Feasibility Study on Lab Server Virtualization: A Final Report

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Executive Summary

Virtualization is allowing a single physical server to run multiple instances of an operating system. Virtualization offers many benefits as it allows companies to decommission racks of servers and consolidate the work into a single machine. This reduces overall operating costs by reducing electricity usage, cooling costs and the amount of hardware needing to be maintained. Given these benefits, virtualization is the next big trend in IT as it allows companies to cut-costs without affecting production.

I began by surveying our current configuration of our lab servers in order to determine the criteria for both the virtualization software as well as the hardware needed. Once this was documented, I researched available software and hardware that would meet these criteria.

Based on the information gathered, I recommend VMWare vSphere 4 Essentials and a new Dell Poweredge R610 server as the best option. This combination is a robust configuration that will exceed all of our current needs as well as provide enough scalability for future growth. The initial investment for the software, hardware and implementation will be $4,183. The return on investment, however, will off-set these costs with an annual cost reduction of $2729.66. Based only on the reduction in electrical costs, the project will pay for itself in less than two years.
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Introduction

Virtualization of computer servers is allowing a single physical server to run multiple instances of an operating system. There are many reasons to consider virtualization including (Lowe, 2008, p 16):

- Better hardware usage rates
- Lower hardware-maintenance costs
- Lower cooling costs
- Lower electric costs
- Lower space costs
- Longer infrastructure run time from UPSes
- Faster server deployment
- Simplified management
- Easy backup and fast recovery

In NICE’s Customer Support Organization, we use computer labs extensively to test and stage new versions and upgrades of our product. Currently, our lab has a total of 12 servers. Although the lab is functional, there is a steep operational cost associated with the current setup. It takes 12 times the amount of power to run these machines as compared with a virtualized server. There are also 12 times as many CPUs, Power-Supplies and Hard-Disks to replace when they fail. It takes 12 times as many man-hours to manage and maintain the servers. With a simple implementation of a virtualized server, we can convert a single physical machine into one hosting the same 12 servers on virtual machines. This would allow us to harness these benefits along with the other rewards of virtualization.

In this study, two components were researched. Software was identified that was capable of meeting the virtualization needs as well as physical hardware that was capable of
running this software. I have concluded that using VMWare vSphere 4 Essentials and a new Dell Poweredge R610 server is the best option. This combination is a robust configuration that will exceed all of our current needs as well as provide enough scalability for future growth. In the following sections, I will provide additional details about the research methods of virtualization solutions and the recommendations to move forward on this project.
Research Methods

Two components were reviewed in this study: the type of virtualization software to implement and the physical hardware capable of running the software. There were three stages involved in the research of this study:

1) Surveyed the current configuration of the computer lab servers. This survey included both the software and hardware specifications of the servers. This was used as a base-line in determining criteria for the software and hardware selection.

2) Used on-line research to find what software was available that could perform virtualization. The following criteria were determined necessary requirements for the software:
   a) It would be able to run different Operating System platforms – both Windows Server 2000 and Server 2003.
   b) It would need to be forward capable of integrating with Windows Server 2008.
   c) Cost for software would be less than $1000.

3) Used on-line research to find what hardware was available that could meet the requirements of our current servers as well as meet the requirements for the virtualization. To identify the best hardware solution, the following criteria were used:
   a) It would meet the minimum requirements for the virtualization software.
   b) It would need to have enough hardware resources to equal the load the current servers are performing. The following are estimates based on the current work-load (virtualized servers shares resources so the new server will not need to have 12 times the original configurations, but enough to ‘juggle’ all of the server requests).
i. CPU – Quad 2 GHz Processors

ii. RAM – 4 GBs

iii. Hard Drives – 1 TB

3) The server would need to be scalable to accommodate for future implementations of lab servers.

4) Cost for hardware would be less than $3000.
Results

In this section, the results of the data collection are presented. There are three sections consisting of the current configuration of the lab, the prospective software and the necessary hardware.

1. Survey of Current Lab Configuration

In order to understand the software and hardware requirements, I surveyed our current lab configuration. It has two server racks containing a total of 12 servers. Each server runs a single OS with an install of one of NICE’s products. The specification of the current servers is listed below:

Table 1. Current Configuration of Lab Servers

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Windows Server 2000 or Server 2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>1 GHz</td>
</tr>
<tr>
<td>RAM</td>
<td>512 MB</td>
</tr>
<tr>
<td>Hard Drive</td>
<td>72 GB</td>
</tr>
<tr>
<td>Power-Supply</td>
<td>400 Watts</td>
</tr>
</tbody>
</table>

2. Identifying the Virtualization Software

After researching on-line, there were three choices for software capable of running virtualization software: Microsoft Virtual Server 2005 R2, Microsoft Server 2008 and VMWare vSphere 4 Essentials. See Table 2 for a comparison of the platform and the required criteria.
Table 2. Virtualization Software Necessary Criteria Evaluation

<table>
<thead>
<tr>
<th></th>
<th>MS Virtual Server 2005</th>
<th>MS Server 2008</th>
<th>VMWare vSphere 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server 2000 / 2003</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Server 2008</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Cost of software</td>
<td>Free</td>
<td>$3995</td>
<td>$995</td>
</tr>
</tbody>
</table>

3. Identifying the Hardware

For the hardware solution, I researched 3 leading server providers (HP, Dell and IBM) to determine the best option. See Table 3 for a comparison of the server and the required hardware criteria.

Table 3. Virtualization Hardware Necessary Criteria Evaluation

<table>
<thead>
<tr>
<th></th>
<th>IBM x3350</th>
<th>HP Proliant DL 380 G5</th>
<th>Dell Poweredge R610</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meets minimum requirements for virtualization software</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CPU</td>
<td>Intel Xeon Quad 2.83 GHz</td>
<td>Intel Xeon Quad 2.5 GHz</td>
<td>Intel Xeon Quad 2.53 GHz</td>
</tr>
<tr>
<td>RAM / expandable</td>
<td>4 GBs expandable to 8 GBs</td>
<td>2 GBs expandable to 64 GBs</td>
<td>4 GBs expandable to 64s GB</td>
</tr>
<tr>
<td>HD / expandable</td>
<td>Max 1.5 TBs</td>
<td>Max 8 TBs</td>
<td>Max 3 TBs</td>
</tr>
<tr>
<td>Power-Supply (in Watts)</td>
<td>450</td>
<td>800</td>
<td>502</td>
</tr>
<tr>
<td>Cost</td>
<td>$2,260</td>
<td>$2,789</td>
<td>$2,388</td>
</tr>
</tbody>
</table>
Conclusions

Reviewing the software criteria, neither Microsoft product will meet the requirements for the project. Although Microsoft Virtual Server 2005 is free to download it doesn’t offer forward capability with Server 2008. Microsoft Server 2008 is compatible with all of the versions of Windows, but its cost is outside of the budget of $1000. VMWare vSphere 4 Essentials is the only software that will meet the needs of the virtualization project.

Reviewing the hardware criteria, all three of the servers were below the budget and would meet the minimum requirements for the VMWare software. Looking next at price, the HP was significantly more than the other servers even though it had similar specifications. The HP was ruled out based on the price criteria. The cheapest of the three servers was the IBM. The IBM, however, did not have the same capacity for future scalability as the Dell. The Dell has twice the hard-drive capacity and sixteen times the RAM capacity. The price difference between the two servers: $128.
Recommendations

I would recommend the purchase of the Dell Poweredge R610 and VMWare vSphere 4 Essentials as the solution to implementing virtualization in our lab environment. The steps for implementation would be as follows:

1) Configure the new server and install VMWare vSphere 4.

2) Build and configure 12 virtual servers.

3) Migrate the data from the original lab servers to the virtual machines.

Estimated time for these tasks would be 16 man-hours.

Table 4. Cost of Lab Server Virtualization Project

<table>
<thead>
<tr>
<th>Expense</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dell Poweredge R610</td>
<td>$2,388</td>
</tr>
<tr>
<td>VMWare vSphere 4 Essentials software</td>
<td>$995</td>
</tr>
<tr>
<td>Staff time to configure server, software and data migration</td>
<td>$800</td>
</tr>
<tr>
<td>Total</td>
<td>$4,183</td>
</tr>
</tbody>
</table>

Although there is a high up-front cost for virtualization, there is a significant cost-benefit once it is implemented. If we look only at the energy costs associated with virtualization, the server will pay for itself in less than one year and the entire project will be paid for in less than two years.
Table 5. Benefit Analysis for Electricity Consumption

<table>
<thead>
<tr>
<th></th>
<th>Number of Servers</th>
<th>Kilowatts Used (per server)</th>
<th>Hours per Year</th>
<th>Rate per Kilowatt</th>
<th>Annual Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>12</td>
<td>0.4</td>
<td>8760</td>
<td>0.0725</td>
<td>3048.48</td>
</tr>
<tr>
<td>Virtualization</td>
<td>1</td>
<td>0.502</td>
<td>8760</td>
<td>0.0725</td>
<td>318.82</td>
</tr>
</tbody>
</table>

Annual savings in energy costs after virtualization: $2729.66. Again, this is only for the energy consumption, if we factor in reduction in cooling costs and lowered maintenance costs our return on investment will be much quicker. It is because of these savings, that I conclude that implementing virtualization is a smart business choice for our immediate needs as well as our future growth as a company.