benefits of adding green technology to your network is saving money. You may not feel the savings immediately when you purchase new hardware, but the return on your green investment will be seen in the medium-to-long term. For example, installing a print server will save you ink, a fax server will save paper, and virtualizing your server units will dramatically reduce your electricity bill. Your operating expenses will lessen with every environmentally-friendly solution running on your network.

8.2 Energy efficiency and the reduction of a company's carbon footprint is a significant selling point for virtualization software. By implementing virtual servers rather than physical servers, hardware

resources are better utilized and require less overall equipment/energy. VMware suggests that such energy savings can be as high as 80% and up to 4 tons of CO2 emissions are eliminated via a single virtual server; a significant feature when looking to lessen your own company's environmental impact. A further benefit of server virtualization in particular is the saving of approximately 7000kWh of electricity annually (equating to around $700 per year).[1]

9. GREEEN BENEFITS OF VIRTUALIZATION

9.1   Virtualization helps reduce the ecological impact at all stages of computer lifecycle. However,it is vital that effective governance and monitoring policies are put in place to ensure the post virtualization , the desired optimization is achieved. for instance without effective governance, virtualization might not help in moving the server sprawl problem from the physical to the   virtual domain.

9.2   IT department also needs to measure the green benefits that accrue from their virtualization efforts in organization. this data is vital to articulate the savings to technical and business decision makers in the organization.[2]

9.3   If one of the virtual servers suffers from a malfunction, the data can be transferred quickly and relatively easily to a new virtual server thus minimizing disruption to your business and decreasing any downtime or inconvenience to clients and customer.

9.4   New software can be rolled out across a network quickly and simply via a remote connection.

9.5   Power consumption and cooling requirements are also reduced with the reduction in equipment.

9.6   Space requirements decrease once virtualization is implemented due to the decreasing amount of physical hardware needed

9.7   Network maintenance time and costs are decreased leading to increased efficiency.

10. CONCLUSION AND SUMMARY

10.1   Virtualization is a optimization technique that rationalizes the usage of computing resources thus reducing the harmful effects on the environment.

10.2   with more and more vendors offering various virtualization solutions today, the price pint is no longer a deterrent to adopt virtualization as an enterprise wide strategy

10.3   Resource utilization is measured as the ratio of useful work done to the amount of resources consumed, virtualization helps reduce the environment footprint at all stages of the computer lifecycle by requiring less resources to do the same quantum of useful work.

10.4   More and more companies and organizations are realizing the green IT benefits associated with virtualization and this leading to better adoption to this technology.

10.5   IT department also needs to measure the green benefits that accrue from their virtualization efforts in organization. This data is vital to articulate the savings to technical and business decision makers in the organization

REFERENCES:

[1] Maria Kazandjieva, Brandon Heller, Omprakash GnawaliGreen Enterprise Computing Data: Assumptions and Realities

[2] Er. Navdeep Kochhar, Er. Arun Garg),Eco-Friendly Computing: Green Computing'

[3] International Journal of Advanced Computer and Mathematical Sciences. Vol 1, Issue 1, Dec, 2010,pp4551. http://bipublication.com.' GREEN COMPUTING SAVES GREEN" by Priya Rana, Department of Information Technology, RKGIT, Ghaziabad.

[4]IGEL technology white paper: under the environmental' hood: Thin client's vs. regular PC's.

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