

Constants and Shared Variables WorkSheet			
Constants			
8760	hoursInAYear		number of hours in 1 year (24 hrs/day * 365 days/yr)
12	monthsInAYear		number of months in a year
52	weeksInAYear		number of weeks in a year
365	daysInAYear		number of days in 1 year
1000	wattsInAKilowatt		number of watts in one kilowatt
24	hoursInARealDay		
Shared Variables	These are not constants but are variables which are shared across both scenarios		
\$100.00	administrativeCostPerHourYear1		cost of administrative time per hour in year 1
0.02	administrativeRateIncrease		administrative pay increase amount
\$3,000.00	securityFirmMonthlyCharge		cost per month for security auditing service - outside vendor
\$5,000.00	dataStorageMonthlyChargeYears1And2		cost per month for storing archival backups - years 1 & 2 - outside vendor
\$8,000.00	dataStorageMonthlyChargeYears3Thru5		cost per month for storing archival backups - years 3,4 5 - outside vendor
1.03	serverMaintenanceRateIncrease		assume 3% increase in server maintenance cost each year of study
\$0.13	costkwHYear1		cost of 1 kWh or power in year 1
1.02	powerRateIncrease		assume 2% increase in cost of power/year of study
10	hoursInADay		number of hours in 1 administrative day
70	hoursInAWeek		number of hours in 1 administrative week

Variables Used In The Current Scenario Spreadsheet			
Hard Costs			
	Value	Variable Name	Variable Description
	25000	numServersGroup1	Group1A consists of this many servers
	9000	numServersGroup2	Group 2 consists of this many servers
	100	numServersGroup3	Group 3 consists of this many servers
	700	numServersGroup4A	Group 4A consists of this many servers - backup servers
	200	numServersGroup4B	Group 4B consists of this many servers - backup servers
	3800	serverPowerGroup1	power in watts of the servers in group 1
	4400	serverPowerGroup2	power in watts of the servers in group 2
	2800	serverPowerGroup3	power in watts of the servers in group 3
	3800	serverPowerGroup4A	power in watts of the servers in group 4A
	3300	serverPowerGroup4B	power in watts of the servers in group 4B
	0.15	serverLoadGroup1	average load of the servers in group 1
	0.1	serverLoadGroup2	average load of the servers in group 2
	0.02	serverLoadGroup3	average load of the servers in group 3
	0.01	serverLoadGroup4A	average load of servers in group 4A
	0.01	serverLoadGroup4B	average load of servers in group 4B
	\$900.00	maintenanceCostYear1Group1	cost of maintenance contract year 1/100 servers in group 1
	\$1,200.00	maintenanceCostYear1Group2	cost of maintenance contract year 1/100 servers in group 2
	\$500.00	maintenanceCostYear1Group3	cost of maintenance contract year 1 - servers in group 3
	\$110.00	maintenanceCostYear1Group4A	cost of maintenance contract year 1/100 servers in group 4A
	\$100.00	maintenanceCostYear1Group4B	cost of maintenance contract year 1/100servers in group 4B
	250.00	costUnitsGroup1	25000 servers in group 1 - $25000/100 = 250$
	90.00	costUnitsGroup2	9000 servers in group 2
	1.00	costUnitsGroup3	flat rate = 1 cost unit for group 3
	7.00	costUnitsGroup4A	700 servers in group 4A
	2.00	costUnitsGroup4B	200 servers in group 4B
Soft Costs			
	Value	Variable Name	Variable Description
	2.30	weeksAdministrativeTimeGroup1	weeks of administrative time per server Group 1
	3.10	weeksAdministrativeTimeGroup2	weeks of administrative time per server Group 2
	1.00	weeksAdministrativeTimeGroup3	weeks of administrative time per server Group 3
	0.70	weeksAdministrativeTImeGroup4A	weeks of administrative time per server Group 4A
	0.50	weeksAdministrativeTImeGroup4B	weeks of administrative time per server Group 4B
	0.75	hoursPerBackupGroup1	hours per backup of server in Group 1
	1.25	hoursPerBackupGroup2	hours per backup of server in Group 2
	2.25	hoursPerBackupGroup3	hours per backup of server in Group 3
	0.50	hoursPerBackupGroup4A	hours per backup of server in Group 4A
	0.50	hoursPerBackupGroup4B	hours per backup of server in Group 4B
	365.00	numberOfBackupsPerYearGroup1	number of backups performed on servers in Group 1 in 1 year
	365.00	numberOfBackupsPerYearGroup2	number of backups performed on servers in Group 2 in 1 year
	52.00	numberOfBackupsPerYearGroup3	number of backups performed on servers in Group 3 in 1 year
	26.00	numberOfBackupsPerYearGroup4A	number of backups performed on servers in Group 4A in 1 year
	26.00	numberOfBackupsPerYearGroup4B	number of backups performed on servers in Group 4B in 1 year

## Current Scenario Yearly Costs

Category	Cost					5 Year Totals
	Year 1	Year 2	Year 3	Year 4	Year 5	
<b>Hard Costs</b>						
Power - Group 1	\$16,227,900.00	\$16,552,458.00	\$16,883,507.16	\$17,221,177.30	\$17,565,600.85	\$84,450,643.31
Power - Group 2	\$4,509,648.00	\$4,599,840.96	\$4,691,837.78	\$4,785,674.53	\$4,881,388.03	\$23,468,389.30
Power - Group 3	\$6,377.28	\$6,504.83	\$6,634.92	\$6,767.62	\$6,902.97	\$33,187.62
Power - Group 4A	\$30,292.08	\$30,897.92	\$31,515.88	\$32,146.20	\$32,789.12	\$157,641.20
Power - Group 4B	\$7,516.08	\$7,666.40	\$7,819.73	\$7,976.12	\$8,135.65	\$39,113.98
<b>Total Power Costs/Year</b>	20,781,733.44	21,197,368.11	21,621,315.47	22,053,741.78	22,494,816.62	\$108,148,975.42
Server Maintenance - Group 1	\$225,000.00	\$231,750.00	\$238,702.50	\$245,863.58	\$253,239.48	\$1,194,555.56
Server Maintenance - Group 2	\$108,000.00	\$111,240.00	\$114,577.20	\$118,014.52	\$121,554.95	\$573,386.67
Server Maintenance - Group 3	\$500.00	\$515.00	\$530.45	\$546.36	\$562.75	\$2,654.57
Server Maintenance - Group 4A	\$770.00	\$793.10	\$816.89	\$841.40	\$866.64	\$4,088.03
Server Maintenance - Group 4B	\$200.00	\$206.00	\$212.18	\$218.55	\$225.10	\$1,061.83
<b>Total Server Maintenance Costs/Year</b>	\$334,470.00	\$344,504.10	\$354,839.22	\$365,484.40	\$376,448.93	\$1,775,746.65
Security Auditing Costs	\$36,000.00	\$36,000.00	\$36,000.00	\$36,000.00	\$36,000.00	\$180,000.00
Archival/Storage Costs	\$60,000.00	\$60,000.00	\$96,000.00	\$96,000.00	\$96,000.00	\$408,000.00
<b>Total Yearly Hard Costs</b>	\$21,212,203.44	\$21,637,872.21	\$22,108,154.69	\$22,551,226.18	\$23,003,265.55	\$110,512,722.07
<b>Total Five Year Hard Costs =</b>	\$110,512,722.07					
<b>Soft Costs</b>						
Server Administration - Group 1	\$402,500,000.00	\$410,550,000.00	\$418,761,000.00	\$427,136,220.00	\$435,678,944.40	\$2,094,626,164.40
Server Administration - Group 2	\$195,300,000.00	\$199,206,000.00	\$203,190,120.00	\$207,253,922.40	\$211,399,000.85	\$1,016,349,043.25
Server Administration - Group 3	\$700,000.00	\$714,000.00	\$728,280.00	\$742,845.60	\$757,702.51	\$3,642,828.11
Server Administration - Group 4A	\$3,430,000.00	\$3,498,600.00	\$3,568,572.00	\$3,639,943.44	\$3,712,742.31	\$17,849,857.75
Server Administration - Group 4B	\$700,000.00	\$714,000.00	\$728,280.00	\$742,845.60	\$757,702.51	\$3,642,828.11
<b>Total Server Administration Costs/Year</b>	\$602,630,000.00	\$614,682,600.00	\$626,976,252.00	\$639,515,777.04	\$652,306,092.58	\$3,136,110,721.62
Server Backup - Group 1	\$6,843,750.00	\$6,980,625.00	\$7,120,237.50	\$7,262,642.25	\$7,407,895.10	\$35,615,149.85
Server Backup - Group 2	\$4,106,250.00	\$4,188,375.00	\$4,272,142.50	\$4,357,585.35	\$4,444,737.06	\$21,369,089.91
Server Backup - Group 3	\$11,700.00	\$11,934.00	\$12,172.68	\$12,416.13	\$12,664.46	\$60,887.27
Server Backup - Group 4A	\$9,100.00	\$9,282.00	\$9,467.64	\$9,656.99	\$9,850.13	\$47,356.77
Server Backup - Group 4B	\$2,600.00	\$2,652.00	\$2,705.04	\$2,759.14	\$2,814.32	\$13,530.50
<b>Total Server Backup Costs/Year</b>	\$10,973,400.00	\$11,192,868.00	\$11,416,725.36	\$11,645,059.87	\$11,877,961.06	\$57,106,014.29
<b>Total Yearly Soft Costs</b>	\$613,603,400.00	\$625,875,468.00	\$638,392,977.36	\$651,160,836.91	\$664,184,053.65	\$3,193,216,735.91
<b>Total Five Year Soft Costs =</b>	\$3,193,216,735.91					
<b>Total Current Cost/Year</b>	\$634,815,603.44	\$647,513,340.21	\$660,501,132.05	\$673,712,063.09	\$687,187,319.19	\$3,303,729,457.98
<b>Total 5 Year Current Cost</b>	\$3,303,729,457.98					

Variables Used In The Proposed Scenario Spreadsheet			
<b>Hard Costs</b>			
	Value	Variable Name	Variable Description
	\$45,000.00	costNewGroup1Server	cost of a new group 1 server
	\$5,400.00	year1Group1ServerMaintenance	first year service maintenance cost for server in group 1
	\$40,000.00	costNewGroup2Server	cost of a new group 2 server
	\$4,800.00	year1Group2ServerMaintenance	first year service maintenance cost for server in group 2
	\$20,000.00	costNewGroup3Server	cost of a new group 3 server
	\$2,400.00	year1Group3ServerMaintenance	first year service maintenance cost for server in group 3
	\$23,000.00	costNewGroup4Server	cost of a new group4 server
	\$2,760.00	year1Group4ServerMaintenance	first year service maintenance cost for server in group 4
	2500	numNewServersGroup1	number of new physical servers in Group 1
	10000	numVirtualServersGroup1	number of virtualized servers in Group 1
	940	numNewServersGroup2	number of new physical servers in Group 2
	4000	numVirtualServersGroup2	number of virtualized servers in Group 2
	10	numNewServersGroup3	number of new physical servers in Group 3
	30	numVirtualServersGroup3	number of virtualized servers in Group 3
	50	numNewServersGroup4	number of new physical servers in Group 4
	300	numVirtualServersGroup4	number of virtualized servers in Group 4
	425	newServerPowerGroup1	power in watts of a server in group 1
	300	newServerPowerGroup2	power in watts of a server in group 2
	162	newServerPowerGroup3	power in watts of a server in group 3
	54	newServerPowerGroup4	power in watts of a server in group 4
	\$4,500.00	virtualizationSoftwareCost	cost in dollars for virtualization software for 1 server.
	0.15	virtualizationSoftwareMaintenanceRate	% of original cost to maintain virtualization software
	\$5,500.00	trainingCostPerEmployee	cost per year to train one employee on virtualized system
	4	empsTrainedYears1And2	number of employees trained in years 1 and 2 of the study
	2	empsTrainedYears3Thru5	number of employees trained in years 3 through 5 of the study
<b>Soft Costs</b>			
	Value	Variable Name	Variable Description
	0.4	adminCostOnVirtualServer	percentage of regular admin cost associated with a virtual server
	3	weeksAdminTimeNewServers	
	0.12	year1ServerMaintenanceContractPercentage	
	1	backupTimeGroup1V	hours per backup of physical servers + virtual servers - Group 1
	1	backUpTimeGroup2V	hours per backup of physical servers + virtual servers - Group 2
	1	backUpTimeGroup3V	hours per backup of physical servers + virtual servers - Group 3
	1.5	backupTimeGroup4V	hours per backup of physical servers + virtual servers - Group 4
	365	numberOfBackUpsGroup1V	number of backup of physical servers + virtual servers per year - Group 1
	365	numberOfBackUpsGroup2V	number of backup of physical servers + virtual servers per year - Group 2
	365	numberOfBackUpsGroup3V	number of backup of physical servers + virtual servers per year - Group 3
	52	numberOfBackUpsGroup4V	number of backup of physical servers + virtual servers per year - Group 4

Virtualized Infrastructure Yearly Costs - Proposed Project Costs						
Category	Cost					5 Year Totals
	Year 1	Year 2	Year 3	Year 4	Year 5	
<strong>Hard Costs</strong>						
Machine Purchases	151,450,000.00					151,450,000.00
Software Purchases	15,750,000.00					15,750,000.00
Software Maintenance	2,362,500.00	2,362,500.00	2,362,500.00	2,362,500.00	2,362,500.00	11,812,500.00
Power - Group 1	1,209,975.00	1,234,174.50	1,258,857.99	1,284,035.15	1,284,035.15	6,271,077.79
Power - Group 2	321,141.60	327,564.43	334,115.72	340,798.04	347,614.00	1,671,233.78
Power - Group 3	1,844.86	1,881.75	1,919.39	1,957.78	1,996.93	9,600.70
Power - Group 4	3,074.76	3,136.26	3,198.98	3,262.96	3,328.22	16,001.17
Server Maintenance - Group 1	13,500,000.00	13,905,000.00	14,322,150.00	14,751,814.50	15,194,368.94	71,673,333.44
Server Maintenance - Group 2	4,512,000.00	4,647,360.00	4,786,780.80	4,930,384.22	5,078,295.75	23,954,820.77
Server Maintenance - Group 3	24,000.00	24,720.00	25,461.60	26,225.45	27,012.21	127,419.26
Server Maintenance - Group 4	138,000.00	142,140.00	146,404.20	150,796.33	155,320.22	732,660.74
Training	22,000.00	22,000.00	11,000.00	11,000.00	11,000.00	77,000.00
Security Auditing Costs	36,000.00	36,000.00	36,000.00	36,000.00	36,000.00	180,000.00
Archival/Storage Costs	60,000.00	60,000.00	96,000.00	96,000.00	96,000.00	408,000.00
<strong>Total Yearly Hard Costs</strong>	<strong>189,390,536.22</strong>	<strong>22,766,476.94</strong>	<strong>23,384,388.68</strong>	<strong>23,994,774.42</strong>	<strong>24,597,471.41</strong>	<strong>284,133,647.66</strong>
<strong>Total Five Year Hard Costs</strong>	<strong>284,133,647.66</strong>					
<strong>Soft Costs</strong>						
Server Administration Group 1 - Physical	52,500,000.00	53,550,000.00	54,621,000.00	55,713,420.00	56,827,688.40	273,212,108.40
Server Admin Group 1 - Virtual Systems	84,000,000.00	85,680,000.00	87,393,600.00	89,141,472.00	90,924,301.44	437,139,373.44
Server Administration Group 2 - Physical	19,740,000.00	20,134,800.00	20,537,496.00	20,948,245.92	21,367,210.84	102,727,752.76
Server Admin Group 2 - Virtual Systems	33,600,000.00	34,272,000.00	34,957,440.00	35,656,588.80	36,369,720.58	174,855,749.38
Server Administration Group 3 - Physical	210,000.00	214,200.00	218,484.00	222,853.68	75,770.25	941,307.93
Server Admin Group 3 - Virtual Systems	252,000.00	257,040.00	262,180.80	267,424.42	272,772.90	1,311,418.12
Server Administration Group 4 - Physical	1,050,000.00	1,071,000.00	1,092,420.00	1,114,268.40	1,136,553.77	5,464,242.17
Server Administration Group 4 - Virtual	2,520,000.00	2,570,400.00	2,621,808.00	2,674,244.16	2,727,729.04	13,114,181.20
<strong>Total Administration Cost/Year</strong>	<strong>193,872,000.00</strong>	<strong>197,749,440.00</strong>	<strong>201,704,428.80</strong>	<strong>205,738,517.38</strong>	<strong>209,701,747.22</strong>	<strong>1,008,766,133.40</strong>
Group 1 Backup	91,250,000.00	93,075,000.00	94,936,500.00	96,835,230.00	98,771,934.60	474,868,664.60
Group 2 Backup	34,310,000.00	34,996,200.00	35,696,124.00	36,410,046.48	37,138,247.41	178,550,617.89
Group 3 Backup	365,000.00	372,300.00	379,746.00	387,340.92	395,087.74	1,899,474.66
Group 4 Backup	390,000.00	397,800.00	405,756.00	413,871.12	422,148.54	2,029,575.66
<strong>Total Backup Cost/Year</strong>	<strong>126,315,000.00</strong>	<strong>128,841,300.00</strong>	<strong>131,418,126.00</strong>	<strong>134,046,488.52</strong>	<strong>136,727,418.29</strong>	<strong>657,348,332.81</strong>
<strong>Total Yearly Soft Costs</strong>	<strong>320,187,000.00</strong>	<strong>326,590,740.00</strong>	<strong>333,122,554.80</strong>	<strong>339,785,005.90</strong>	<strong>346,429,165.51</strong>	<strong>1,666,114,466.21</strong>
<strong>Total Five Year Soft Costs =</strong>	<strong>1,666,114,466.21</strong>					
<strong>Total Proposed Project Costs/Year</strong>	<strong>509,577,536.22</strong>	<strong>349,357,216.94</strong>	<strong>356,506,943.48</strong>	<strong>363,779,780.31</strong>	<strong>371,026,636.92</strong>	<strong>1,950,248,113.87</strong>
<strong>Total 5 Year Proposed Project Cost</strong>	<strong>1,950,248,113.87</strong>					

Virtualization Project Cost Summary						
	Category	Cost				
		Year 1	Year 2	Year 3	Year 4	Year 5
<b>Current Infrastructure Costs</b>						
	Total Yearly Hard Costs	21,212,203.44	21,637,872.21	22,108,154.69	22,551,226.18	23,003,265.55
	Total Five Year Hard Costs	110,512,722.07				
	Total Yearly Soft Costs	613,603,400.00	625,875,468.00	638,392,977.36	651,160,836.91	664,184,053.65
	Total Five Year Soft Costs	3,193,216,735.91				
<b>Total 5 Year Cost</b>	<b>3,303,729,457.98</b>					
<b>Virtualized Infrastructure Costs</b>						
	Total Yearly Hard Costs	189,390,536.22	22,766,476.94	23,384,388.68	23,994,774.42	24,597,471.41
	Total Five Year Hard Costs	284,133,647.66				
	Total Yearly Soft Costs	320,187,000.00	326,590,740.00	333,122,554.80	339,785,005.90	346,429,165.51
	Total Five Year Soft Costs	1,666,114,466.21				
<b>Total 5 Year Cost</b>	<b>1,950,248,113.87</b>					
Net Five Year Hard Cost Savings		-173,620,925.59				
Net Five Year Soft Cost Savings		1,527,102,269.71				
<b>Net Five Year Overall Cost Savings</b>		<b>1,353,481,344.11</b>				