Project Two

Title: "Project Two: Virtualization Cost/Benefit Analysis"

Points: 100 points

Due Date: Sunday February 8th by 11:59 pm (WebCourses time)

Objective: To practice conducting a financial feasibility cost benefit analysis for a server virtualization project.

Deliverables: On or before 11:59 pm (WebCourses time) Sunday February 8, 2015 submit the following items via WebCourses:

- A spreadsheet (similar to that we developed in class) with variable definitions and worksheets covering current cost infrastructure, proposed project cost infrastructure, and a summary.
- A one page report summarizing your findings with respect to the feasibility of this project for the ITCorp.

Description

What you are going to do in this project is pretend that you are the system administrator for an organization that is attempting to determine if virtualization of its computing infrastructure would be beneficial to the organization from a financial perspective.

As the system administrator you are in charge of conducting the cost/benefit analysis for the proposed virtualization project.

This will include creating financial spreadsheets using a 5 year projection and writing a brief report summarizing your findings.

The Current Scenario

The next few paragraphs describe the current infrastructure of the organization and the proposed virtualization project. Let's call the organization the ITCorp.

Currently ITCorp is running 40 physical servers which support various applications and several different operating systems.

These servers are configured into three different groups:

- Group 1 consists of 20 mission critical servers. Fifteen of these servers consume 3000W of power each at full load and five of these servers consume 3200W of power each at full load. The fifteen 3000W servers average load is 65% and the five 3200W servers average load is 45%
- Group 2 consists of 10 non-mission critical in-house application and file servers, each of which consumes 2800W of power at full load. The servers in this group run with an average load of 15%
- Group 3 consists of a pool of 10 redundant servers utilized as backup servers. Eight of these servers (drawing 3000W at full load) are used as backups for Group 1 servers and two of these servers (drawing 2800W at full load) are used as backups for Group 2 servers. These servers all run at 8% load.

The maintenance contracts on the current physical servers are as follows:

- Group 1 (3200W) servers: $2500.00/server/year
- Group 1 (3000W) servers: $2000.00/server/year
- Group 2 (2800W) servers: $1000.00/server/year
- Group 3 (3000W) servers: $1500.00/server/year
- Group 3 (2800W) servers: $750.00/server/year

Assume that server maintenance costs will increase 3%/year over the duration of the study for all server maintenance agreements.

Server administration efforts also vary across the server groups as follows:

- Group 1 (3200W) servers: 4 administrative weeks/server/year
- Group 1 (3000W) servers: 3 administrative weeks/server/year
- Group 2 (2800W) servers: 2 administrative weeks/server/year
- Group 3 (3000W) servers: 3 administrative weeks/server/year
- Group 3 (2800W) servers: 2 administrative weeks/server/year

Administrative costs are currently $80/administrative hour. Assume that administrative costs will increase at the rate of 2%/year over the duration of the study.

An administrative day is 10 hours long. An administrative week is 7 days long. A server day is 24 hours long.

Server backup efforts also vary across the server groups as follows:

- Group 1 (3200W) servers: these servers are backed-up nightly and require 75 minutes per server.
- Group 1 (3000W) servers: these servers are backed-up nightly and require 1 hour per server.

- Group 2 (2800W) servers: these servers are backed-up weekly and require 2 hours per server.
- Group 3 (3000W) servers: these servers are backed-up weekly and require 75 minutes per server.
- Group 3 (2800W) servers: these servers are backed-up weekly and require 2 hours per server.

ITCorp currently employs an external security firm to run routine security audits on the mission critical servers. This occurs once a month and the charge is $1500.00. Current contract with this firm guarantees this price through the duration of this study.

ITCorp currently employs a data storage company to maintain archival backup copies of server backups. The charge for this service is billed monthly and is based on the data volume stored each month. The bill last month was $350.00. Based on the data volume trend produced by ITCorp, it is expected that the next billing level plateau will be achieved at the start of year 3 of the study when the monthly cost will rise to $500.00/month. This rate is expected to remain the same throughout the duration of the study.

The Proposed Scenario

The virtualization project proposed for the ITCorp would reduce its current number of physical servers from 40 to 10.

- Group 1 servers reduced from 20 to 6.
- Group 2 servers reduced from 10 to 2
- Group 3 servers reduced from 10 to 2

Sun Fire X4-8 servers have been selected to host the virtualized environments. This is one of Sun's latest and leading edge x86 servers. This is a 5 rack unit (5U) server that supports 2 or 4 CMODs (configuration modifications) providing 4 or 8 CPU configurations. Up to 192 DIMMs (Dual In Line Memory Module) (32/CMOD) providing a maximum of 6TB main memory.

Information on Sun x86 Systems can be found at: http://www.oracle.com/us/products/servers-storage/servers/x86/index.html (Links to an external site.)
Information on the X4-8 model specifically can be found at: http://www.oracle.com/us/products/servers-storage/servers/x86/x4-8/overview/index.html (Links to an external site.)

The configurations for the new servers appear below:

Group 1 and Group 3 Servers

- Processor = Intel Xeon E7-8895v2, 2.8Ghz, 155W, 15-core
- CPUs = 8
- Memory (32 GB DIMM) = 192 DIMMs
- Hard Disk Drives = 4 HDDs
- Solid State Drives = 4 SSDs
- PCIe Express Modules =16
- Workload = 90% for Group1 and 60% for Group 3

Group 2 Servers

- Processor = Intel Xeon E7-8895v2, 2.8 GHz, 155W, 15-core
- CPUs = 4
- Memory (32 GB DIMM) = 96 DIMMs
- Hard Disk Drives = 8 HDDs
- PCIe Express Modules = 8
- Workload = 75%

To determine the cost of the new servers go to the following page: https://shop.oracle.com/pls/ostore/f?p=dstore:5:3240385169614::NO::P5_PROD_HIER_ID,P5_LPI:124338776235580242804724,124331090161560216811688: (Links to an external site.)

click (See Configurations).

Note that this cost calculator is actually for the SPARC T5-8 server, which is different than the X4-8 servers that we configured for the power. While this configuration is not exactly the same as that which we configured for the power calculator, it is pretty close and will give us an accurate enough value for inclusion in our analysis.

Use the “Small” configuration for the Group 2 servers and the “Medium” configuration for Group 1 and 3 servers. Use this as the price for your new servers. Also note the price for the first year of Oracle’s Premier level support for this system and use this price as the first year price for the maintenance contract on each server.

The virtualization software of choice will be VMware and this will cost $6000/physical server. The maintenance contract on this software will be priced at 15% of the original cost and will remain in effect at this rate for the duration of the study.

Each new server will be under a server maintenance contract that will have an initial cost as per your research (see page 11) and this cost will increase by 3% in each year of the study.

It is estimated that the new physical servers will require 5 weeks/server/year of administrative effort with backup effort assumed to be 60 min/physical server/day.

Training employees on the new virtualized systems will require a time expenditure equivalent to $2500/year/employee trained on the system. In years 1 and 2 of the study four employees will be trained and in all subsequent years of the study two employees will be trained per year.

Some basic assumptions about ITCorp and the future as it pertains to your cost/benefit analysis:

- The cost of 1kwH of power is currently 13 cents. Assume that the cost of power will increase 2%/year over the duration of the study.
- When calculating power costs for the new servers, note that the loading of each server was already factored into the value produced by the power calculator.
- Assume that server maintenance costs will increase 3%/year over the duration of the study for all server maintenance agreements.
- The outside service contracts for security and storage will continue in the proposed scenario just as they are to continue in the current scenario.
- Also assume that administrative costs on a virtual server are only 10% of the administrative costs on a physical server.
- 1 administrative day is 10 hours long. 1 server day is 24 hours long. There are 365 days in one year.

Your Task

Your first task for this project is to construct spreadsheets like the ones we discussed in the notes (See the notes: (2-3) – Cost-Benefit Analysis – Preparing the Spreadsheet) that will illustrate the current and proposed infrastructure costs for the ITCorp given this proposed virtualization project.

You should create (1) a variables spreadsheet(s) that includes all the variables defined in the project, (2) a current infrastructure cost spreadsheet, (3) a virtualization projected cost spreadsheet, and (4) a summary spreadsheet that highlights the major costs and benefits of the project.

IMPORTANT!!! You must create your spreadsheet using variables to identify the various costs that are being tracked. In other words, do not hard code any numbers into the formulas in your spreadsheets. The following image illustrates one of the variables pages in my spreadsheet where I defined the variables used in current cost spreadsheets. You must include a similar page(s) in your spreadsheet.

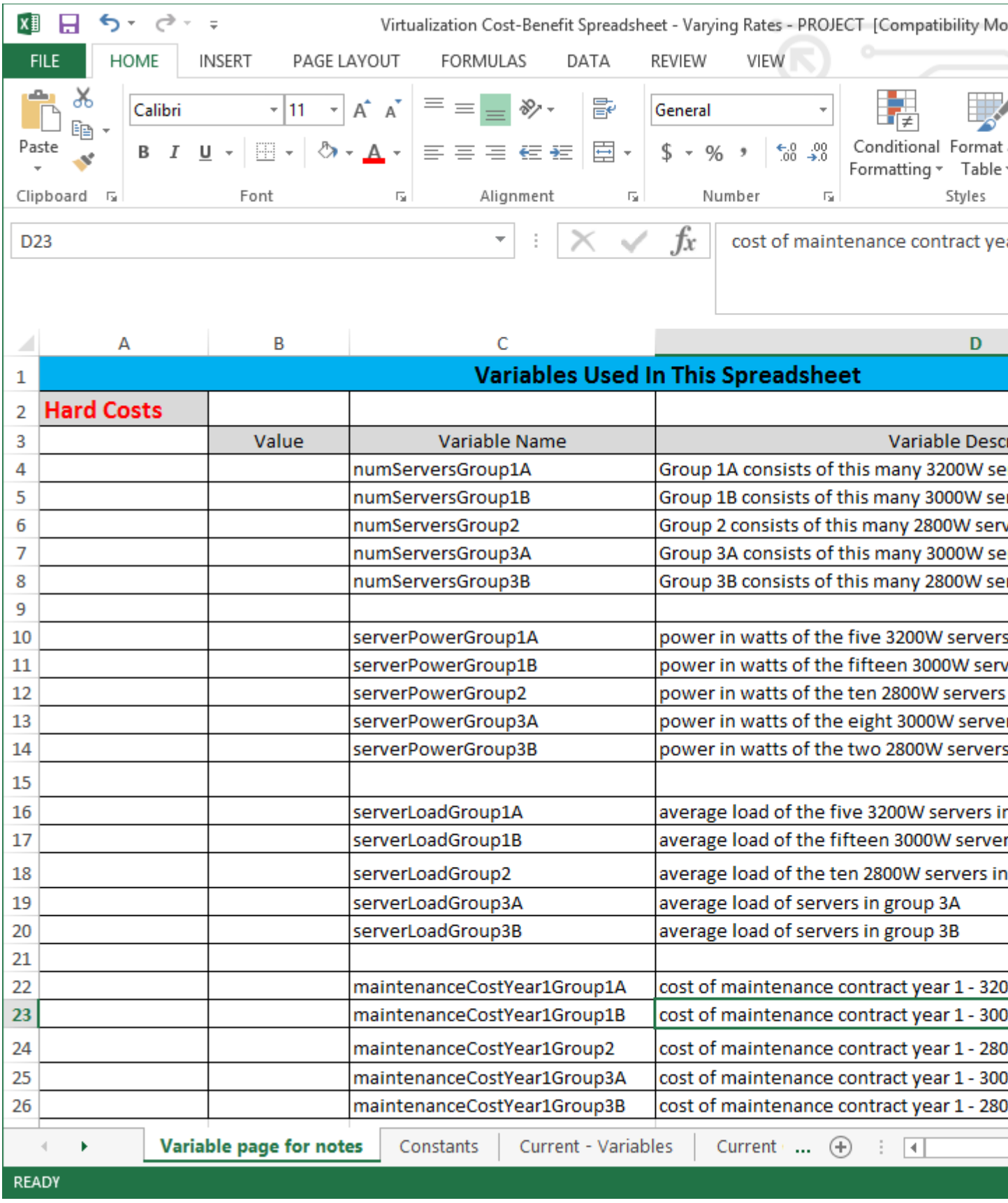
Virtualization Cost-Benefit Spreadsheet - Varying Rates - PROJECT [Compatibility Mo
FILE
HOME
INSERT
PAGE LAYOUT
FORMULAS
DATA
REVIEW
VIEW
Paste
Calibri
11
General
Conditional Formatting
Format Table
Clipboard
Font
Alignment
Number
Styles
D23
cost of maintenance contract yea
Variables Used In This Spreadsheet
Hard Costs
Value
Variable Name
Variable Desc
numServersGroup1A
Group 1A consists of this many 3200W se
numServersGroup1B
Group 1B consists of this many 3000W ser
numServersGroup2
Group 2 consists of this many 2800W serv
numServersGroup3A
Group 3A consists of this many 3000W se
numServersGroup3B
Group 3B consists of this many 2800W ser
serverPowerGroup1A
power in watts of the five 3200W servers
serverPowerGroup1B
power in watts of the fifteen 3000W serv
serverPowerGroup2
power in watts of the ten 2800W servers
serverPowerGroup3A
power in watts of the eight 3000W server
serverPowerGroup3B
power in watts of the two 2800W servers
serverLoadGroup1A
average load of the five 3200W servers in
serverLoadGroup1B
average load of the fifteen 3000W server
serverLoadGroup2
average load of the ten 2800W servers in
serverLoadGroup3A
average load of servers in group 3A
serverLoadGroup3B
average load of servers in group 3B
maintenanceCostYear1Group1A
cost of maintenance contract year 1 - 320
maintenanceCostYear1Group1B
cost of maintenance contract year 1 - 300
maintenanceCostYear1Group2
cost of maintenance contract year 1 - 280
maintenanceCostYear1Group3A
cost of maintenance contract year 1 - 300
maintenanceCostYear1Group3B
cost of maintenance contract year 1 - 280
Variable page for notes
Constants
Current - Variables
Current ...
READY

Figure (Project 2)-1 - A variables page utilized by the spreadsheets so that expressions are more flexible.

Once your spreadsheets are completed, you'll construct a 1 page executive summary report of your findings.

This report should address the feasibility of the proposed project and its financial impact on the ITCorp.

Rubric

Grading rubric for Project Two

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Criteria	Ratings		Pts
Spreadsheet contains a complete variables page	Full Marks 10 pts	No Marks 0 pts	10 pts
Separate current and proposed spreadsheets with summary page	Full Marks 10 pts	No Marks 0 pts	10 pts
No hard-coded values in spreadsheets - all expressions use variables defined in the variables page	Full Marks 10 pts	No Marks 0 pts	10 pts
Correctly captured the various parameters for the current infrastructure	Full Marks 15 pts	No Marks 0 pts	15 pts
Correctly captured the various parameters for the proposed infrastructure	Full Marks 15 pts	No Marks 0 pts	15 pts
Correctly defined expressions for determining current costs	Full Marks 15 pts	No Marks 0 pts	15 pts
Correctly defined expressions for determing proposed costs	Full Marks 15 pts	No Marks 0 pts	15 pts
Summary page provides correct summary of values as outlined in report.	Full Marks 10 pts	No Marks 0 pts	10 pts

Grading rubric for Project Two		
Criteria	**Ratings**	**Pts**
Total Points: 100		

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