Server Virtualization Implementation & Cost-Benefit Analysis

A Step-by-Step Implementation Plan, Risk Assessment, and Cost-Benefit Evaluation

Introduction

What is Virtualization?

"Virtualization is technology that you can use to create virtual representations of servers, storage, networks, and other physical machines. Virtual software mimics the functions of physical hardware to run multiple virtual machines simultaneously on a single physical machine. Businesses use virtualization to use their hardware resources efficiently and get greater returns from their investment. It also powers cloud computing services that help organizations manage infrastructure more efficiently."

(AWS.Amazon, n.d.)

Why is virtualization important?

“By using virtualization, you can interact with any hardware resource with greater flexibility. Physical servers consume electricity, take up storage space, and need maintenance. You are often limited by physical proximity and network design if you want to access them. Virtualization removes all these limitations by abstracting physical hardware functionality into software. You can manage, maintain, and use your hardware infrastructure like an application on the web.”

(AWS.Amazon, n.d.)

Implementation for Virtualization

Evaluation & Planning

- Evaluate the current infrastructure of the servers, storage, applications and performance .
- Identify the servers that can work optimally with virtualization (vCPU, RAM, disk space).
- Choose Oracle VirtualBox Enterprise Edition, for its open-source flexibility and compatibly with various third-party software.

Licensing & Hardware

- Obtain the Oracle VirtualBox Enterprise licenses & SQL Server licenses for all critical systems.
- Configuring the network infrastructure & storage solutions.

Implementation for Virtualization

Setting up Environment

- Install Oracle VirtualBox on host servers.
- Configure the virtual networks, the VirtualBox Remote Desktop Protocol, and shared storage.
- Using OCI sandbox environment for testing VM deployment and application performance.

Testing Migration

- Testing migrating with low-risk systems first (e.g. using robocopy.exe.).
- Using Oracle VirtualBox built-in snapshot functionality to test rollback and backup processes.
- Monitor performance and resolve any compatibility or resource issues using Oracle VirtualBox Logs and OCI logging analytics.

Implementation for Virtualization

Full Migration

- Schedule a migration for critical systems like SQL Server.
- Use tools such as disk imaging or. Disk2vhd to create a copy of
- Using SQL Server failover clustering, Backup & Restore.

Staff Training and Documentation

- Training IT staff in virtual machine management (Oracle VirtualBox), SQL Server backup/restore procedures, and system monitoring.
- Documenting all virtual machine configurations, resource allocations, and failover setups.

Risk Assessment of Migration to Virtualization

Software Compatibility:

In order for software to communicate efficiently with software components, applications, and operating systems it needs to compatibility either through updating or configuring

Impact – Medium

Mitigation

Testing our software firstly in (OCI) Oracle Cloud infrastructure sandbox and keeping our physical fallback until we have confirmed it is compatibility with our system

Risk Assessment of Migration to Virtualization

Backup Failures:

Backup failures need to be mitigated to prevent data loss, operational disruptions (such as downtime), and financial records being lost

Impact - High

Mitigation

Utilizing snapshots to ensure we have a safe restore point to revert to if anything fails and configuring our Azure to backup regularly to the cloud

Risk Assessment of Migration to Virtualization

Security Misconfigurations:

Security configurations for the virtual machine is critical as if they are not set up properly they could lead to a breach in the system

Impact – High

Mitigation

Oracle VirtualBox addresses security and compliance risks by using Remote Desktop Authentication this encryption used by Oracle VirtualBox is (AES) Advanced Encryption Standard which uses a symmetric encryption algorithm what it this does is it converts sensitive data it into an unreadable format to protect it

Risk Assessment of Migration to Virtualization

Staff Skills Gap:

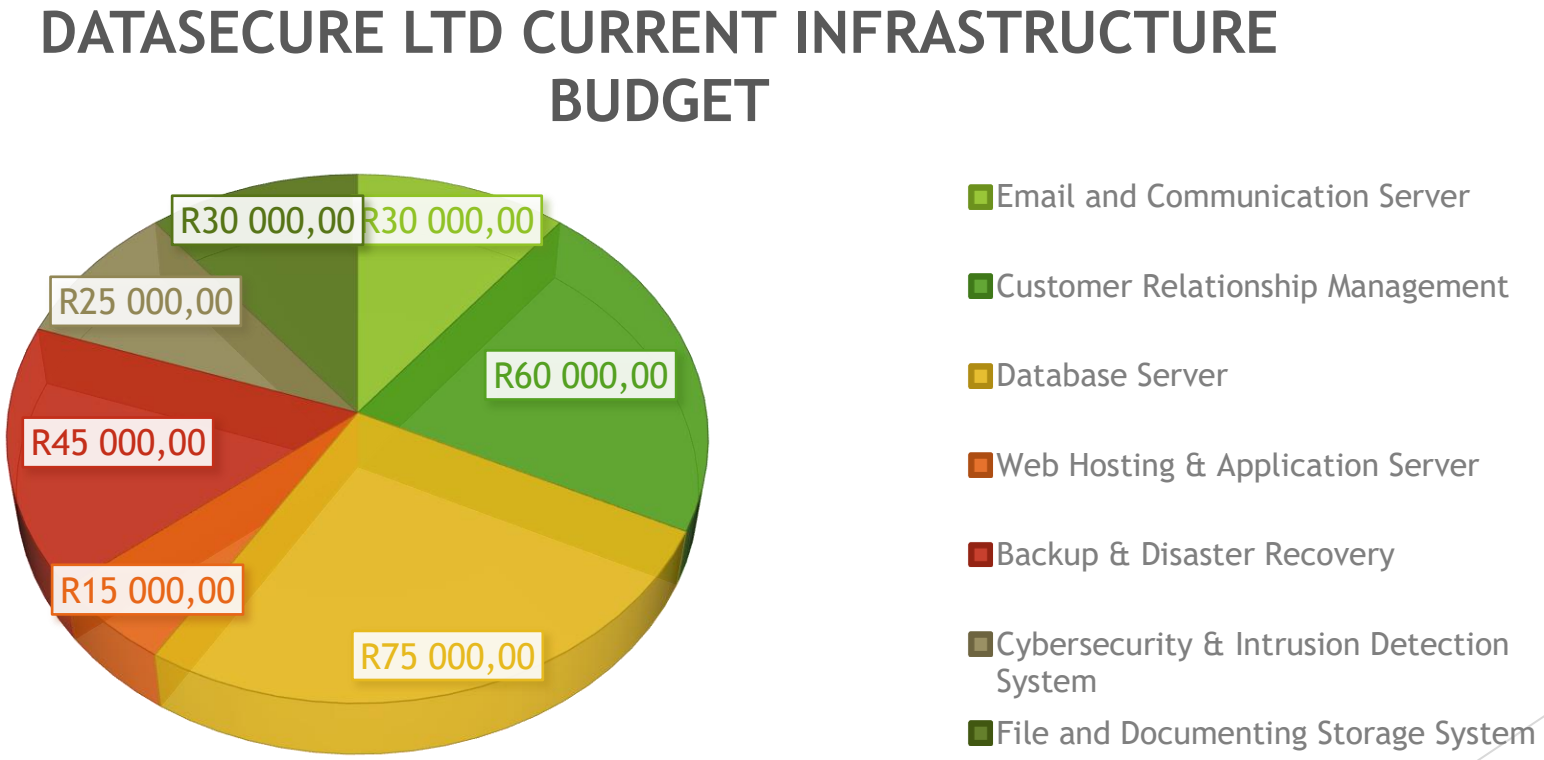
Current staff needs to be educated on the staff system and this process might delay implementation

Impact – Medium

Mitigation

Ensure high quality training that involves theory and practical work/examples of the new work environment and use vendor support

DataSecure Ltd Current Infrastructure



Hardware (10 Servers):

R1,000,000.00

Software Licensing:

R280,000.00

Cooling:

R150,000.00

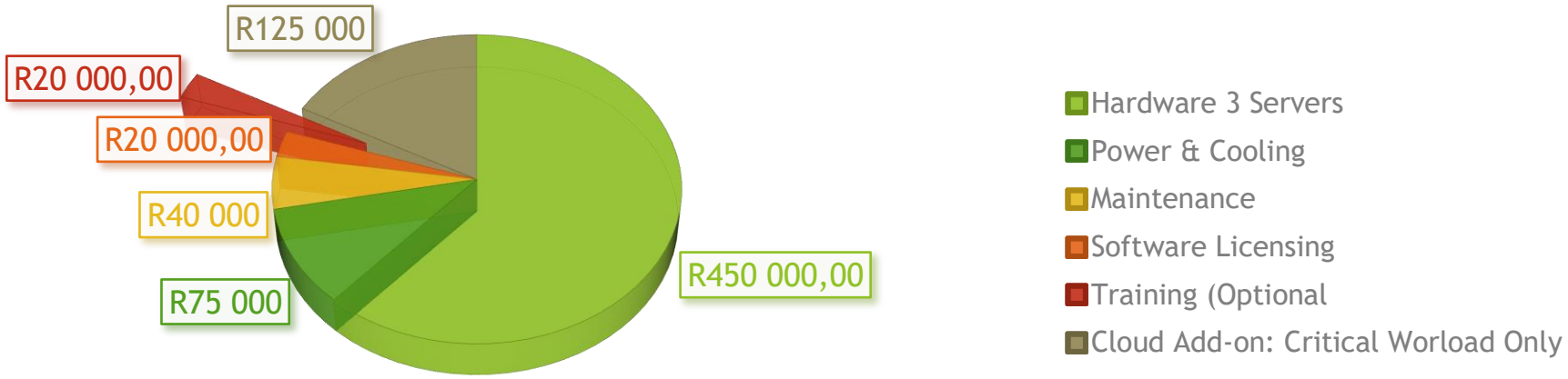
Maintenance:

R75,000.00

Total:

R1,505,00.000

DataSecure Ltd New Virtualization Infrastructure



Hardware (3 Servers):

R450,000.00

Power & Cooling:

R75,000.00

Maintenance:

R40,000.00

Software Licensing:

R20,000.00

Training (Optional):

R20,000.00

Cloud Add-on:

R125,000.00

Total:

R730,000.00

DataSecure Ltd Expenditure Comparison

BUDGET FOR THE IT DEPARTMENT @ DATASECURE LTD
(R1,800,000.00)

Physical Servers

Drawback:

Multiple points of failure, when the servers are down

Financial Cost:

R1,500,000.00 (saved - R295,000.00)

Advantages:

All equipment and maintenance stays in-house

Virtualization

Drawback:

The cost for setting up all these infrastructures such as servers, licensing and training will be costly

Financial Cost:

R730,000.00 (saved - R1,070,000,00)

Advantages:

Optimal use of your computing power (CPU, Memory and RAM)

“By virtualizing an object, you can obtain some greater measure of utility from the resource the object provides”

— **Matthew Portnoy,** Virtualization Essentials

(goodreads.com, 2012)

References

AWS.Amazon, n.d.. What is Virtualization? - Cloud Computing .... [Online]

Available at: https://aws.amazon.com/what-is/virtualization/

[Accessed 13 June 2025].

goodreads.com, 2012. Virtualization Essentials Quotes by Matthew Portnoy. [Online]

Available at: https://www.goodreads.com/work/quotes/19473147-virtualization-essentials

[Accessed 13 June 2025].

Linkedin.com, 2023. How to Explain Hardware and Software Compatibility .... [Online]

Available at: https://www.linkedin.com/advice/0/how-can-you-communicate-hardware-software-compatibility-derbe

[Accessed 13 June 2025].

Microsoft.com, 2024. Troubleshoot SQL Server backup and restore operations. [Online]

Available at: https://learn.microsoft.com/en-us/troubleshoot/system-center/dpm/troubleshoot-scheduled-backup-job-failures

[Accessed 13 June 2025].