Optional Lab 4

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This is an optional - additional lab.

You do not need to do this lab if you do not wish to. This lab is worth 15 extra points if you complete it satisfactory. This is a written lab assignment, and it should be assumed each question should be answered with at least 1 paragraph.

You can complete the entire lab or only parts of the lab. You will get the points for the parts completed successfully.

As the lab setup for this written lab would be too difficult and unreasonable for a student to complete in a reasonable amount of time- this lab will be carried out using photographs from a setup lab environment and will test your ability to recognize common storage issues.

In all of these - the name of the CPG should indicate the following:

NL (Near Line SAS)

FC (FiberChanel)

SSD (SolidState Drive)

And R<Number> will indicate the RAID level (R0 would be a RAID 0)

Final Note and Warning: This is extra credit in a master level course. As there is no practical part of this lab, you will only be answering my questions. I would strongly suggest that you perform research to answer these questions. Your answer may be different than what I have in mind - but you also need to defend your answer. The more research you have backing your answer up, the more of a chance you have at getting the answer correct.

Performance Lab (10 Points)

1. **[3 Points]**You are a database administrator at AdeventureWorks and you need a new server. You ask for a new virtual machine to be created. You need to tell your VMWare Architect exactly the configuration you need (you need to tell them not only the kind

of RAID you think each drive needs, but also the kind of disks you would prefer from FC, NL, and SSD for each as well as your best guess as to the RAM and Processors that you want for your server).

In other words - you should answer the following questions:

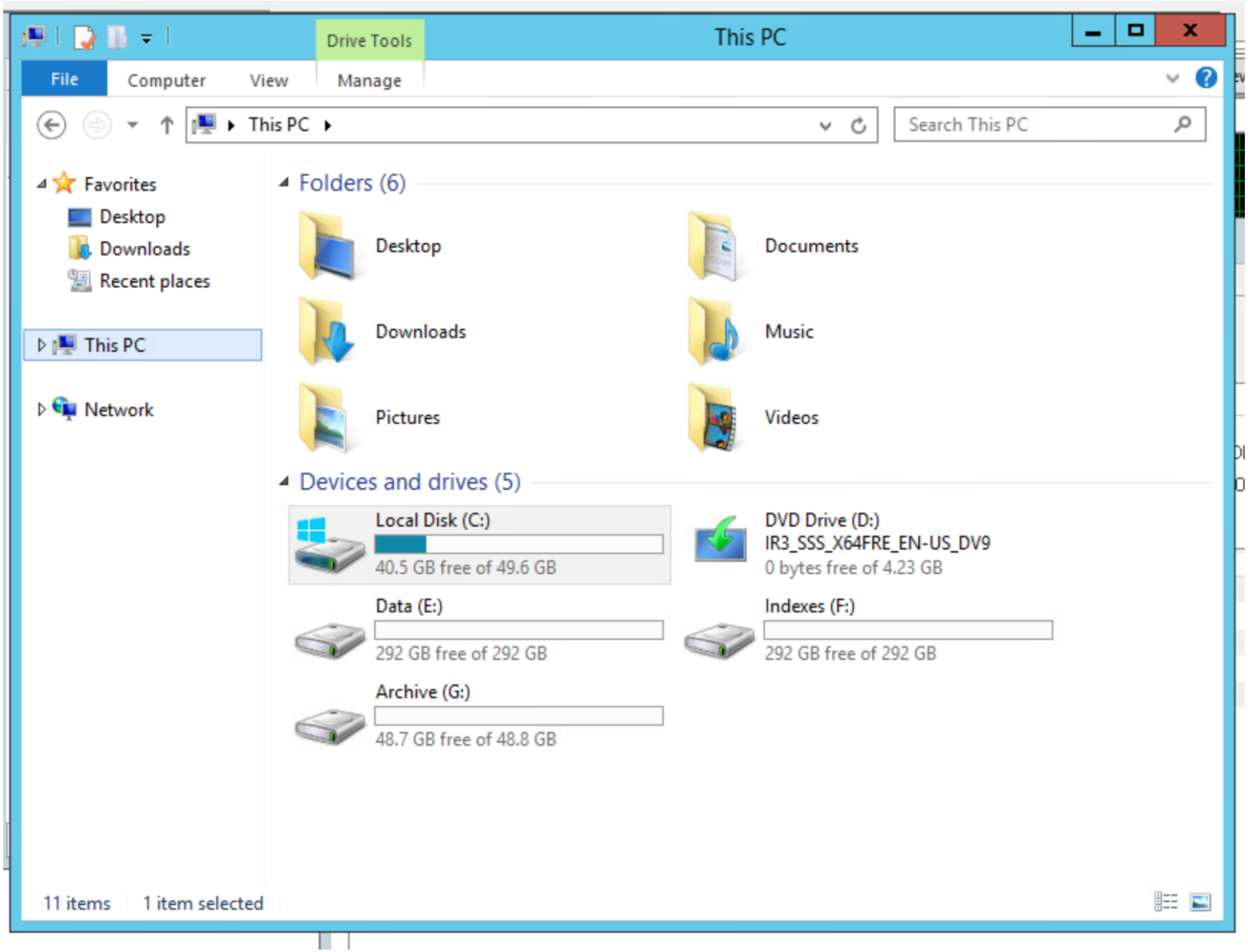
1. How many virtual processors and how much RAM do you require and why?
2. The exact disk layout you wish to have - For each:
   - What is the purpose of the given LUN or Volume?
   - How large will the LUN or Volume be? Why did you choose this size?
   - What kind of storage would you like the LUN or Volume to be stored on?
   - What RAID Level would you like the LUN or Volume to be stored on?

The database that will be hosted on this server has the following File Groups:

1. A file group for DATA (initial size of 200GB with an annual growth of about 10%, so next year you expect that your DATA file group will be about 220GB)
2. A file group for INDEXES (initial size is 100GB with an annual growth of about 5%, so next year you expect that your DATA file group will be about 105GB)
3. This database will be in full recovery mode (meaning that you will need a place for transaction logs). You generally see about 50GB of transactions each day.
4. You will want to consider any system level databases or anything else that would be important
5. Also, consider that you will need a place to backup your database - you will want to specifically describe where and how much space you need to do this
6. Finally, consider that your company does not have unlimited money. Storage costs money and faster storage generally costs more money (in other words, a 7200RPM NL-SAS disk should be assumed to cost LESS not MORE than an equivalent SSD). You want the fastest disks you can get, but you do not want to ask for something you will not fully need or use.

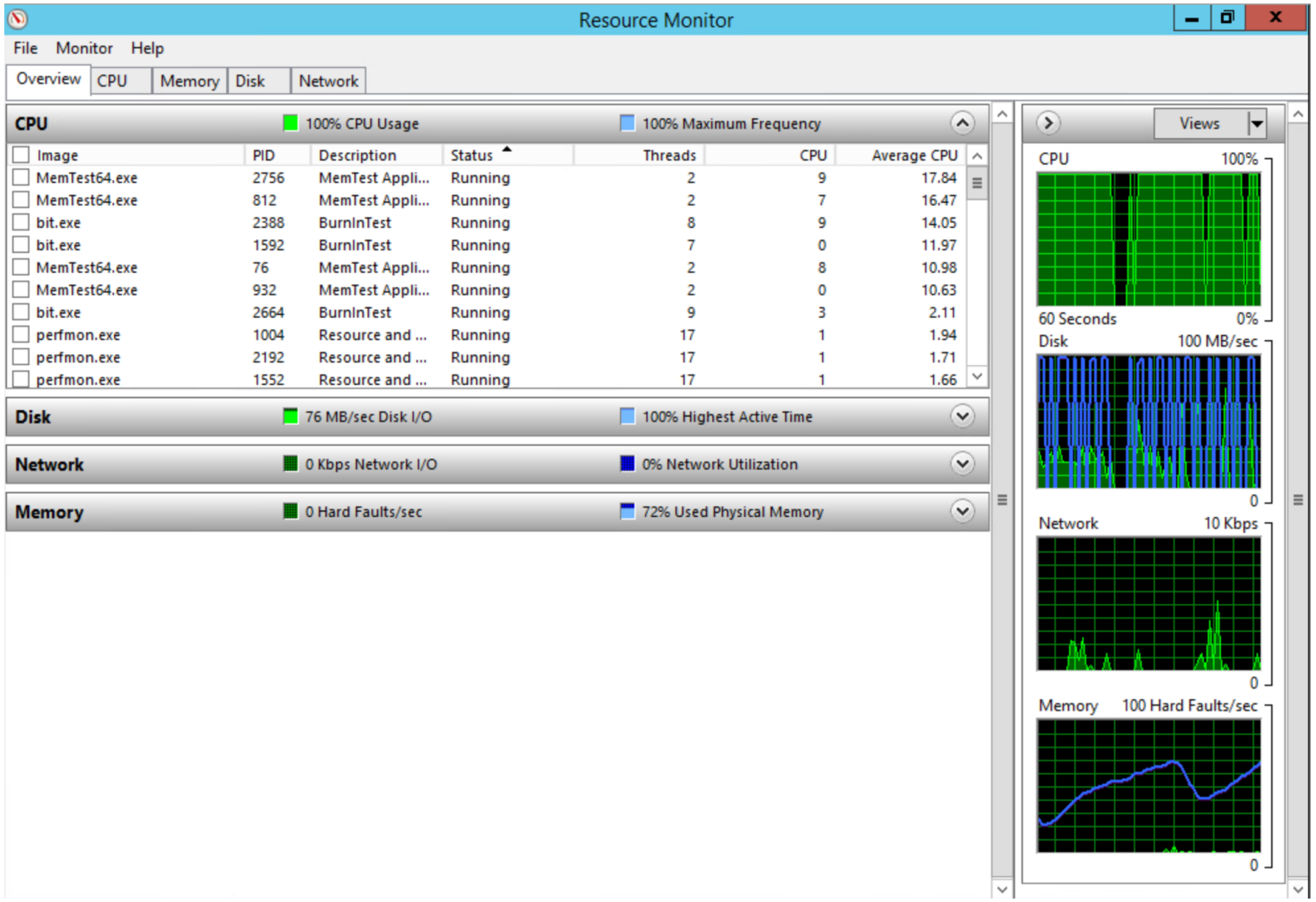
2. **[1 Point]** Your VMWare architect is on vacation, but the IT Manager has agreed to build the system for you. You have given him/her the configuration you created in Step 1 - the IT Manager knows a lot about databases, so he/she has set up the virtual machine the way him/her thought would be best. They indicate that your configuration would be much too expensive to

implement. This is a screenshot of the drive setup:



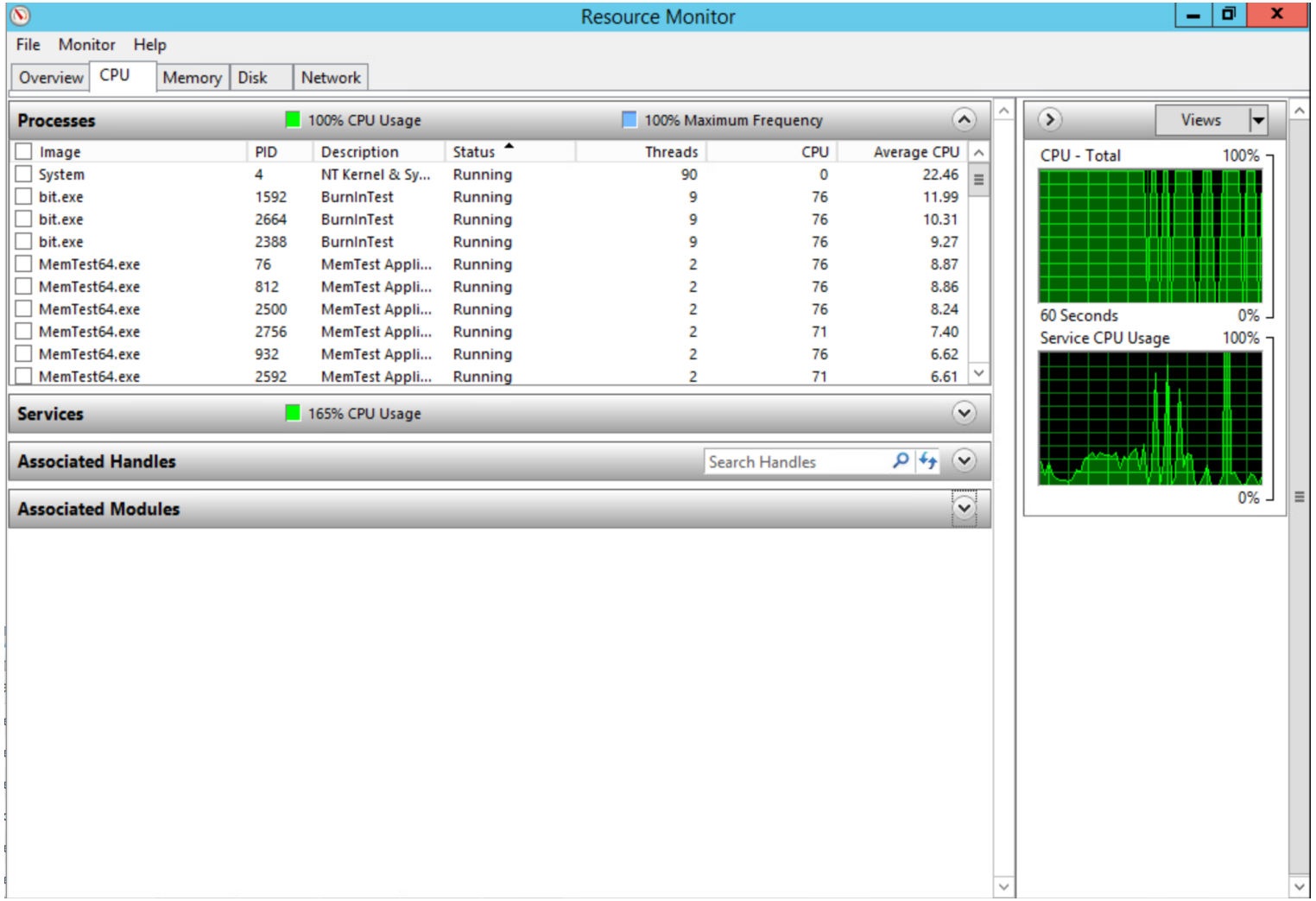
1. Answer the following questions:
    1. How does this differ from your setup and why is your setup better than this setup?
    2. What are some of the dangers of using this setup as opposed to yours?

2. Use the answers from above to craft an email to the IT Manager where you professionally explain why this configuration may not work well for the database you are creating.
3. **[3 Points]** The IT Manager has responded saying that while they appreciate your input, that for right now this is the setup you have to use. You begrudgingly implement the database on this server and you find that you are having performance challenges. Use the following pages in Resource Monitor to answer the given questions about the performance.

1. 

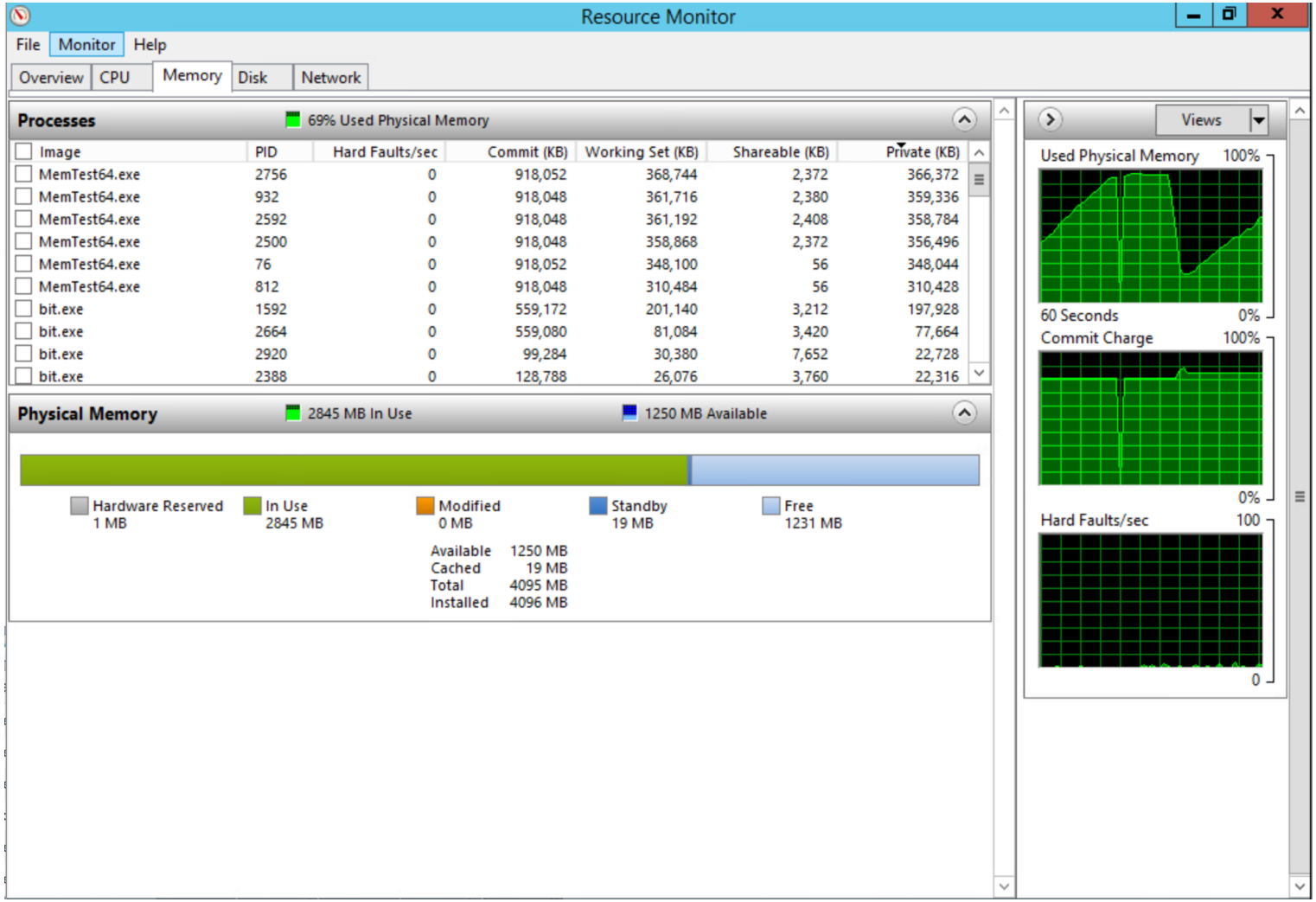
   - What conclusions can you draw from the first page shown here?

2. You look at the CPU Page



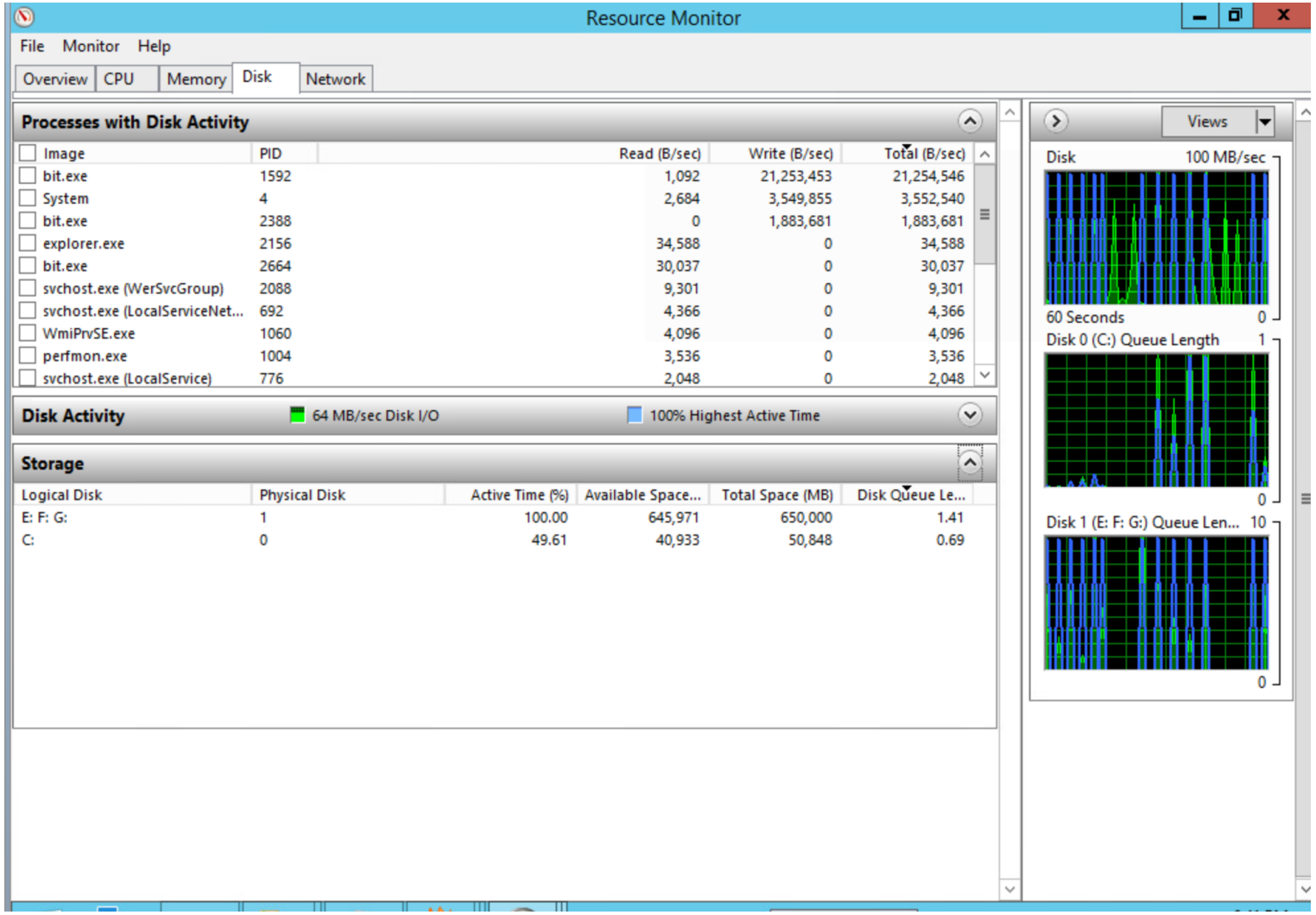
- How many CPUs are attached to this machine?
- What can you tell about the overall CPU usage on this machine?

3. You also look at the Memory tab.



- How much RAM is attached to this machine?
- Do you feel that adding more RAM will fix the performance challenges? Why or why not?

4. You then look at the disk performance -



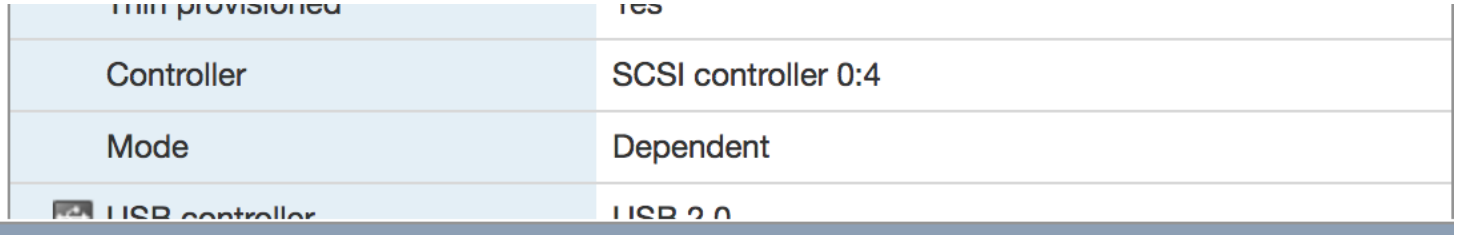
- What can be said about the disk performance on this machine?
- How many disks are on this system?

5. Using the answers to your questions to craft an email to the IT Manager with some suggestions on how to improve the performance on the server.

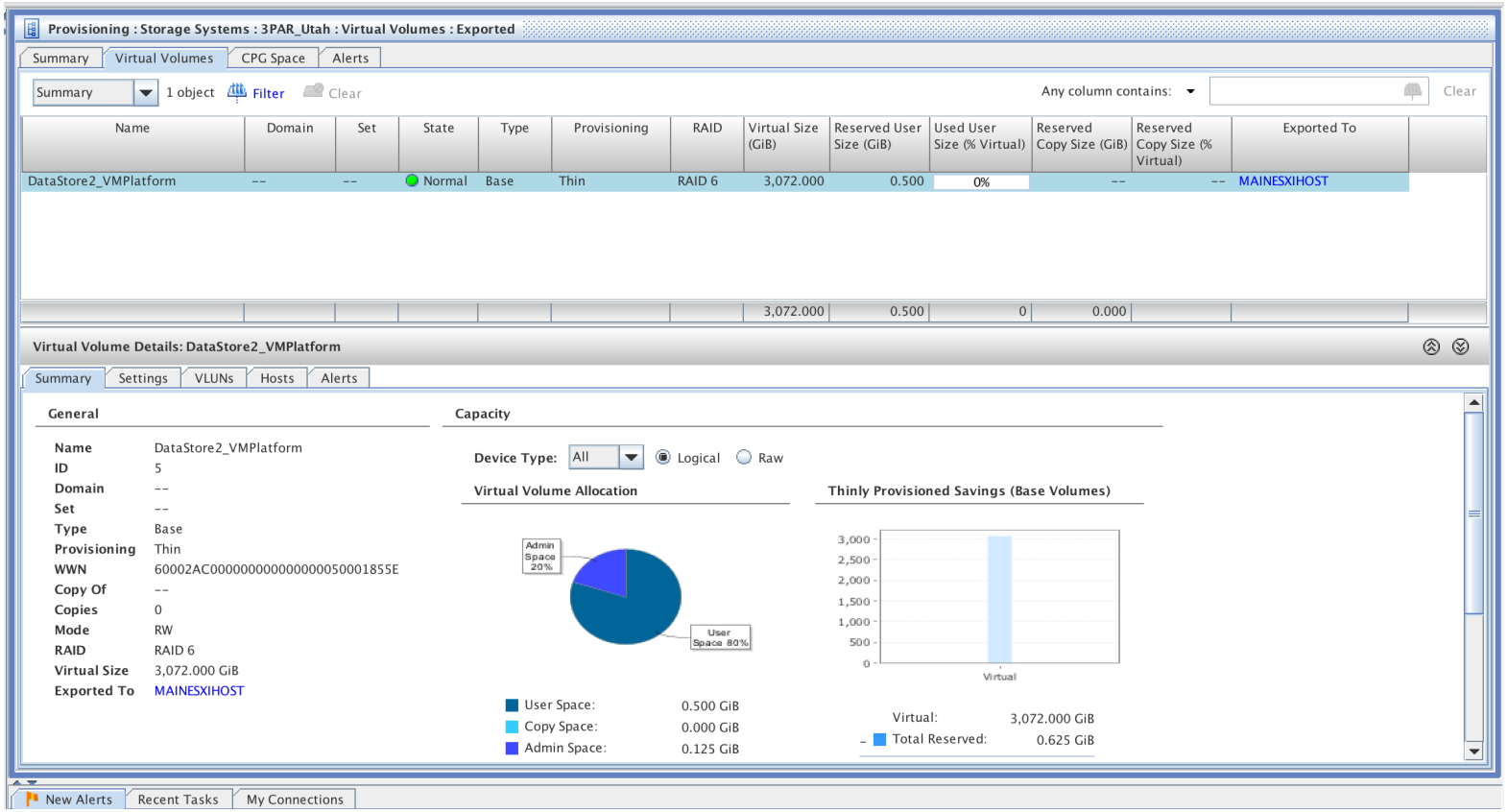
4. **[1 Points]** The IT Manager has decided to add some new disks to your server. Given the following screenshot from VMWare - do you think that this will help with performance? Why or why not?

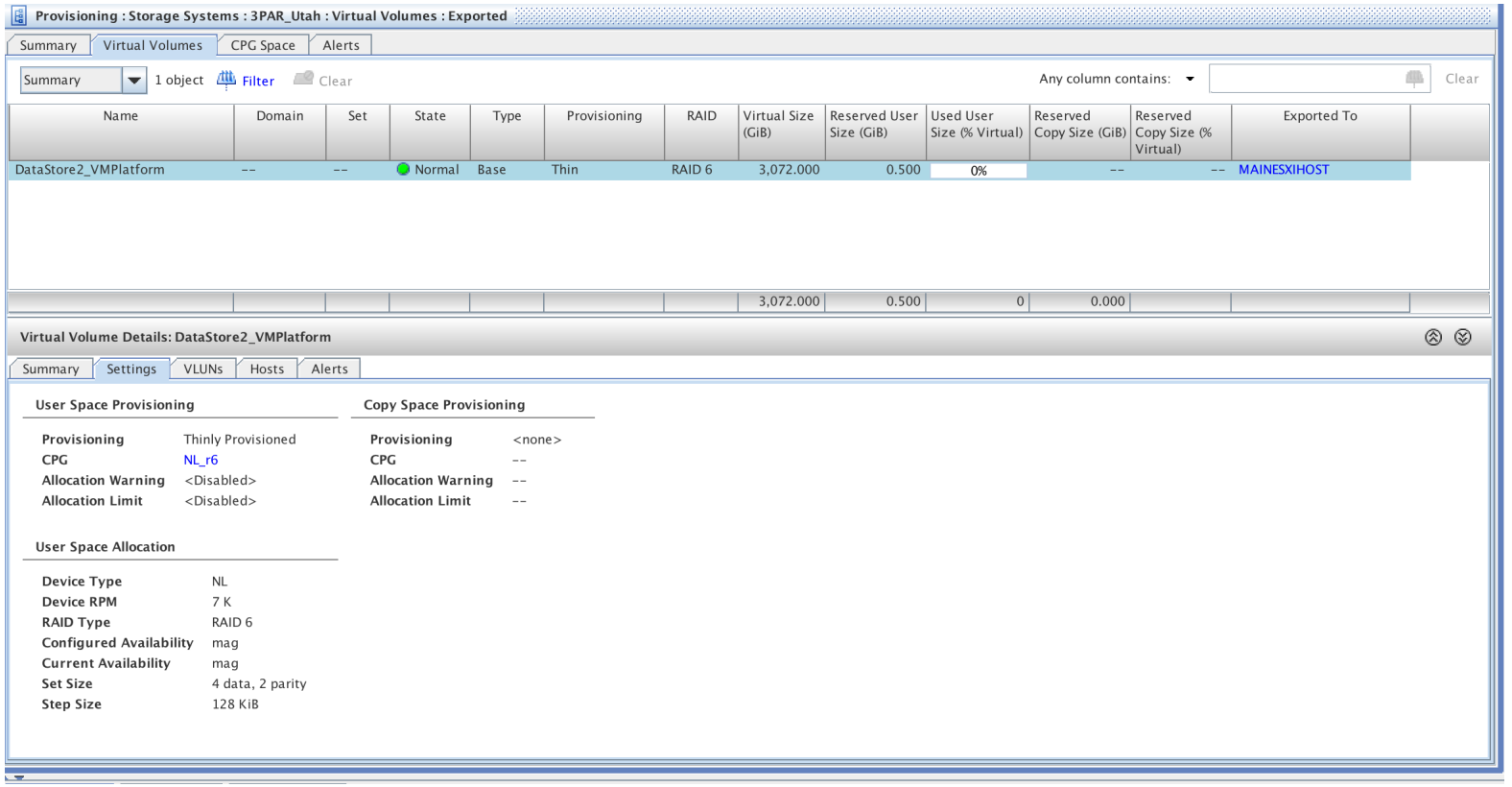
1.

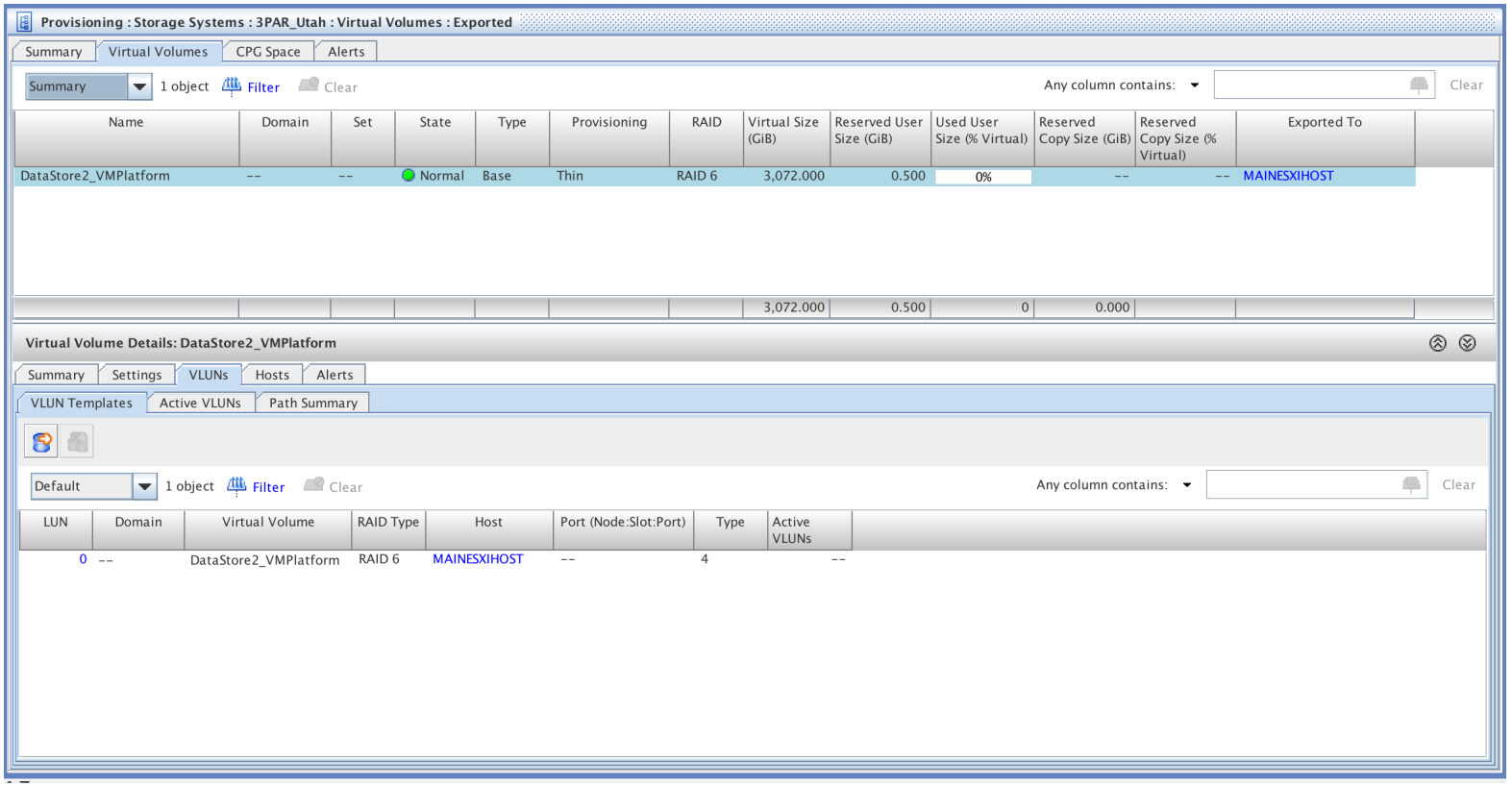
Backing	[datastore2] XZTEST/XZTEST_1.vmdk
Capacity	800 GB
Thin provisioned	Yes
Controller	SCSI controller 0:1
Mode	Dependent
Hard disk 3	
Backing	[datastore2] XZTEST/XZTEST_2.vmdk
Capacity	300 GB
Thin provisioned	Yes
Controller	SCSI controller 0:2
Mode	Dependent
Hard disk 4	
Backing	[datastore2] XZTEST/XZTEST_3.vmdk
Capacity	300 GB
Thin provisioned	Yes
Controller	SCSI controller 0:3
Mode	Dependent
Hard disk 5	
Backing	[datastore2] XZTEST/XZTEST_4.vmdk
Capacity	300 GB
Thin provisioned	Yes

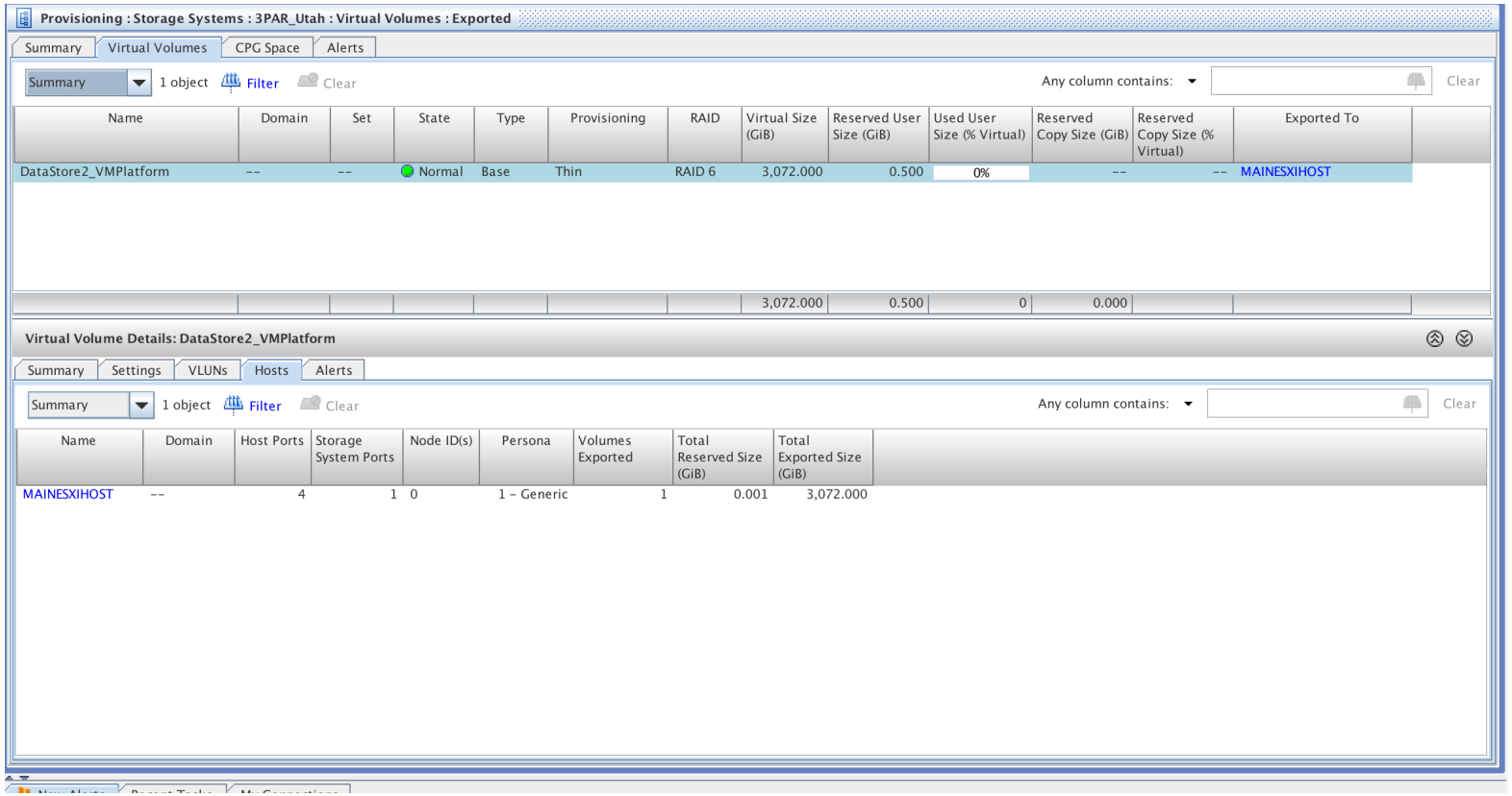


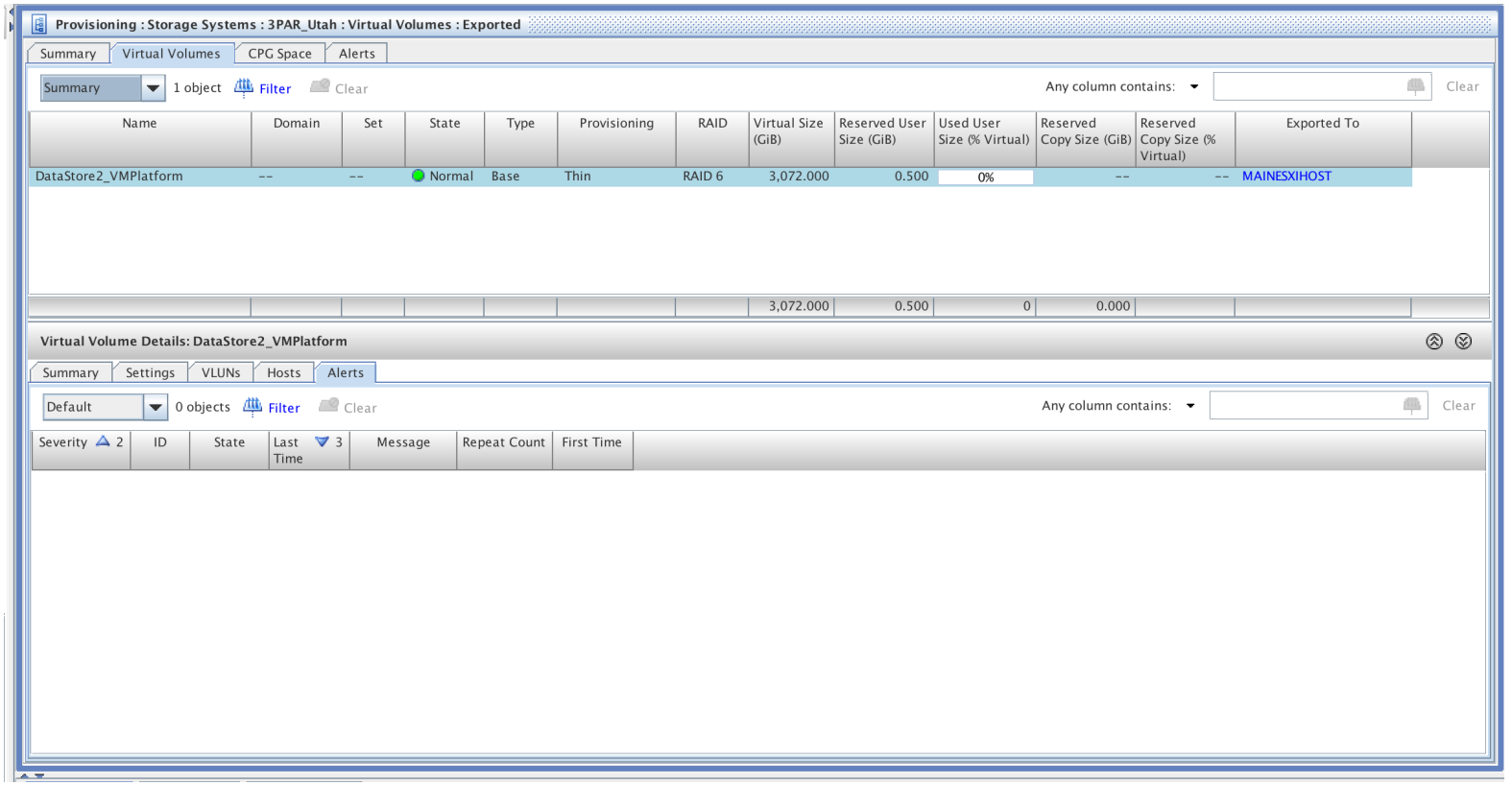
5. **[2 Points]** You then ask for the Storage Administrator to send you the details about the datastores used for your VM. He/she sends you the following screenshots.




Provisioning : Storage Systems : 3PAR_Utah : Virtual Volumes : Exported
Summary
Virtual Volumes
CPG Space
Alerts
Summary
1 object
Filter
Clear
Any column contains:
Clear
Name
Domain
Set
State
Type
Provisioning
RAID
Virtual Size (GiB)
Reserved User Size (GiB)
Used User Size (% Virtual)
Reserved Copy Size (GiB)
Reserved Copy Size (% Virtual)
Exported To
DataStore2_VMPlatform
--
--
Normal
Base
Thin
RAID 6
3,072.000
0.500
0%
--
--
MAINESXIHOST
3,072.000
0.500
0
0.000
Virtual Volume Details: DataStore2_VMPlatform
Summary
Settings
VLUNs
Hosts
Alerts
User Space Provisioning
Provisioning
Thinly Provisioned
CPG
NL_r6
Allocation Warning
<Disabled>
Allocation Limit
<Disabled>
Copy Space Provisioning
Provisioning
<none>
CPG
--
Allocation Warning
--
Allocation Limit
--
User Space Allocation
Device Type
NL
Device RPM
7 K
RAID Type
RAID 6
Configured Availability
mag
Current Availability
mag
Set Size
4 data, 2 parity
Step Size
128 KiB


Provisioning : Storage Systems : 3PAR_Utah : Virtual Volumes : Exported
Summary
Virtual Volumes
CPG Space
Alerts
Summary
1 object
Filter
Clear
Any column contains:
Clear
Name
Domain
Set
State
Type
Provisioning
RAID
Virtual Size (GiB)
Reserved User Size (GiB)
Used User Size (% Virtual)
Reserved Copy Size (GiB)
Reserved Copy Size (% Virtual)
Exported To
DataStore2_VMPlatform
--
--
Normal
Base
Thin
RAID 6
3,072.000
0.500
0%
--
--
MAINESXIHOST
3,072.000
0.500
0
0.000
Virtual Volume Details: DataStore2_VMPlatform
Summary
Settings
VLUNs
Hosts
Alerts
VLUN Templates
Active VLUNs
Path Summary
Default
1 object
Filter
Clear
Any column contains:
Clear
LUN
Domain
Virtual Volume
RAID Type
Host
Port (Node:Slot:Port)
Type
Active VLUNs
0
--
DataStore2_VMPlatform
RAID 6
MAINESXIHOST
--
4
--


Provisioning : Storage Systems : 3PAR_Utah : Virtual Volumes : Exported
Summary
Virtual Volumes
CPG Space
Alerts
Summary
1 object
Filter
Clear
Any column contains:
Clear
Name
Domain
Set
State
Type
Provisioning
RAID
Virtual Size (GiB)
Reserved User Size (GiB)
Used User Size (% Virtual)
Reserved Copy Size (GiB)
Reserved Copy Size (% Virtual)
Exported To
DataStore2_VMPlatform
--
--
Normal
Base
Thin
RAID 6
3,072.000
0.500
0%
--
--
MAINESXIHOST
3,072.000
0.500
0
0.000
Virtual Volume Details: DataStore2_VMPlatform
Summary
Settings
VLUNs
Hosts
Alerts
Summary
1 object
Filter
Clear
Any column contains:
Clear
Name
Domain
Host Ports
Storage System Ports
Node ID(s)
Persona
Volumes Exported
Total Reserved Size (GiB)
Total Exported Size (GiB)
MAINESXIHOST
--
4
1
0
1 - Generic
1
0.001
3,072.000



Analyze the screenshots and answer the following questions:

- How many LUN(s) and what host(s) are/is that/those LUN(s) attached to?
- Assuming that the storage shown is being used for a database - is the configuration of this storage a good configuration for a database? Why or why not?

Uptime Lab (5 Points)

1. **[1 Points]**Reflecting on the previous section - if you were to place your database on a RAID 6 array:
    1. What is the maximum number of disks that can be lost before you are unable to repair the array?
    2. Why would you not want to use RAID 6 for heavy IO use cases (such as a database server)
2. **[1 Points]** The storage system that you are using has a system built in which can replicate data at time of write. In practical tests - it has been found that there is about a 1 minute delay between the time a piece of data is written locally and when it is replicated
    1. What does RPO mean and how would you explain RPO to your management?

2. What is the RPO of this solution?

3. **[1 Points]** Your company utilizes a VMWare cluster environment to ensure uptime. In practical tests - it was found that the cluster takes about 30 seconds to fail over from one system to another. The cluster is made up of two servers - both of which are processing transactions all the time and systems are load balanced between the two servers.
   1. What kind of cluster is this - and how would you describe this kind of cluster to your management?
   2. What does RTO mean and how would you explain RTO to your management?
   3. What is the RTO of this solution?
4. **[1 Points]** Recently, an employee in the IT department encrypted a large number of files on the network and held those files ransom. Your company had tape archives of these files, but the files were very old. Since the employee was in the IT department, they knew enough to encrypt the backups. Law enforcement got involved and was able to get the key from the employee without any issue - however, the entire incident took 1 week to resolve costing the company 1 Million Euros.
   1. What kind of disaster was this? Why do you feel that this was that kind of disaster?
   2. How could this disaster have been prevented?
5. **[1 Points]** As part of your post disaster analysis of the incident in Question 4 - it was found that the backups that your company had to recover the data were incremental backups. Your company lacked a full backup of the data, and only had the last incremental backup in any case
   1. Can the backups be used - why or why not?
   2. Assuming a full backup was found - what does this change about your answer?
   3. What would you suggest to mitigate issues in the future?

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Aug 9	Everyone	-	-

+ Rubric