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### Flash Research Paper #3: Virtualization and Cloud Computing

As a manufacturing company we have grown rapidly over the past few years, but imagine how much more our business can expand with a \$9,200,000 savings in just three years. With the start of a hardware refresh cycle, we should consider implementing virtual machines (VM), rather than physical machines, in our datacenter because of the considerable cost benefits. VMs can consolidate the 1000 physical servers we are currently operating, to only 200 physical servers and 80 virtual machines – reducing the initial hardware costs by 36% and the yearly maintenance costs by 32%.

Our current physical machines individually host different operating systems (OS) and applications that must run separately from one another; however, sourcing so many physical machines is a problem because they are costly, spacious, and inefficient. On the other hand, virtual machines contain *one* physical machine, called the host machine, with *multiple* virtual servers, called guest servers. Virtual machines consolidate multiple operating systems and applications into one physical server, allowing the OS and applications to run simultaneously on one machine. Each virtual machine can operate 10 virtual servers. By consolidating 80% of the servers in our datacenter we can decrease our number of physical servers to 200, and purchase 80 virtual machines to host 800 virtual servers. Consolidation will enable us to host the same number of operating systems and applications required to operate our business successfully and realize the benefits of lower operating costs.

Switching from physical machines to virtual machines will save our company \$9,200,000 over three years. The hardware for each virtual machine costs \$16,000 and the yearly maintenance will cost \$3,000; however, since there are 80% fewer machines, we are spending \$4,800,000 over three years, instead of \$14,000,000 that would be required to reinstall only physical machines. By using virtualization to consolidate servers we can reduce our overall hardware costs and yearly maintenance costs by 66% resulting in an annual savings of \$1,360,000.

## Attachment 1: Cost Breakdown

Option 1 - Replace AS IS	
# physical servers	1000
cost per server	\$8,000.00
yearly maintenance per server	\$2,000.00
<b>Total hardware cost</b>	<b>\$8,000,000.00</b>
<b>Total yearly cost</b>	<b>\$2,000,000.00</b>
Option 2 - Upgrade with Virtualization	
Total servers	1000
Total physical servers	200
Total virtual servers	800
Total physical machines	200
Total virtual machines	80
Cost per physical machine	\$8,000.00
cost per virtual machine	\$16,000.00
<b>Total hardware cost</b>	<b>\$2,880,000.00</b>
Yearly maint. (physical)	\$2,000.00
Yearly maint. (virtual)	\$3,000.00
<b>Total yearly maintenance</b>	<b>\$640,000.00</b>

## Attachment 2: 3-Year Cost-Benefit Breakdown

3 Year Cost - Benefit Breakdown					
Option 1		Year 1	Year 2	Year 3	
	Hardware costs	\$8,000,000.00	\$0.00	\$0.00	
	Yearly Maintenance	\$2,000,000.00	\$2,000,000.00	\$2,000,000.00	
	<b>Total cost</b>	<b>\$10,000,000.00</b>	<b>\$2,000,000.00</b>	<b>\$2,000,000.00</b>	<b>\$14,000,000.00</b>
Option 2		Year 1	Year 2	Year 3	
	Hardware costs	\$2,880,000.00	\$0.00	\$0.00	
	Yearly Maintenance	\$640,000.00	\$640,000.00	\$640,000.00	
	<b>Total cost</b>	<b>\$3,520,000.00</b>	<b>\$640,000.00</b>	<b>\$640,000.00</b>	<b>\$4,800,000.00</b>
				Net Benefit	<b>\$9,200,000.00</b>

## Attachment 3: Return on Investment

$$\text{ROI} = \frac{(\text{gain from investment} - \text{cost of investment})}{\text{cost of investment}}$$

$$\text{ROI} = \frac{(\$9,200,000 - \$4,800,000)}{\$4,800,000}$$

$$\text{ROI} = 92\%$$

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