



# ***Virtualization Readiness Assessment***

for

ACME Corporation

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**CONFIDENTIALITY**

All information contained within this proposal is Miles Consulting Corp confidential.

- Confidentiality Statement.....2
- Executive Summary.....3
- Sample Scenario.....4
- Virtualization Infrastructure Overview.....5
- Virtualization Readiness Assessment Goals.....7
- Server Inventory Summary.....8
- Exclusion Criteria.....10
- Consolidation Scenarios.....11
- Proposal.....12
- Total Cost of Ownership (TCO).....13
- Demonstration & Design Plan.....15
- Appendix A – Server Inventory.....16
- Appendix B – Additional Considerations.....17

## ***Executive Summary***

Our Virtualization Readiness Assessment explores and analyzes the impact of implementing virtualization technology in your organization's computer environment and how your company can benefit from it.

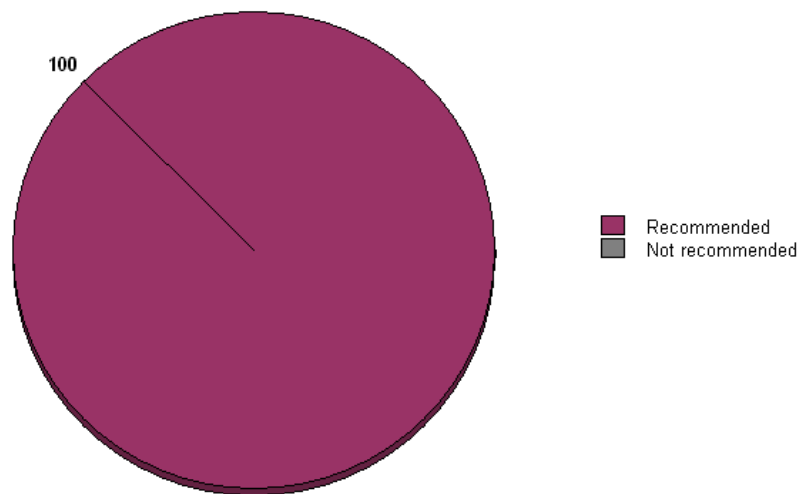
It analyses how your organization uses network and server resources, see how your servers utilize computer power and memory and how you can save money by maximizing your IT investment.

Consolidation of applications, resources and others are not part of this assessment, it only focuses on how to consolidate servers in a virtualization environment.

Our Virtualization Readiness Assessment used a combination of sophisticated data collection techniques which then were forwarded to our Virtualization Experts who reviewed the information and wrote a report based on the findings.

In our experience, we typically have found that most of computer environments do not use computer power to its maximum capacity, resources such as memory and CPU usage are underutilized so they can benefit by implementing virtualization infrastructure.

### **Computer Environments ideal for Virtualization**



**Computer Environments ideal for Virtualization**

## **Sample Scenario**

Let's pretend your organization has a computer environment with 26 servers. Your organization would benefit by deploying a virtualization infrastructure as follows:

- All of the 26 servers in the environment are candidates for virtualization
- ACME Corporation will benefit by reducing 77% of its servers
- 26 Servers can be consolidated in:
  - Two 2-way Servers configured with 32GB of RAM
  - For the purposes of this assessment we will be comparing the cost and value of 6 ESX servers to comparable traditional infrastructure.
- Save costs of up to \$58,508 per year on power and cooling by removing 4 racks
- Investment on virtualization can be returned in 2 years
- Hard Cost savings over a 3 year period would be \$435,834

# Virtualization Infrastructure Overview

## What is Virtualization?

Virtualization is a proven software technology that is rapidly transforming the IT landscape and fundamentally changing the way that people compute. Today's powerful x86 computer hardware was designed to run a single operating system and a single application. This leaves most machines vastly underutilized. Virtualization lets you run multiple virtual machines on a single physical machine, sharing the resources of that single computer across multiple environments. Different virtual machines can run different operating systems and multiple applications on the same physical computer.

## How Does Virtualization Work?

Virtualization software is used to transform or "virtualize" the hardware resources of an x86-based computer—including the CPU, RAM, hard disk and network controller—to create a fully functional virtual machine that can run its own operating system and applications just like a "real" computer. Each virtual machine contains a complete system, eliminating potential conflicts. Virtualization software works by inserting a thin layer of software directly on the computer hardware or on a host operating system. This contains a virtual machine monitor or "hypervisor" that allocates hardware resources dynamically and transparently. Multiple operating systems run concurrently on a single physical computer and share hardware resources with each other. By encapsulating an entire machine, including CPU, memory, operating system, and network devices, a virtual machine is completely compatible with all standard x86 operating systems, applications, and device drivers. You can safely run several operating systems and applications at the same time on a single computer, with each having access to the resources it needs when it needs them.

## Reduce Costs with a Virtual Infrastructure

Lower your capital and operational costs and improve operational efficiency and flexibility. Go beyond server consolidation and deploy a standard virtualization platform to automate your entire IT infrastructure. VMware customers have harnessed the power of virtualization to better manage IT capacity, provide better service levels, and streamline IT processes.

## **Benefits of Virtualization**

- Run multiple operating systems on a single computer including Windows, Linux and more.
- Let your Mac run Windows creating a virtual PC environment for all your Windows applications.
- Reduce capital costs by increasing energy efficiency and requiring less hardware and increasing your server to admin ratio
- Ensure your enterprise applications perform with the highest availability and performance
- Build up business continuity through improved disaster recovery solutions and deliver high availability throughout the datacenter
- Improve enterprise desktop management & control with faster deployment of desktops and fewer support calls due to application conflicts

# Virtualization Readiness Assessment Goals

Our Virtualization Readiness Assessment will help your organization to find out how it can take full advantage of implementing virtualization technology by consolidating servers thus maximizing computer power and minimizing costs.

Also, when your organization gets our Virtualization Readiness Assessment, ACME Corporation will:

- Conclude which servers are ideal to be migrated into virtual machines
- Comprehend server utilization and performance of 26 servers according to ACME Corporation specifications
- Get counsel and guidance through the whole virtualization migration process.
- Get Total Cost of Ownership (TCO) for implementing virtualization technology.

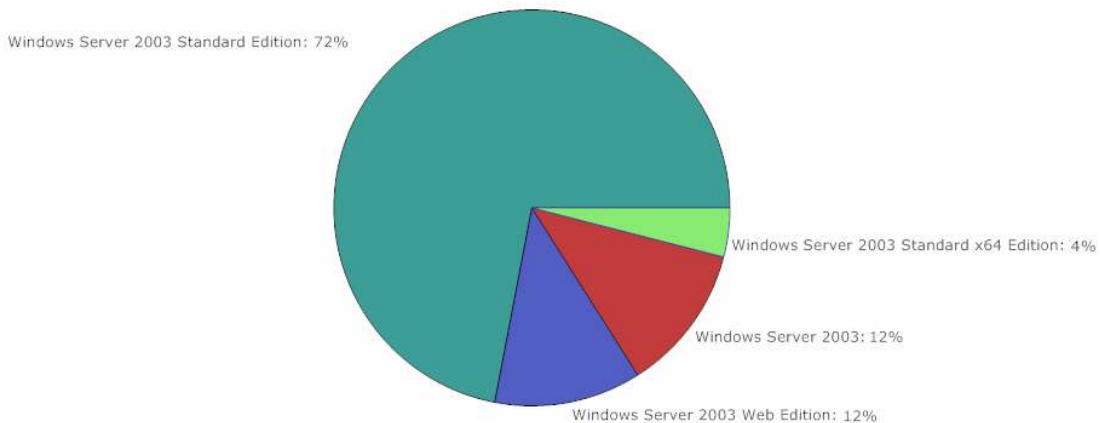
## Server Inventory Summary

The following is a server of server inventory. For a detailed server inventory, please see Appendix A.

### Processor Analysis

CPUs per Server	Servers
1	9
2	16
4	1
<b>Total of servers</b>	<b>26</b>

### Operating System Analysis



### Operating System analysis

As shown in the pie chart above, our assessment shows that most of the computers in your organization are running Microsoft Windows Server 2003 Standard Edition. You should really take into consideration licensing Windows Server Datacenter Edition to take advantage of its unlimited and downgrade rights.

The following table shows the number of instances allowed per Operating System License:

Operating System	Allowed Instances on a single server	
	In physical environment	In virtual environment
Windows Server 2008 Standard	1	1
Windows Server 2008 Enterprise	1	4
Windows Server 2008 Datacenter	Unlimited	
Windows Small Business Server 2008 Standard	1 or 1	
Windows Server 2003 for Small Business	1 or 1	

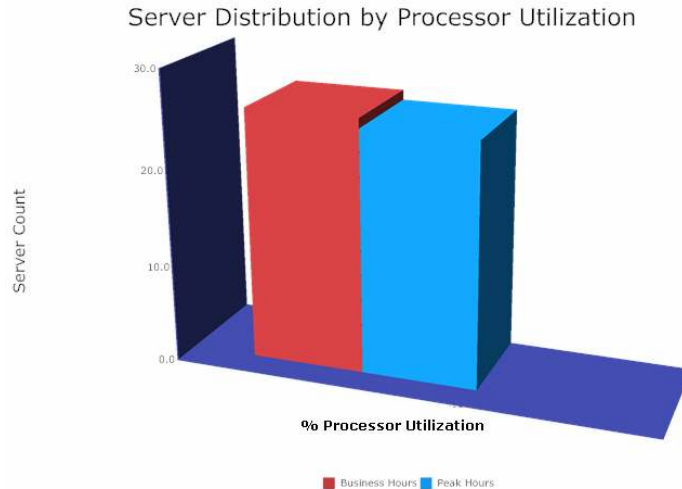
**Note:** When running the maximum of permitted instances, the instance in the physical environment should be only used to run operating system services, run software for virtualization. Uses other than the ones mentioned above (i.e. running applications) are not allowed.

According to Microsoft Product Uses Rights (October 2008):

***"You may run on the licensed server an instance of Standard or Enterprise in place of Datacenter and Datacenter without Hyper-V in any of the operating system environments."***

## Utilization Analysis

The following chart shows the utilization of server usage at Peak hours. All of the monitored servers reported less than 60% of utilization during business hours. These findings suggest that all (100%) of the assessed servers are ideal candidates for server consolidation by deploying virtualization environments.



**Server Distribution by Processor Utilization**

## Exclusion Criteria

No Systems were excluded due to the following systems requirements. Systems were excluded from virtualization based the cumulative effect of meeting one or more of the following Exclusion Criteria.

1. Memory utilization greater that 64 GB.
  - a. Each virtual machine can be configured to a maximum of 64 GB of RAM.
  
2. To allow room for growth any system that on average required more than 64 GB of memory was excluded 2. Computing power (Mhz) greater than 3000 Mhz
  - a.  $((CS*CN)*AU)$
  - b. CS=CPU Speed in Mhz of virtualization candidate
  - c. CN=Number of CPU's in virtualization candidate
  - d. AU=Percent Average Utilization of virtualization candidate
  - e. Example;  $((1200[Mhz]*2[CPUs])*80[% \text{ utilization}])=1920 \text{ Mhz}$
  
3. Network usage greater than 300 Mb/sec 4. Disk IOPs greater than 2000
  - a. Although Disk IOPs alone are not true measure of disk performance, high IOPs raises a flag that more investigation into performance should be performed.

## Consolidation Scenarios

Since 100% of the analyzed servers are part of one domain on the same site, 26 servers will be considered for these consolidation scenarios.

Numerous servers were determined as ideal candidates for virtualization consolidation. We also discovered that Server X, which is configured with 32GBS of RAM was selected to consolidate the target servers. This server is also equipped with AMD Quad Core CPUs.

Server name	# CPUs	Speed	RAM	Network Card Speed	Mhz Load	RAM Load	Disk I/O
Himalaya-1	4	3000	32768	400	9.60%	26.23%	485.44
Himalaya-2	4	3000	32768	400	23.05%	48.91%	611.1

Server Name	Migrated to	Server Name	Migrated to
EMAIL1	Himalaya-1	VOIPSERV1	Himalaya-2
FTP1	Himalaya-1	EMAIL4	Himalaya-2
FILESERV1	Himalaya-1	WEB3	Himalaya-2
VOIPSERV2	Himalaya-1	DB1	Himalaya-2
PRINTSERV4	Himalaya-1	PRINTSERV3	Himalaya-2
DB3	Himalaya-1	VS3	Himalaya-2
WEB2	Himalaya-1	FILESERV2	Himalaya-2
PRINTSERV1	Himalaya-1	FTP2	Himalaya-2
FTP3	Himalaya-1	EMAIL2	Himalaya-2
DB2	Himalaya-1	VOIPSERV3	Himalaya-2
FILESERV3	Himalaya-1	VS1	Himalaya-2
FTP4	Himalaya-1	PRINTSERV2	Himalaya-2
VS2	Himalaya-1	WEB1	Himalaya-2

## Proposal

Our Virtualization Readiness Assessment Professionals' opinion is that ACME Corporation is able to start deploying a virtualization infrastructure using a moderate approach. By doing so, savings and costs will be very significant.

The biggest cost savings could be realized from not having to replace 26 servers coming off lease warranty through in 2008. And/or having to buy extended warranties for those servers while they are being replaced over a two year period. Additional cost savings would come from reduced power and cooling requirements. Additional feature benefits provided by virtualization are high availability, redundancy, and disaster recovery. The recommended server platform that would achieve the highest consolidation ratios in conjunction with providing the best resource utilization would consist of (2) Servers configured with 32GB's of RAM

Server name	# CPUs	Speed	RAM	Network Card Speed	Mhz Load	RAM Load	Disk I/O
Himalaya-1	4	3000	32768	400	9.60%	26.23%	485.44
Himalaya-2	4	3000	32768	400	23.05%	48.91%	611.1

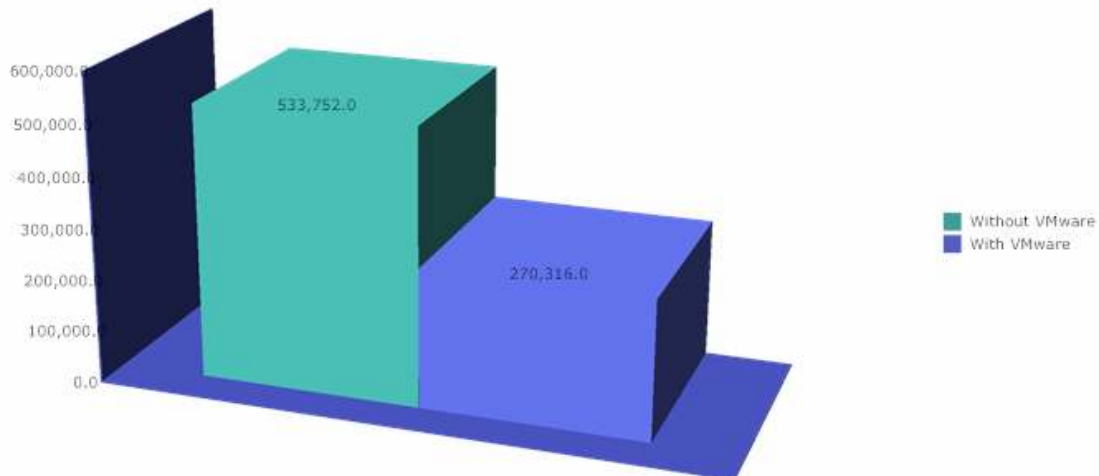
## Total Cost of Ownership

This is a projection of a 3 year TCO was computed refresh cycle for servers, Along with this TCO includes a ROI analysis that will compare costs of implementing a Virtual Environment using VMware technologies to those costs of a typical 1 physical server.

These costs include implementation, maintenance and optimization of 6 ESX server. Note that this is more than the minimum server requirements of 2 so we can duplicate ACME Corporation's IT strategy.

Direct Costs	Without VMware	With VMware	Savings
VMware Services	\$ -	\$ 11,840.00	-\$ 11,840.00
VMware Software & Support	\$ -	\$ 69,126.00	-\$ 69,126.00
Third Party Software & Support	\$ -	\$ 11,600.00	-\$ 11,600.00
Server Hardware	\$ 312,000.00	\$ 70,427.00	\$ 241,573.00
Network Costs	\$ 15,600.00	\$ 5,600.00	\$ 10,000.00
SAN Costs	\$ -	\$ 80,632.00	-\$ 80,632.00
<b>Total Directs Costs</b>	<b>\$ 327,600.00</b>	<b>\$ 249,225.00</b>	<b>\$ 78,375.00</b>
Indirect Costs			
Data Center	\$ 193,100.05	\$ 17,577.00	\$ 175,523.00
Server Administration	\$ 13,052.00	\$ 3,514.00	\$ 9,538.00
<b>Total Indirect Costs</b>	<b>\$ 206,152.05</b>	<b>\$ 21,091.00</b>	<b>\$ 185,061.00</b>
<b>Total Cost of Ownership</b>	<b>\$ 533,752.00</b>	<b>\$ 270,316.00</b>	<b>\$ 263,436.00</b>

3-year Total Cost of Ownership Comparison



3-Year Total Cost of Ownership Comparison

<b>Return on Investment</b>			
<b>Investments</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>
VMware Services	\$ 14,400.00	\$ -	\$ -
VMware Software & Support	\$ 69,126.00	\$ 9,877.00	\$ 9,877.00
Third Party Software & Support	\$ 11,600.00	\$ -	\$ -
Server Hardware	\$ 70,427.00	\$ -	\$ -
Network Costs	\$ 6,400.00	\$ -	\$ -
SAN Costs	\$ 80,632.00	\$ -	\$ -
<b>Total Investments</b>	<b>\$ 252,585.00</b>	<b>\$ 9,877.00</b>	<b>\$ 9,877.00</b>
<b>Savings</b>			
Server Hardware	\$ 33,573.00	\$ 104,000.00	\$ 104,000.00
Network Costs	\$ 9,200.00	\$ -	\$ -
Data Center	\$ 58,508.00	\$ 58,508.00	\$ 58,508.00
Server Administration	\$ 3,179.00	\$ 3,179.00	\$ 3,179.00
<b>Total Savings</b>	<b>\$ 104,460.00</b>	<b>\$ 165,687.00</b>	<b>\$ 165,687.00</b>
<b>Total Cumulative Investments</b>	<b>\$ 252,584.00</b>	<b>\$ 262,461.00</b>	<b>\$ 272,338.00</b>
<b>Total Cumulative Savings</b>	<b>\$ 104,460.00</b>	<b>\$ 270,147.00</b>	<b>\$ 435,834.00</b>
<b>Total Return On Investment</b>	<b>41%</b>	<b>103%</b>	<b>160%</b>

## Demonstration & Design Plan

Now our Virtualization Readiness Assessment Experts will provide with a demonstration for ACME Corporation This demonstration will give you a better idea and understanding of how a Virtual Environment works in ACME Corporation's Computer Environment, validate it that it can actually works and show you how your organization will benefit by deploying a Virtual Infrastructure

After successfully showing you the demo, whether you determine it is not necessary to deploy it in your organization or not, our Virtualization Consultants will discuss and help you to build a Virtualization Infrastructure Design Plan:

1. Virtual Infrastructure Assessment
2. Physical Design
  - a. Virtual Infrastructure Diagrams
  - b. Server Hardware
  - c. Networking
  - d. Storage
3. Logical Design
4. Naming Conventions
5. Virtual Machines
6. Server Provisioning
7. Migrations – Physical to Virtual
8. Security Management
9. High Availability
10. Monitoring
11. Maintenance
12. Backup/Restore and Disaster Recovery
13. Service Level Agreements
14. Problem Management
15. Performance Management
16. Capacity Planning
17. Change Control
18. Software Distribution & Patch Management
19. Asset Management
20. Version & Release Management
21. Chargeback
22. Training
23. Implementation Plan
24. Complementary Product Overviews
25. Best Practices

## Appendix A – Server Inventory

The following table lists all the servers that were used to perform the Virtualization Readiness Assessment, along with their configuration and resources. We based our recommendations and scenarios on this group of servers.

Server	CPUs	CPU Speed	Mhz	RAM (MBs)	Disk Size (GB)	NIC (Mbs)	Power (watts)	Cooling (BTU/hr)
FTPSERV1	1	2992	2992	512	43	N/A	N/A	N/A
VS4	1	3000	3000	1024	80	2000	236.9	808.3
EMAIL1	2	2992	5984	2048	73	2000	442.4	1509.5
PRINTSERV6	2	2788	5576	2048	36	1000	541.6	1847.9
WEBSERV2	2	3056	6112	2048	109	1000	541.6	1847.9
EMAIL10	2	2992	5984	4096	513	2000	713.9	2435.8
VS6	4	2993	11972	8192	1296	N/A	878	2995.7
FTPSERV7	2	2992	5984	4096	586	2000	713.9	2435.8
PRINTSERV8	2	2793	5586	2048	109	2000	507.9	1733
EMAIL2	2	2990	5980	4096	440	N/A	900	3070.8
WEBSERV1	2	2992	5984	2048	146	N/A	511.6	1745.6
VS9	1	3391	3391	1024	80	2000	N/A	N/A
WEBSERV9	2	2793	5586	2048	989	1000	457.6	1561.3
PRINTSERV6	1	2991	2991	1024	17	N/A	N/A	N/A
FTPSERV10	1	2992	2992	1024	17	N/A	N/A	N/A
WEBSERV4	2	2793	5586	4096	182	2000	507.9	1733
EMAIL3	2	2992	5984	4096	292	N/A	495.1	1689.3
FTPSERV8	1	2992	2992	1024	120	1000	N/A	N/A
WEBSERV6	1	2992	2992	1024	120	1000	N/A	N/A
PRINTSERV5	1	2992	2992	1024	120	1000	N/A	N/A
VS5	1	2992	2992	384	17	1000	N/A	N/A
WEBSERV3	2	2992	5984	2048	73	200	442.4	1509.5
PRINTSERV9	2	2992	5984	2048	73	2000	442.4	1509.5
EMAIL4	2	2992	5984	2048	73	2000	442.4	1509.5
FTPSERV2	2	2793	5586	1024	73	2000	507.9	1733
VS3	2	2793	5586	2048	214	2000	713.9	2435.8

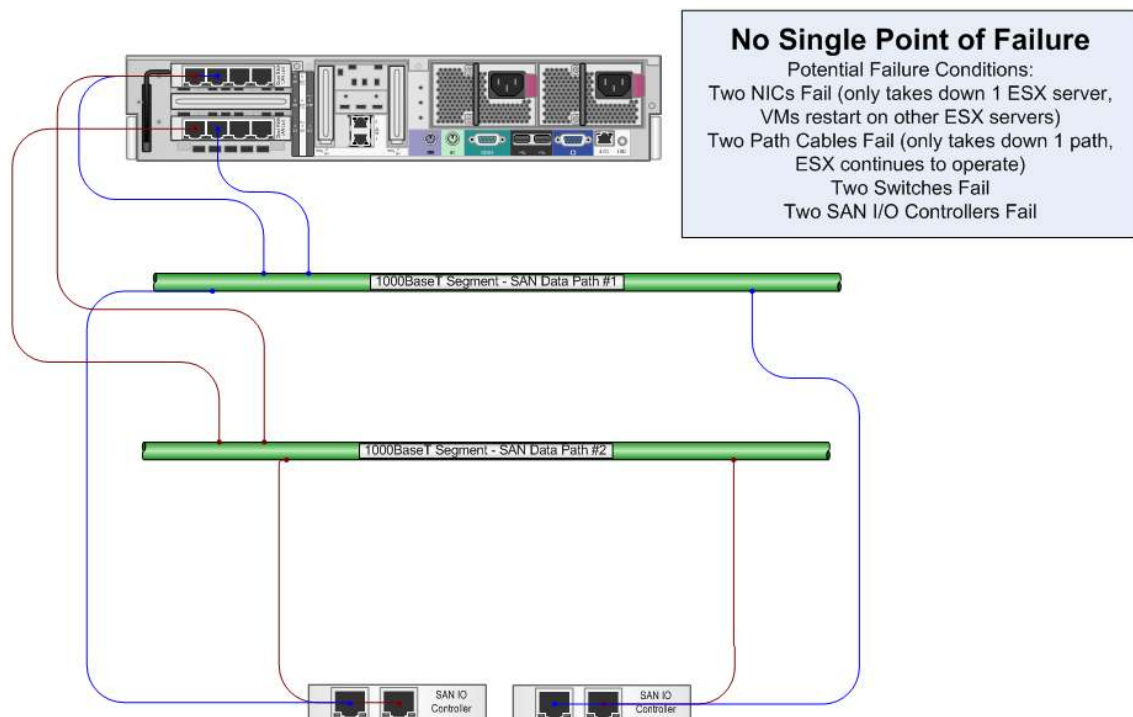
## Appendix B – Additional Considerations

### Storage Area Network (SAN) Assessment & Recommendations

A SAN is not a requirement to start the process of server consolidation through virtualization. However, a SAN is a requirement to take advantage of certain high-level functions of VMware, such as VMotion, and to fully realize the capabilities in regards to disaster recovery and business continuance.

It is recommended that a SAN be used in conjunction with a virtual infrastructure implementation. The diagram below depicts a typical HA SAN configuration where there exists no single point of failure on the storage communication paths.

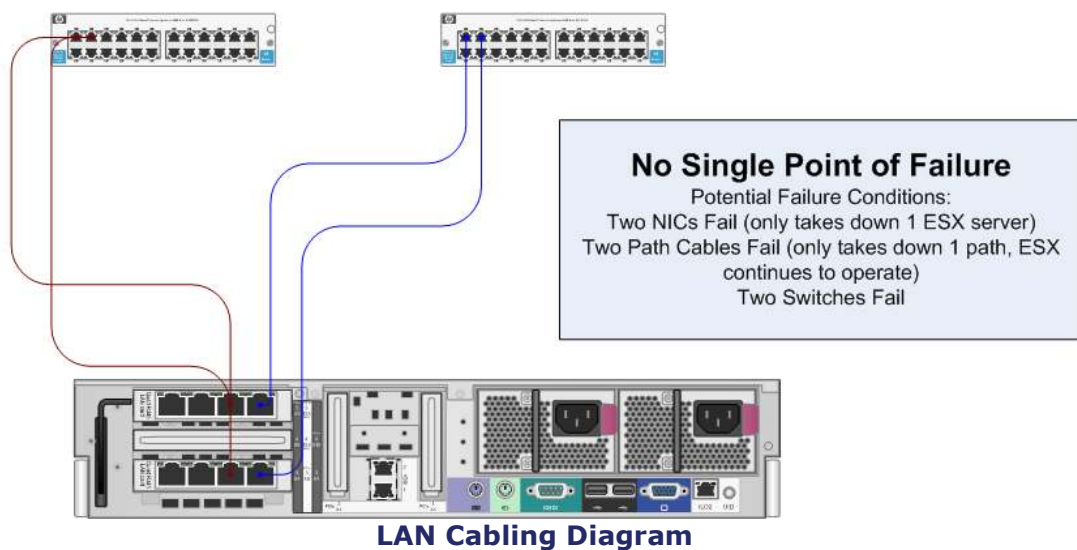
### SAN Cabling Diagram – Redundant Paths to 2 Data Paths



## Network Assessment

Multiple independent networks, NIC bonding, and virtual switches are commonly implemented in a virtual infrastructure. Additionally, high performance gigabit capacity is required to perform such higher functions such as VMotion. The diagram below depicts a typical HA network configuration.

## LAN Cabling Diagram – Redundant Paths to Multiple Switches



## Deployment and Migration

The deployment of the virtual infrastructure should be approached as a structured effort in order to insure success. There are two primary components to a virtual infrastructure deployment; installation of new infrastructure and migration of current physical servers to the virtual infrastructure. Often, when existing server platforms are going to be re-deployed in the virtual infrastructure, virtual machine server states are moved from host to host to support the transition effort. Specifically, the following major areas must be addressed to insure a successful migration and deployment:

- Virtual Infrastructure design blueprint
- Virtual Infrastructure jumpstart
- Physical to Virtual (P2V) migration services
- Best practices knowledge transfer

## Training Requirements

Virtual Infrastructure will effect every employee in the IS department. The levels of interaction will be different for each group.

Group	Interaction Type	Recommended Training
Network Engineers/Network Specialist	Virtual Infrastructure engineering and administration	VMware Authorized training; Virtual Infrastructure with ESX Server and VirtualCenter Shadow training with Miles Consulting Corp
DBAs	Virtual Machine users. Rarely need console access, primary using application tools and Terminal Services.	Onsite admin training session by Miles Consulting Corp
Operations	Virtual Machine administration, reboots, backups, server administration	Onsite admin training session by Miles Consulting Corp. Shadow training.
Software Engineers/Developers	Virtual Machine users. Rarely need console access, primary using application tools and Terminal Services. Potentially may use console tools to manage snapshots or undoable disks.	Onsite admin training session by Miles Consulting Corp Virtualization Professionals. Ongoing support by MCC Virtualization Specialists.
Technical Support	Virtual Machine users. Rarely need console access, primary using application tools and Terminal Services.	Onsite admin training session by MCC Virtualization Experts