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# Virtualization Challenges in the IT World

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## 1.1 Overview of Leading Virtualisation Platforms

### **VMware vSphere**

VMware vSphere virtualization and scalability is outstanding compared to its competitors, VMware gives their competitors a run for their money when it comes to their performance in the virtualisation software industry, not only have they managed to create a system that maximizes hardware use and it improves overall performance their “vMotion uses live migration technology that allows seamless live migration, (DRS) Distributed Resource Scheduler which is used to allocate resource to keep your VMs running efficiently, and to run centralized management VMware have designed a platform called vCenter Server

### **Microsoft Hyper-V**




Microsoft Hyper-V integrates well with the Microsoft solutions such as Failover Cluster, Remote Desktop Services, System Center Virtual Machine Manager, and Window Server. Microsoft Hyper-V works seamlessly with the Windows ecosystem which gives them a big advantage against their competitors. Microsoft-based applications provide a seamless environment for native support on these technologies. (Hyper-V seamlessly integrates with Microsoft products like SQL Server Management Studio, System Center, and Windows Admin Center)

### **Oracle VirtualBox**

Oracle Virtual Box allows for more customization for their users because it is an open-source platform, this software feature allows them to stand out in front of their competitors. Oracle VirtualBox is versatile and efficient because it gives all the benefits of virtualisation without having to add additional



## 1.2 Comparative Analysis of Performance, Security, Scalability, and Licensing

Virtualisation Software	performance	security features	scalability	licensing costs
	<ul style="list-style-type: none"> <li>vMotion uses live migration technology that allows seamless live migration, (DRS) Distributed Resource Scheduler which is used to allocate resource to keep your VMs running efficiently, and to run centralized management VMware have designed a platform called vCenter Server</li> </ul>	<ul style="list-style-type: none"> <li><b>Guest OS Security</b></li> <li><b>Virtual Machine Encryption</b></li> <li><b>Managing TLS Protocol Configuration</b></li> <li><b>vSphere Privileges</b></li> </ul>	<ul style="list-style-type: none"> <li>VMware vSphere primarily uses vSAN and clustered based resource management for stability</li> </ul>	<ul style="list-style-type: none"> <li>HPE VMware vSphere Standard Edition License 1-year 24x7 Support BD710AAE (R31,499.00 + VAT)</li> <li>HPE VMware vSphere Enterprise Plus Edition with 1-year 24x7 Support License - Single Processor BD714AAE (106,499.00 + VAT)</li> </ul>
	<ul style="list-style-type: none"> <li>Microsoft Hyper-V integrates well with the Microsoft solutions such as Failover Cluster, Remote Desktop Services, System Center Virtual Machine Manager, and Window Server. Microsoft Hyper-V works seamlessly with the Windows ecosystem which gives them a big advantage against their competitors.</li> </ul>	<ul style="list-style-type: none"> <li><b>Virtual Trusted Platform Module</b></li> <li><b>BitLocker</b></li> <li><b>Virtual Network Isolation</b></li> </ul>	<ul style="list-style-type: none"> <li>Hyper-V is designed to scale both horizontally and vertically what this means is that the Hyper-V infrastructure is able to allocate vertically the resources that are needed to run the virtualisation (CPU, RAM and Memory) and horizontally scale the amount of VMs of the network</li> </ul>	<ul style="list-style-type: none"> <li>Windows Server 2025 Standard edition Suggested MSRP: (R20 912,28 + VAT)</li> <li>Windows Server 2025 Datacenter edition Suggested MSRP: (R120 405,65 + VAT)</li> </ul>
	<ul style="list-style-type: none"> <li>Oracle Virtual Box allows for more customization for their users because it is an open-source platform this software feature allows them to stand out in front of their competitors. Oracle VirtualBox is versatile and efficient because it gives all the benefits of virtualisation without having to add additional</li> </ul>	<ul style="list-style-type: none"> <li><b>Encryption of Disk Image</b></li> <li><b>Remote Desktop Authentication</b></li> <li><b>Bridged Networking</b></li> </ul>	<ul style="list-style-type: none"> <li>OCI Oracle Clouding Infrastructure allows for Oracle VirtualBox to increase its scaling capability by allocating the storage and computing resources needed to run a huge organization</li> </ul>	<ul style="list-style-type: none"> <li>Oracle VirtualBox Enterprise Perpetual Socket (R17 782,55 per socket + VAT)</li> </ul>

## 1.3 Virtualisation Platform Recommendation for DataSecure Ltd

### **High Maintenance Costs:**

Oracle VirtualBox addresses high maintenance costs by reducing the number of servers and desktops needed to run everyday operations this is done through proficient use of the hardware through virtualization

### **Limited Scalability:**

Oracle VirtualBox addresses the scalability limitations of physical machines by allowing for multiple operating systems an application on 1 virtual machine

### **Security and Compliance Risks:**

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

### **Underutilisation of Resources:**

Oracle VirtualBox addresses underutilization of resources by allowing for several servers to run on 1 machine and use the same resources such as the CPU, memory and storage through shared resources capability

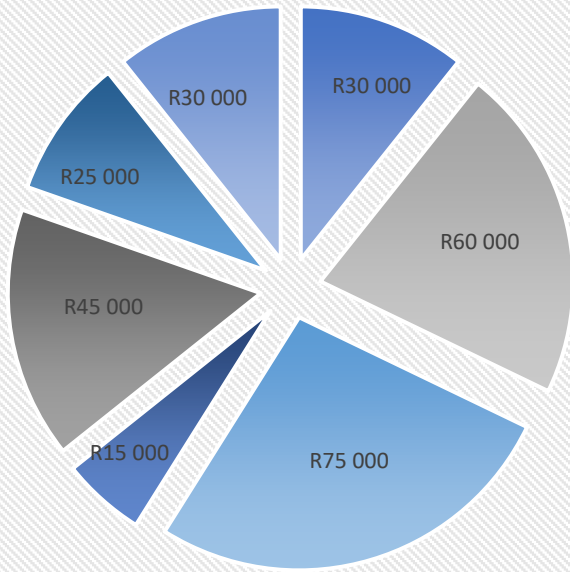
### **Disaster Recovery Concerns:**

SQL Server addresses disaster recovery concerns by offering Always "On Availability Groups" which will be used to focus on maintaining all and any online services are up and running. It will minimize downtime by keep the (HA) in more than one location in case of a disaster happening. To ensure secure and reliable Disaster Recovery SQL Server has a built-in feature called Failover Cluster Instance

### 1.3 Virtualisation Platform Budget

(DataSecure Budget is: R1,700,000.00)

DataSecure Ltd Current Infrastructure Budget



- Email and Communication Server
- Customer Relationship Management (CRM)
- Database Server
- Web Hosting and Application Server
- Backup and Disaster Recovery Server
- Cybersecurity and Intrusion Detection System
- File and Document Storage System

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**

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

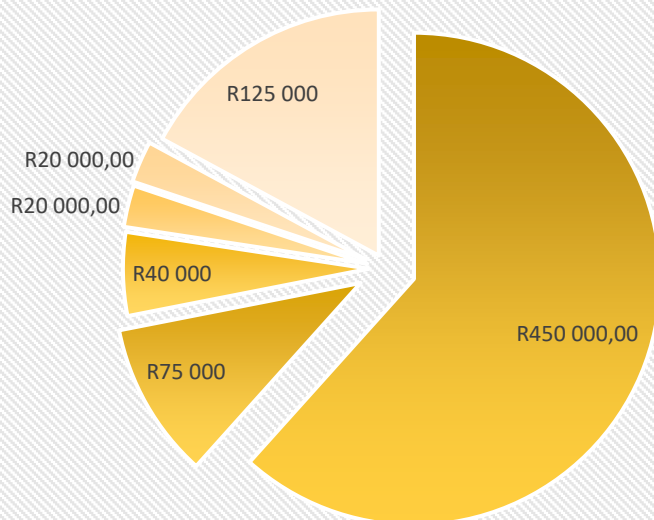
Cloud Add-on:

R125,000.00

**Total:**

**R730,000.00**

DataSecure Ltd New Virtualized Infrastructure



- Hardware (3 servers)
- Power & Cooling
- Maintenance
- Software Licensing
- Training (Optional)
- Cloud Add-on: Critical Workloads Only

## 1.4 Resource Optimisation through Virtualisation

### **CPU**

The main use of a CPU (Central Processing Unit) is to handle the processing load of the device it is in it executes all the commands giving to it by the device. A vCPU works in a similar way however the CPU's cores are sliced so that it can accommodate the other VMs working on the host machine

### **RAM**

The RAM is used for accessing data/information on the prescribe devices. How this works in virtualisation is that whenever the VM(s) switch on the host machine allocates RAM to each machine from the physical RAM available allowing for each machine to run smoothly.

### **STORAGE**

Storage in virtualization works by pooling physical storage into one centralized manageable storage unit. This process allows for your virtual machine to see the storage as 1 huge pool of storage.

## 1.5 Virtualisation for Enhanced Disaster Recovery

### **Snapshots**

A database snapshot is a read-only, static view of a SQL Server database (the source database). It's transactionally consistent with the source database as of the snapshot's creation and always resides on the same server instance as its source database. While database snapshots provide a read-only view of the data in the same state as when the snapshot was created, the size of the snapshot file grows as changes are made to the source database

- Snapshots can be used for reporting purposes.
- Maintaining historical data for report generation.
- Safeguarding data against administrative error.
- Managing a test database.

### **Failover cluster instances**

SQL Server when operating alongside Microsoft Azure uses a Windows Server Failover Cluster which offers local high availability through redundancy at the server instance. A Failover Cluster Instance is a single instance of the SQL Server across the nodes, the FCI allows for failover from one Windows Server Failover Cluster to another if the current node is.

### **Failover Cluster Instance for SQL Server on Azure:**

- SQL Server failover cluster instances
- Windows cluster technologies

### **Backup & Restore Database**

SQL Server allows for automated backups that store all your information in an Azure cloud storage your data is then encrypted for 90 for days for you to review for audit log retention & compliance.

### **SQL Server 2016 and higher features:**

- Manual backup schedule and time window
- System database backups
- Full and log file backup frequency

Restoring a database can only be done by, firstly locating the required backup file in the storage account and then you need to execute a restore command on the Transact-SQL commands or on the SQL VM using SQL Server Management Studio.

## 1.6 Cost-Benefit Analysis of Implementing Virtualisation

### Licensing cost for virtualisation

Oracle Virtual Box is an open-source platform and has no licensing fee for personal use or educational use however they do have a commercial licensing fee for those who want to use it in a corporation setting it. Oracle Virtual Box Enterprise allows the same flexibility as the zero-licensing version however it does come with add-ons such as

- VirtualBox Remote Desktop Protocol (VRDP) support
- Intel PXE boot ROM
- Entitlement for enterprise usage of VirtualBox and the latest security updates

### Reduction in physical servers

Virtualization helps decrease not only the number of servers we have to run as an organization but will help save money on power & cooling. It allows us to run multiple virtual machines on the few servers we have without compromising productivity

### Simplified maintenance and fewer physical points of failure.

Virtualisation allows for us to have one point of failure if we are experiencing and failure in our system, with the use of isolation we can run all other services on the other machines and troubleshoot the machine that we think is going us problems

### Optional cloud integration (for Exchange and DR) allows scalability without major upfront capital.

SQL Server is a relational database management system that can run Microsoft Azure cloud either as a fully managed Azure SQL Database with a built-in high availability & backups, or on Azure Virtual Machines where you have full control over the SQL Server instance, VM, and operating system.

Overall, DataSecure Ltd. could save and reduce capital expenses in Year 1 by R730,000.00 per year. These savings could be reinvested in staff training, cybersecurity improvements, or cloud-based services.

## 1.7 Cybersecurity Enhancements via Virtual Environments

### **VRDP Remote Desktop Authentication**

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

### **Encryption**

Oracle VirtualBox allows for you to encrypt your virtual machine hard disk so that if anyone tries to upload the file and they don't have the password they can't access the data/information. The 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

## Conclusion

The purpose of this document was to display a throughout analysis of the challenges that come with virtualisations and a virtualisation platform that would align with DataSecure Ltd needs

Oracle VirtualBox stands because allows for more customization for their users because it is an open-source platform, this software feature allows them to stand out in front of their competitors. Oracle VirtualBox is versatile and efficient because it gives all the benefits of virtualisation without having to add additional

Key benefits:

- **Licensing cost for virtualisation**  
Oracle Virtual Box is an open-source platform and has no licensing fee for personal use or educational use however they do have a commercial licensing fee for those who want to use it in a corporation setting it. Oracle Virtual Box Enterprise allows the same flexibility as the zero-licensing version however it does come with add-ons such.
- **Reduction in physical servers**  
Virtualization helps decrease not only the number of servers we have to run as an organization but will help save money on power & cooling. It allows us to run multiple virtual machines on the few servers we have without compromising productivity

Key benefits:

- **High Maintenance Costs:**  
Oracle VirtualBox addresses high maintenance costs by reducing the number of servers and desktops needed to run everyday operations this is done through proficient use of the hardware through virtualization
- **Security and Compliance Risks:**  
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

### Cloud integration:

Optional cloud integration (for Exchange and DR) allows scalability without major upfront capital.

SQL Server is a relational database management system that can run Microsoft Azure cloud either as a fully managed Azure SQL Database with a built-in high availability & backups, or on Azure Virtual Machines where you have full control over the SQL Server instance, VM, and operating system.

### Estimated annual savings

Overall, DataSecure Ltd. could save and reduce capital expenses in Year 1 by R730,000.00 per year. These savings could be reinvested in staff training, cybersecurity improvements, or cloud-based services.

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