

# Enhanced availability, agility, Centralized Management and benefits with vCenter & vMotion- A Reflection

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## Abstract

It has always been challenging for enterprises to balance between the level of availability, flexibility, ease of management, and overall IT expenditure. As IT infrastructure has become a core of each business enterprise, its availability, scalability, agility, and other features are mostly sought however on an acceptable and affordable price tag that can be tolerated by the enterprises. Virtualization technology has come as a huge advantage for enterprises and has provided the capability to bestow optimum, fault-tolerant IT services to customers and users at an affordable price, moreover, unleashing the features that otherwise are not available. This research paper is a study conducted to discuss the data center issues of an enterprise and how these problems can be resolved by the implementation of virtualization technology using vCenter. This research study would be very useful for enterprises intending to go for virtualization and will act as a guide for enterprises especially in the Sultanate of Oman for virtualizing their data centers.

## **Keywords.**

Virtualization, vMotion, vCenter, Virtualization benefits, and VCenter Server, Esxi, vSphere.

## **Introduction**

As information technology and IT systems have become a critical part of all enterprise and business organizations will cease to exist in the absence of information technology and systems. It is one of the major responsibilities for the enterprise's management and IT team to ensure the availability of critical IT services all the time. In addition, it is also the responsibility of Information technology administrators and managers to ensure that the IT systems are fault-tolerant, sustainable, flexible, scalable, and manageable at the same time. It is not easy to attain all these features with huge investments however it is also the responsibility of organizations management to limit the investment in IT infrastructure without affecting the efficiency of the work. However, to balance between the two is an extremely difficult job. It is certainly very difficult to achieve all these features that are desired for the IT infrastructure and services and at the same time limit the investment on the IT infrastructure so that same investment can be used for the expenditure of business is no easy task. Cloud computing has shown extremely positive results by enabling pay-as-you-go services to individuals and organizations and has drastically reduced the investment on IT infrastructure, administrative cost and the running expenditure on IT services moreover it has increased flexibility with optimum features available. There is clear evidence of cloud computing being utilized variety of sectors ranging from

educational institutions to automobile and construction companies, from e-commerce to Internet of Things deployments, we can see prevalent use of cloud computing (Bhat, Shuaibi, & Singh, Virtual private network as a service—A need for discrete cloud architecture, 2016) (Bhat, Singh, & Mohsin, Cloud Implementation to Assist Teachers of English to Speakers of Other Languages in HEI's in Sultanate of Oman, 2021) (Bhat, Naidu, & Singh, Multimedia Cloud for Higher Education Establishments: A Reflection, 2019) (Bhat & Ahmed, Big data for institutional planning, decision support and academic excellence, 2016). Cloud computing has particularly provided a lot of flexibility with its service models that are suitable for different types of users and situations. The service architectures also provide a lot of flexibility for a specific group of users to utilize these services. Cloud deployments are normally seen with three main service architectures however some more specific service architecture has been proposed to fulfill the requirements of a diverse group of users (Bhat, Singh, & Singh, Learning resources as a service (L r aaS) for Higher Education Institutions in Sultanate of Oman, 2017) (Bhat, Kameshwari, & Singh, MathCloud: A Discrete Cloud Implementation to Enhance Learning Experience in Mathematics, 2020) (Bhat A. , Role of Cloud Computing in higher education and implementation challenges in higher education establishments in Oman and India, 2018). Cloud computing has certainly contributed to innovative technologies like the Internet of Things and the establishment of Smart Cities, Artificial intelligence, Big Data, and Big Data analytics (Zameer, Saqib, Naidu, & Ahmed, 2019) (Muhsin, Bhat, Ahmed, & Khan, 2019). Although cloud computing has contributed a lot to a variety of organizations however due to certain limitation of security and lack of trust from organizations to store confidential and security-critical data on the cloud has certainly increased the complexity of organizations to manage their IT infrastructure. This research study is analyzing the scenario of an educational institution and the specific requirements of this institution concerning a variety of IT hardware, software, and information systems that this institution is using that are not possible to be hosted on the public cloud due to a variety of reasons which are mainly related to security, regulation, compliance, and privacy. There are several services and information systems that are being used by the institution that are hosted on twenty-five servers with SAN storage and other network devices. However, these twenty-five servers currently utilized by the educational institution are obsolete and need immediate replacement as these servers are being used for the last 15-16 years. The institution has an option of hosting the services on the cloud however all the services cannot be hosted because of the reasons that have been provided above. Despite migrating many of the services to the cloud, the institution still needs 15-18 physical servers to host the rest of the services on-premise. The procurement of these servers is incurring a huge investment just on the hardware leaving aside the upgradation that is the requirement for the applications and operating system. The requirement of the institution is depicted in Figure 1 shown below.



Figure 1. Current Hardware Infrastructure of the Institution

The current infrastructure as shown in the above figure consists of mainly 25 servers that are currently functional for a variety of different services that are being provided to the users. Although some of these services can be migrated directly to the public cloud however most of the services need to be hosted on-premises and for all these services hardware upgrades are desperately required. The up-gradation of hardware for the data center of the educational institution will incur huge investment. This research study proposes a virtual environment that can be used instead of upgrading the infrastructure of the data center. The implementation of virtualization can eliminate the need to procure the hardware to the extent that is currently required and will save 80% investment on hardware devices. This investment can be utilized for other purposes or upliftment of IT infrastructure in some other respects. Moreover, the arrangement and implementation of virtualization will provide advanced features of availability, redundancy, fault tolerance, scalability, manageability, and sustainability. It will also decrease the administrative overhead, reduce the consumption of electricity, and investment in the maintenance of the equipment. In addition to all these benefits listed above the system is capable of recovery from the disaster in a much seamless manner compared to what is a nightmare for most of the administrators. The virtualization environment provides capabilities of balancing the load between physical infrastructure seamlessly with the features that are available with the virtualization environment. The below subsection will discuss the proposed architecture for the Institution.

## Proposed Architecture with VMware vCenter

The proposed architecture will utilize the VMware ESXi and will acquire the license for vSphere servers that will host virtual machines about different information systems that are being utilized by the education institution. The architecture would have a comprehensive solution for balancing the load between physical machines and will provide optimum fault tolerance in case any of the physical servers face downtime (W. Chen, 2008) (Haletky, 2011). The proposed architecture is provided as follows in Figure 2 and Figure 3.

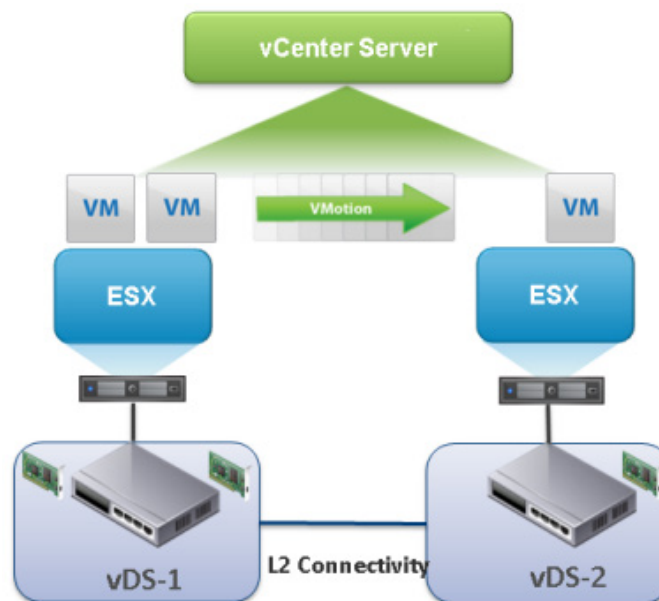


Figure 2 vCenter Server with Esxi hosts

Figure 2 (Grehl, 2015) above depicts the ESXi hosts that relate to a vCenter Server that can control the overall abstraction layer that is formed by both ESXi servers. The exact architecture solution of the institution after the implementation of virtualization is shown in Figure 3 below.

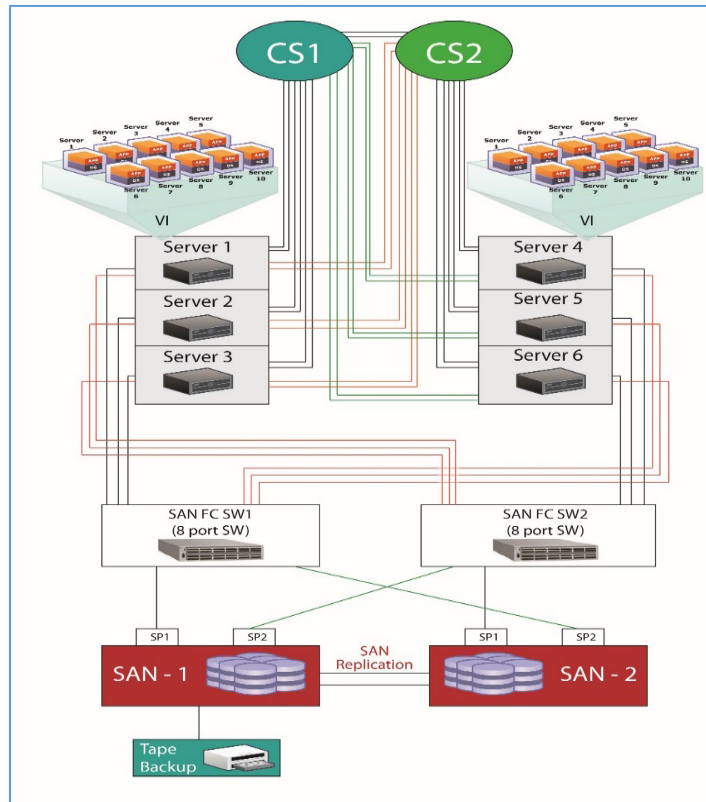


Figure 3 Solution Architecture for the Institution

The solution architecture for the institution suggests and proposes three physical servers in site 1 which is denoted by CS1 in the above exhibit. The CS2 is site 2 that may be used as the disaster recovery site for the institution. Three physical servers can host up to 35-40 virtual machines that can be utilized for different information systems of the institution. Although the current requirement for the institution is 20 virtual machines however keeping in view the future requirements, the additional virtual machines are planned. The infrastructure provides the optimum solution to the problems that were faced by the institution in terms of availability, reliability, scalability, fault tolerance, load balancing, administrative overhead and at the same time significantly reduces the investment cost and the running cost on the maintenance of the infrastructure. The above deployment enables the benefits of a variety of features that are available with VMware virtualization. The abstraction layer is created at multiple levels in the above deployment. The vSphere server provides the access to virtual machines that are existing on one set of physical infrastructure. It provides overall management capabilities to administer and manage the hardware resources pertaining to one set of physical infrastructure. It consolidates the hardware capabilities of a physical server and provides it to the virtual machines for utilization. This abstraction layer is presented by the vSphere server and the hardware resources can be shared and shifted between different virtual machines that are hosted on a particular hardware resource. This is depicted in the following Figure 4 provided below.

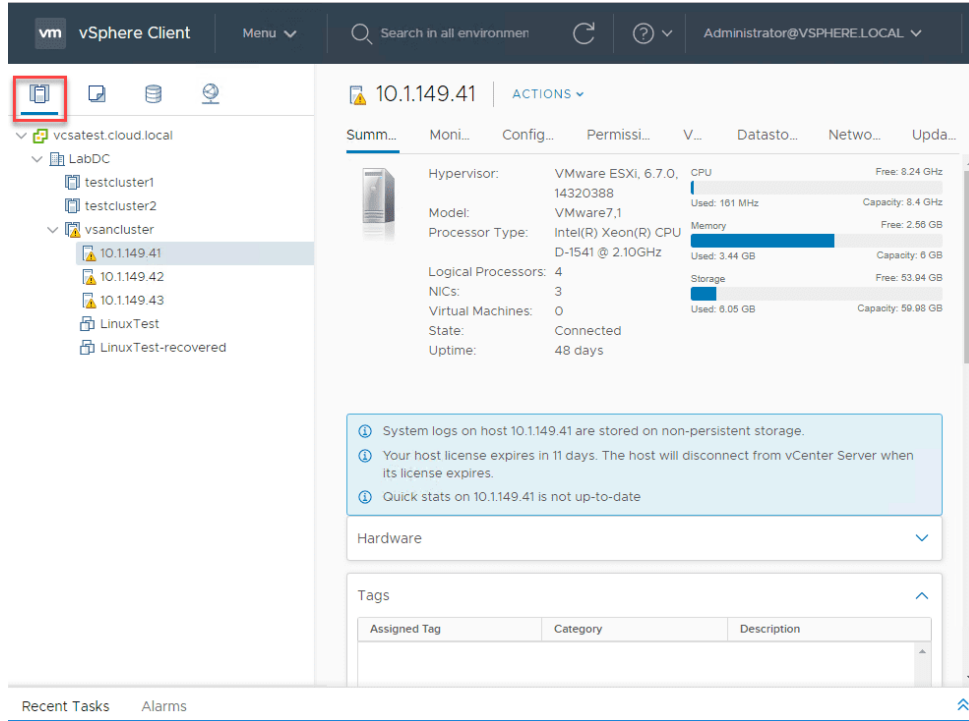


Figure 4 vSphere Client

The abstraction layer pertaining to the consolidated hardware belonging to all servers is represented by the vCenter appliance. Figure 5 shows the vCenter Server appliance.

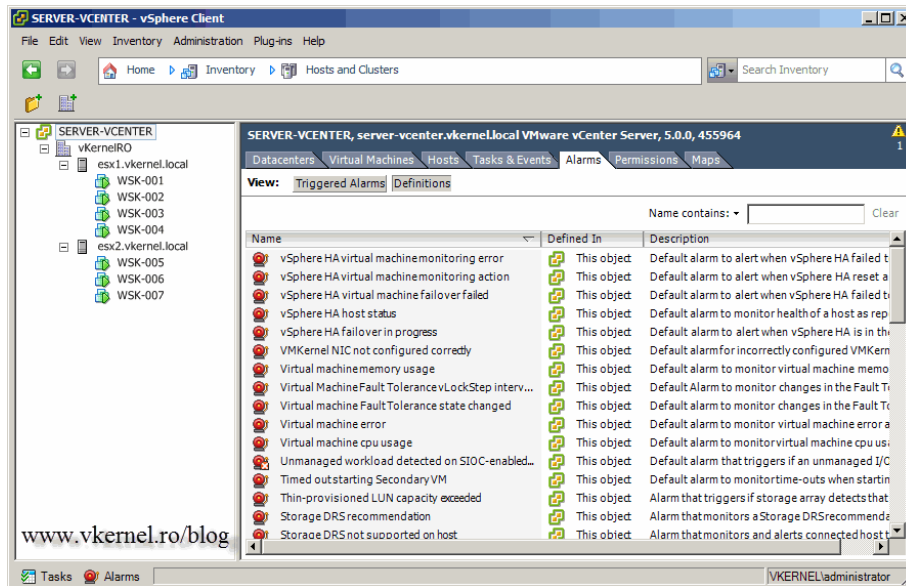


Figure 5 vCenter Server Appliance

vCenter server appliance provides a comprehensive feature to manage the complete data center infrastructure and provides the abstraction layer for the entire infrastructure with features such as live migration with vMotion and other

significant features for the administration and management of data center infrastructure. This deployment of virtualization yields benefits for the institution that were desired at an optimal cost and within the limited investment of the procurement of hardware resources. This deployment results in efficient utilization of hardware resources with minimal administrative overhead and availability of various features like live migration, backup, load balancing, fault tolerance, resource planning, and optimization, etc. This implementation will benefit the institution manifold.

## Conclusion

High availability of IT resources with flexibility and ease of administration are some of the desired features that organizations are expecting at minimal investment in IT infrastructure. Although current public cloud services do provide a lot of advantages to organizations however all the services in an organization cannot be hosted on the public cloud because of various considerations. Appropriate implementation of virtualization services in a particular organization can yield significant benefits that are not only limited to cost-saving however enhanced feature availability that is desired in 21<sup>st</sup> century IT systems. This research provides a case study in an institution and shows how due to the implementation of an appropriate virtualization environment optimum solution can be provided for IT deployments at minimal with maximum flexibility and features.

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