

## Virtualization providing software applications as a service

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### ABSTRACT

Application virtualization technologies enable an organization to consolidate resources in order to improve hardware efficiencies and save cost. This study explores a scaled down implementation for a school environment. Selected literature published from 2005 through 2010 were thoroughly examined. This study used Xenapp server as its hypervisor to publish and virtualize applications, which resulted in a reliable virtual application environment. The Benefits of virtualization and recommendations are identified to maximize positive features, for use by IT security professionals. This work can be used in an areas of application virtualization, desktop virtualization and storage virtualization.

**Keywords:** Virtualization, Optimization, Server Infrastructure, hypervisor, application virtualization.

### INTRODUCTION

Computer Users want to be able to access their documents, use their important applications, and even their entire desktops on the go. They want to be able to do these without having to carry their computer systems everywhere with them. Tablets and super smart phones have done a lot to an extent to resolve some of these issues as they are very light and easy to carry around and can carry out a couple of the tasks that the normal computer system should carry.

But still these devices are too small (in terms of memory) to be really able to carry the many applications a user needs, or let alone process them. Also because of flexibility users would like to access the same thing with any device, instead of being tied to one device.

Virtualization provide a solution to all of these issues and even more. They provide several consolidation and virtual solutions that help make data recovery and data redundancy easier, maintenance and management of information technology easier, and even reduce information technology costs.

So, virtualization is basically the process of taking advantage of excess processing, memory storage, networking, and capacity to create several artificial environments each having different functions [1]. Virtualization has led to several spin-offs, one of which is cloud computing. Cloud computing can be referred to as network-based services which are provided by virtual hardware, simulated by hypervisors running on the physical servers.

This concept of virtual computing can be likened to how electricity is used in houses via paid meters and also how water is distributed to houses. While owning a computer can be likened to owning your own generator (or any other way of generating your own electricity) or drilling a bore hole in your house to provide water.

In virtual computing, performance is also closely monitored and therefore relatively consistent. Data and processes are reliable and redundant. And cost of computing is effectively reduced [2]. A public-cloud delivery model converts capital expenditure to operational expenditure. This purportedly lowers barriers to entry, as infrastructure is typically provided by a third-party pricing on a utility computing basis is fine-grained, with usage-based options and fewer in-house IT skills are required for implementation.

In the recent times a lot of research works have been done to analyze virtualization and its sustainability in the industry as well as how much security it offers. When assessing Virtualization

through its research Cloud Computing key technology, Shufen (2012) considered cloud computing as a consequence of virtualization by demonstrating how Virtualization helps Cloud to achieve the global goal of enlarging virtualization to the public even with no in house infrastructure. In other words, Virtualization is an early phase of Cloud computing, particularly, Private Cloud computing. According to Shu-fen (2012), Virtualization can be seen as getting services, platform, resources as services within the company's facilities. So, it is accessing to the in house or on premise re-sources on demand and at no cost.

For Teneyuca (2011) security issues on cloud and virtualization are still to challenge and he qualify their illusion of security as the illusion of inclusion. Cloud can be seen as the illusion of being secured on data centers and Virtualization as the illusion of security that the isolation principle of virtualization may offer.

This study however focuses on implementing a virtual environment in the school and office environment, using Lagos State University as case study, where applications is provided as a service in the virtual environment.

### METHODOLOGY

The design is done with the big picture in mind and is viable for use in high schools, universities, small, medium and large enterprises. However, because of costs, time and other factors the implementation is scaled down to the minimum suitable size for demonstration. Because of the scale-down, tools and instruments differ from what the actual design recommend but these is clearly stated in this work. In the course of this research the production deployment is referred to as the full deployment, while the scaled-down version is referred to as the scaled deployment.

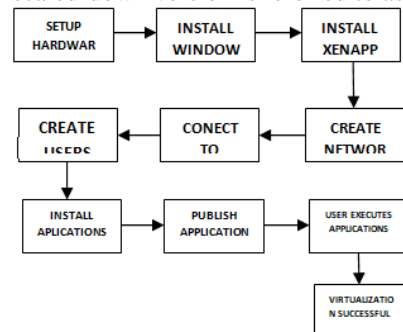


Fig 1: The block diagram of application virtualization.

This block diagram depicts the process undertaken to achieve application virtualization.

The hypervisor used is Xenapp Server, with Windows Server 2008 R2 as the server software. The is tested with users on the network and not via the web for security reasons.

Table 1: showing difference between full and scaled deployment

	Scaled Deployment	Full Deployment
Servers	1-50	>100
Named		
Users	< 150	>5000
Applications	< 100	> 2000

**Model of Application Virtualization**

Fig. 2 shows a probable model flowchart for the virtual environment, and Fig 3 shows the instance used . Where the algorithm is stated as follows:

- Step1: Start
- Step2: Prepare Server for virtualization
- Step3: Publish application on server
- Step4: User logs on to the network
- Step5: User chooses application to use
- Step6: Server grants user access to application
- Step7: User authentication approved
- Step8: User executes application.
- Step9: User is done using application
- Step10: User closes application.
- Step11: Server creates a log file
- Step12: Virtualization complete and successful.

**Step 1:**

Determine the scope.

In this stage, the type of model for deployment is decided, based on the number of user, and the sensitivity of the applications used in that environment. In the case of this design, a scaled down implementation is used.

**Step 2:**

Determine which model is needed.

Based on the need at hand and the operations to be performed, the model needed is decided.

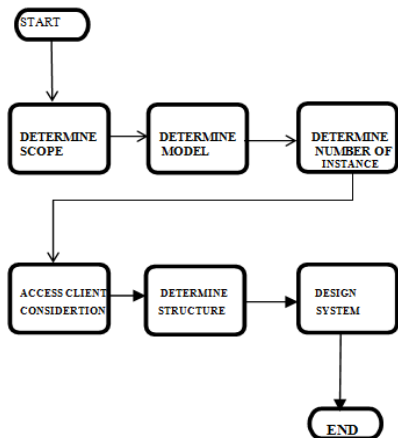


Fig.2: System flowchart

**Step 3:**

Determine how many instances needed.

For server consolidation and redundancy to ensure backup when failure occurs, the instances to be used are determine, mostly based on the criticality of the applications and environment.

**Step 4:**

Access Client Consideration.

Before any design is implemented, the users/clients that make use of the system needs is considered, their needs, skills and performance optimization needs also considered.

**Step 5:**

Determine Infrastructure.

After careful evaluation of the need of the environment the system is to be deployed, the right infrastructure to accommodate these demands is then chosen,

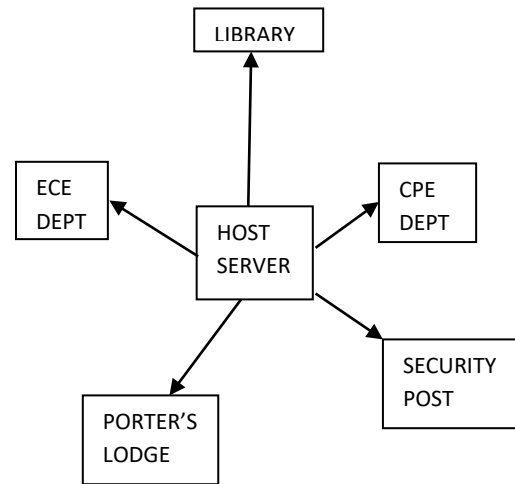


Fig 3. Project Instance

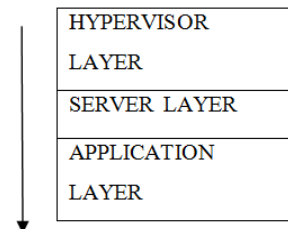
**Step 6:**

Design System.

The system design begins, following a checklist of all processes preceding this stage.

**Implementation**

For implementation, the first layer of virtualization is the RemoteApp hypervisor, which is chosen for this scaled down version because of its cost, and several other factors. Other levels of virtualization include storage, applications, and desktop. With the use of suites such as Xen server, Windows Server, XenApp, XenDesktop, VDI-In-A-Box. 2X computing is software that is also test run. In the end only one suite per service is used in both the scale deployment and the full deployment.



**Server Virtual Machines Installation**

The virtual machines are installed on the server hardware. One to serve as the domain controller and active directory and the other to serve the remaining roles: application server, web server, database server and license server. Both VMs run the Windows Server 2008 R2 server OS, standard edition.

The first VM is assigned with 1024 MB (1 GB) of memory, 24

GB of storage and 2 virtual CPUs. The VM is given a static IP of: 192.168.0.20/24 and the computer name: Domain-Ctrl. This VM is assigned the role of the domain controller. Since no applications is published over the internet or any server connected to the internet then a private domain can be used. The private domain given is: project.LASU. Before setting a server as a domain controller, either .NET framework 3.5 or 4.0 must be turned on in the server feature manager; then the Active directory domain services' role must be configured in the server role manager. The last stage would be then to run dcpromo.exe in the command prompt interface of the server.

This promotes a server to become a domain controller. The dialogue boxes thereafter then allow the administrator to set the domain name and other features. The computer name of the server is then become: Domain-Ctrl.project.LASU. Client users and devices is added to the active directory of this VM. Figure below is a screenshot of the server manager console of the domain controller (Dom-Ctrl.project.LASU).

Once the applications have been installed using the RDP installer they must published from the XenApp infrastructure. The applications are published using the Publish Applications wizard in the Applications pane of the XenAppCenter software on the application server. In the process of publishing an application the administrator specify some details such as; whether the application is to be streamed or hosted, the executable file to launch the application, the servers in the server farm on which the application is to run when being delivered via ICA, the users allowed to use the application, the application icon to use, and whether or not to add the application to the client's start menu. Figure below shows the applications presently published on the applications pane of the XenAppCenter software.

#### User Device Requirements

After publishing applications, users can run applications from virtually any user device and platform with a supported web browser, Citrix plug-in or Citrix receiver.

Supported devices include:

- PCs running Windows 7, Vista, and XP
- Macintosh computers running Mac OS X
- Devices running Linux and Solaris operating systems
- Any mobile device supported by Citrix receiver for Mobile Devices

The supported Citrix receiver software for mobile devices can be downloaded from their respective platform app stores.

Supported web browsers include:

- Internet Explorer 7.x and 8.x
- Google Chrome
- Firefox 3.x
- Safari 5.x
- Netscape 9.x

Note that the appropriate plugins must be installed on devices running Windows, Mac, Linux and other operating systems before any application is attempted to be launched, if not the application launch will fail.

#### Testing

Published applications were tested on two operating system platforms (Windows and Macintosh) and two mobile device platforms (iOS and Android) using Citrix Online Plug-in Citrix Receiver as the client software. The client devices were connected to a wireless network on which the hardware server was connected as well.

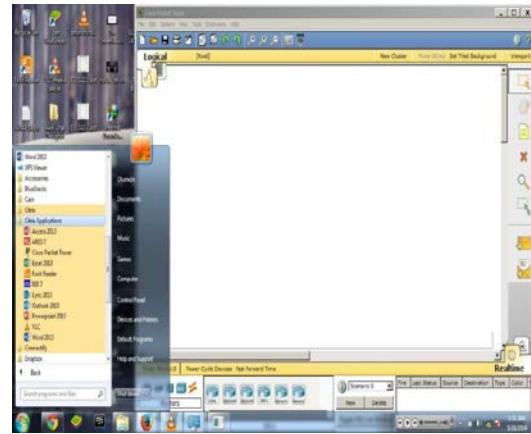


Fig. 4: Windows 7 laptop showing published applications with Cisco Packet Tracer executed

For the Windows 7 test, the Citrix Online Plug-in was used. Figure above shows the published applications shown in the Citrix Applications folder in the start menu of a Windows 7 laptop with Cisco Packet Tracer executed.

#### CONCLUSION

This work has proven that it is in fact possible to deploy applications and desktops from the cloud. Providing solutions to the issues of mobility and compatibility that users encounter. Users are now able to access their documents, use their important applications, and even their entire desktops on the go. They are able to do these without having to carry their computer systems everywhere with them. For organizations, we see how easier data recovery, data redundancy and also maintenance and management of information technology can become. This research is also able to help reduce cost of information technology, especially for consumers and small enterprises. For instance, for small enterprises virtual computing helps convert capital costs to operational costs.

#### Recommendations

Instead of the use of Xen-App for both applications and desktops virtualization, Xen desktop should also be looked into. Other virtualization software providers could prove worth trying such as 2X computing and VDI-in-a box as they have very worthwhile packages. Of course, for a full deployment, a VMware, Citrix, and Microsoft packages present the best possible option. However, for further work on this study, a fully open source implementation is recommended

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