



Citrix XenApp™ Server Deployment on VMware ESX® at a Large Multi-National Insurance Company

June 2010

TECHNICAL CASE STUDY

Table of Contents

Executive Summary	1
Customer Overview	1
Business Challenges	1
Technical Challenges	2
XenApp Server Overview	2
VMware vSphere Overview	2
The Technical Solution	4
Production XenApp Server Virtual Machines	4
File Server/CIFS Server Virtual Machines	4
Standby XenApp Server Virtual Machine	5
System Software Configurations	5
XenApp Server Virtual Machines	5
Physical Server Configurations	5
Storage Configuration	5
Operations Support	6
High Availability	6
Templates	7
Operations and Performance Monitoring	7
Disaster Recovery (DR)	7
Best Practices	7
Benefits Achieved	8
Conclusions	8
References	8

Executive Summary

This document describes the deployment of the XenApp™ server from Citrix in a set of virtual machines on VMware vSphere™ for a multinational insurance company's business use. This deployment has been in place for more than a year and it serves the needs of two thousand concurrent users within the larger group. The end-user response times for the applications that are hosted on the virtualized systems are equal to those formerly observed in the physical implementation of the XenApp server, so that the users do not notice the difference between the new virtualized version and the previous physical system. This paper describes that implementation at a technical level. The decision to go with a virtualized form of the XenApp server based on VMware technology was taken for reasons of consolidation and cost reduction, as well as the proven robustness of the underlying technology.

Customer Overview

The company is a global insurance and investment services company with offices in many countries and over 175,000 employees worldwide. The various business units within the company serve a wide variety of financial services customers, including the health and life insurance industries as well as the investment management business.

The focus of this case study is on the deployment of the XenApp servers from Citrix on VMware vSphere 4 for the UK division, providing remote application access to users in distant locations, while retaining the company's data within its datacenters. The goal is to consolidate these and other data centers into a new one that will be located in Switzerland in the 2010 timeframe.

Business Challenges

IT organizations are under constant pressure to reduce costs and increase service levels to their business users. Many companies have achieved this through the consolidation of physical computing resources onto fewer hardware servers that host virtual machines. Consolidation allows companies to reduce equipment capital expenditure as well as power, cooling and recurring administrative costs. They also achieve increased business flexibility through the ability to move workloads around more easily for load balancing purposes and to prioritize computing resource allocations to the most important work to be done.

The insurance company was faced with the challenge of providing desktop application support to a wide variety of business users in various countries in Western Europe as well as to overseas application development teams in India. This requirement incurred significant costs in the past and these had been tackled by deploying Citrix's XenApp server on physical systems. The company is an early adopter of VMware ESX® server software since its early days when it was at version 1.5. (The current version is VMware vSphere v4.0 at the time of writing.) The UK department decided to further reduce costs by moving the XenApp server software from physical hosts on to virtual machines based on VMware ESX host servers, thereby further reducing the need for new hardware and thus reducing costs.

The company uses the XenApp server configuration to support two different types of users:

- **Onshore and Offshore business application users** – of whom 700 users are in India and 300 users in the UK.
- **Development and support users** – of whom 500 are in India and some others are at third party sites in the UK.

The total population of concurrent system users can range from 1400 to 1700 people. The planned deployment shows that the virtualized XenApp server system will support more than 1200 UK users for an outsourcing project and a further 300 users on a subsequent project.

Technical Challenges

Before implementing the XenApp server software on the VMware® Infrastructure platform, the company's IT organization faced some significant technical challenges in maintaining service to end users. They had been running XenApp server on physical systems for approximately eight years (from 2000 to 2008) before making the decision to move to virtual. The most significant of these technical challenges were:

- The need for a Desktop Recovery solution that could scale quickly to handle rapid growth in employee numbers.
- The need to quickly test patches and reproduce issues.
- The need to reproduce issues without adding new hardware to the existing set.
- The need to test new functionality and features in a safe environment without prejudicing the production systems.
- The need to reduce physical server count.
- The VMware virtual infrastructure platform was the key enabler in resolving all of these challenges.

XenApp Server Overview

The XenApp server, formerly called the Citrix Presentation Server, is a component of the Citrix remote presentation suite of products. By deploying this server, users can connect to a remote machine, and use it as if it were local to them. That remote machine may well be a virtual machine itself, running in a datacenter that is remote from the users. XenApp makes use of the ICA protocol to carry traffic back and forth between the centralized site and the remote users. Users may operate with a very lightweight desktop computer that essentially contains just enough software to connect to the central XenApp site. These widely dispersed desktops are much cheaper to maintain than fully fledged PCs.

The XenApp server suite has been in use at various parts of the company's operation since the late 1990's (in the form of the Citrix Metaframe Server). In 2005, the company migrated to Citrix Presentation Server 3.0 which was run on 240 x86-compatible blade servers. In 2007/2008, the UK division adopted XenApp version 4.5 and subsequently moved all of its XenApp server virtual machines on VMware ESX in 2009.

VMware vSphere Overview

VMware provides the most widely deployed software suite for optimizing and managing IT environments through virtualization – from the desktop to the data center. VMware solutions deliver results at more than 130,000 customers of all sizes, where they are used in a wide variety of environments and applications. The VMware vSphere virtualization suite is fully tested and certified for the widest range of hardware, operating systems and software applications allowing for enterprise-wide standardization independent of operating systems and hardware. VMware vSphere provides built-in management, resource optimization, application availability and operational automation capabilities that deliver cost savings as well as increased operational efficiency, flexibility and IT service levels.

Key components of vSphere are classified as either infrastructure services or application services:

- **Infrastructure services** are the set of components, including VMware ESX, that comprehensively virtualize server, storage and network resources, aggregate them and allocate them precisely on demand to applications based on business priority.
- **Application services** are the set of components that provide built-in service level controls to all applications running on VMware vSphere, regardless of application type or operating system.

Administration of infrastructure and application services, automation of day-to-day operational tasks with deep visibility into every aspect of large and small VMware vSphere environments is provided by VMware vCenter Server.

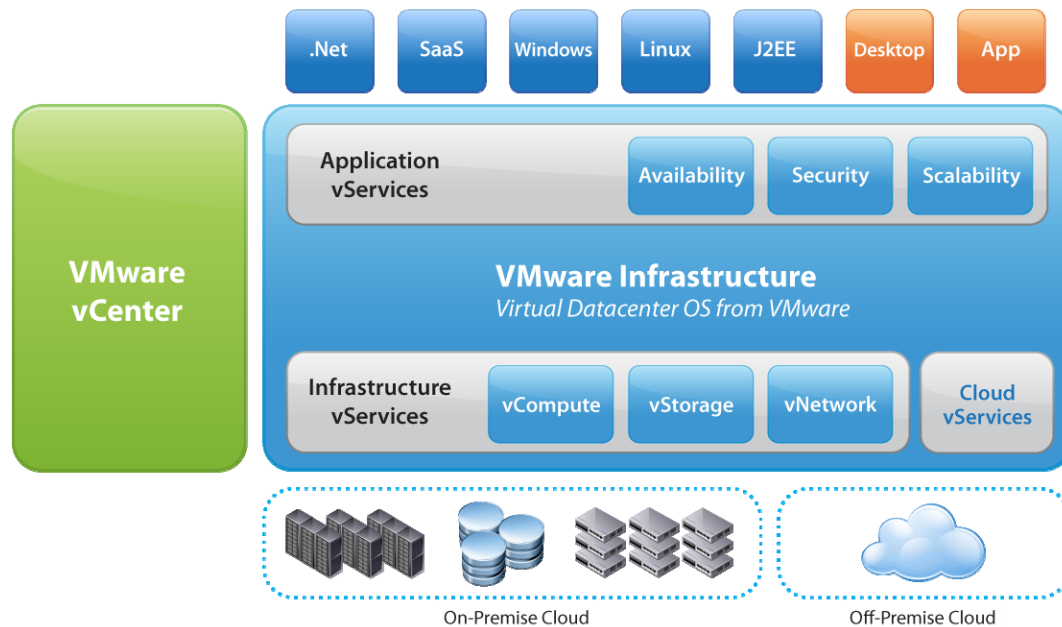


Figure 1. VMware vSphere Outline Architecture

In addition, vSphere provides a set of distributed services that enables fine-grained, policy-driven resource allocation, high availability, and consolidated backup of the entire virtual datacenter. These distributed services enable an IT organization to establish and meet production service level agreements (SLAs) with its customers in a cost-effective manner.

The relationships between the various components of VMware Infrastructure are shown in figure 1.

VMware vSphere includes the following components:

- **VMware ESX (ESX):** A robust, production-proven virtualization layer, run on physical servers, that abstracts processor, memory, storage, and networking resources into multiple virtual machines.
- **VMware vCenter Management Server (vCenter):** A central point for configuring, provisioning, and managing virtualized IT environments.
- **VMware vCenter Client (vCenter Client):** A graphical interface that allows users to connect remotely to the vCenter Server or to individual ESX instances from any Windows PC.
- **VMware vCenter Web Access:** A Web interface that allows virtual machine management and access to remote consoles.
- **VMware Virtual Machine File System (VMFS):** A high-performance clustered file system for ESX virtual machines.
- **VMware Virtual Symmetric Multi-Processing (SMP):** Allows a single virtual machine to use multiple physical processors simultaneously.
- **VMware vMotion (vMotion):** Enables the live migration of running virtual machines from one physical server to another with zero down time, continuous service availability, and complete transaction integrity.
- **VMware High Availability (HA):** Provides easy-to-use, cost-effective high availability for applications running in virtual machines. In the event of server failure, affected virtual machines are automatically restarted on other production servers that have spare capacity.
- **VMware Distributed Resource Scheduler (DRS):** Allocates and balances computing capacity dynamically across collections of hardware resources for virtual machines.
- **VMware SDK (SDK):** supports a standard programming interface for VMware and third-party solutions that want to access the VMware infrastructure.

The Technical Solution

Figure 2 shows the virtual machine layout for the XenApp servers and associated servers at one of two data centers located in the UK. The second data center contains a mirror image setup to this one, apart from the storage configuration. The plan is to expand and migrate this architecture to other data centers, over time, in Switzerland in 2010.

CITRIX Target Architecture

Production Logical Architecture

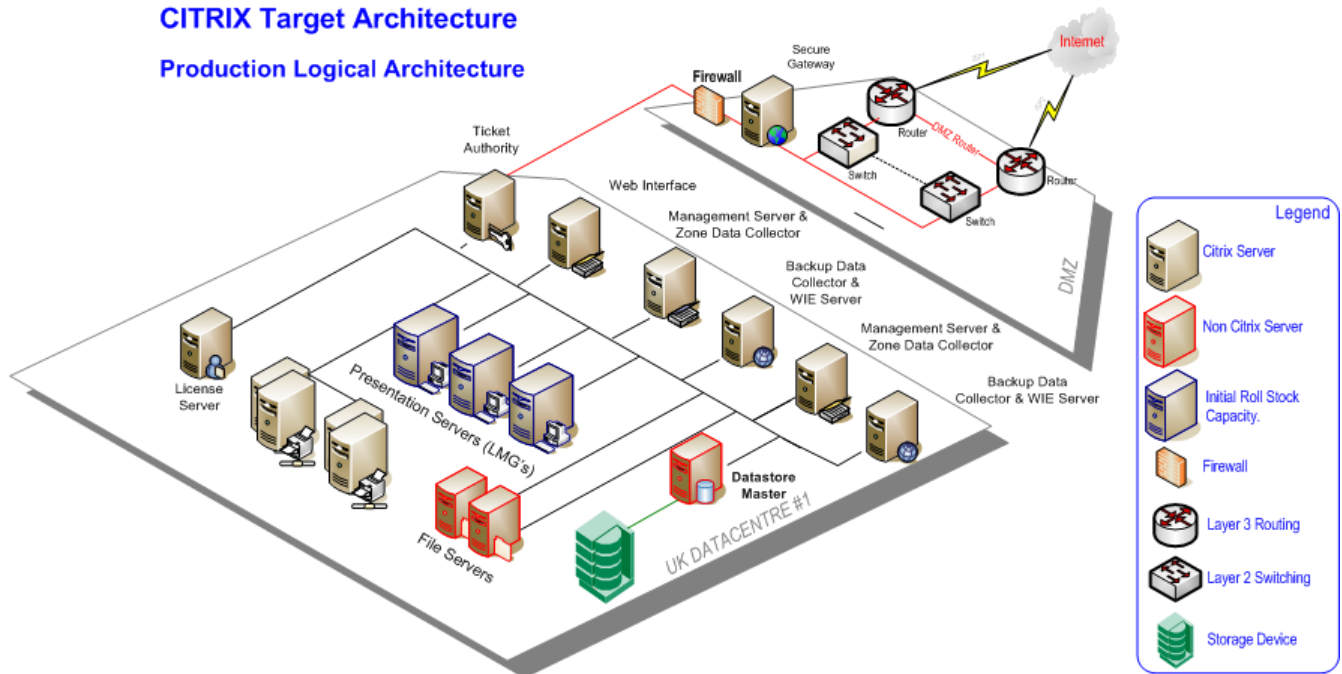


Figure 2. XenApp Server Architecture Layout in Virtual Machines on ESX

Note: The file servers shown in the lower section of Figure 2 are CIFS shares that are hosted on a NAS device.

Production XenApp Server Virtual Machines

The core of the virtualized XenApp system is made up of three production virtual machines with the XenApp Presentation Server operating in them, shown in the middle section of Figure 2 (the nodes labeled “Presentation Servers”). The software specifications for the contents of those XenApp server virtual machines are detailed in the System Software Configurations section below.

The other services that make up the components of the XenApp application, such as the License Server, the Web Interface server, the WIE Server and the other servers are also contained in virtual machines of their own that execute on the same physical servers as the XenApp presentation servers.

File Server/CIFS Server Virtual Machines

There are two file server virtual machines as shown in the middle left section of Figure 2, along with a set of print servers that are also virtualized. The file servers are implemented as CIFS shares that are hosted on a NAS device.

Standby XenApp Server Virtual Machine

The production XenApp server systems have a standby XenApp server virtual machine with identical specifications.

System Software Configurations

This section describes the various software components that are installed and used in each virtual machine as well as configuration details of each XenApp server virtual machine.

XenApp Server Virtual Machines

Each production XenApp server virtual machine (including any standby XenApp server virtual machine) has the following software and hardware installed:

- XenApp server version 4.5 (some remaining version 4.0 instances remain in service)
- Windows Server 2003 Standard Edition R2 SP2
- 2 vCPUs and 4GB RAM per XenApp server virtual machine
- 1 x 20GB c:\ drive (VMFS) per virtual machine (OS and binaries)
- 1 x 40GB d:\ drive for application installation and source files ONLY (i.e. not for user data)
- User data is on CIFS on a NetApp fileshare

The XenApp server virtual machines share a cluster of between four and eight ESX host servers, depending on application capacity requirements.

The company uses the same ESX servers to host a variety of other non-XenApp server Windows and Linux workloads at any given time.

Physical Server Configurations

This section describes the physical servers, storage and network setup for the servers that host the virtual machines described above. All the XenApp server virtual machines run on a VMware ESX cluster that has VMware High Availability (HA) enabled.

- IBM 3850 M2 rack-mounted servers
- 128 Gb RAM configured in each server
- The core XenApp virtual machines are replicated on two separate sites, so that there is full resiliency in case of a site failure.
- VMware High Availability (HA) protects the XenApp server virtual machines against machine failure within any one site.

Storage Configuration

The IBM DS 8000 fiber channel storage array configuration for the XenApp servers is shown in Figure 3. The disk storage is split into two main sections as follows:

- One VMFS datastore to store system disks (C:\vmdk)
- A second VMFS datastore to store application disks (d:\vmdk)

The users' data is stored through a V3050 NetApp gateway on the DS8000 on a CIFS share as shown in Figure 3. This is replicated on to the other datacenter storage using NetApp's SnapMirror.

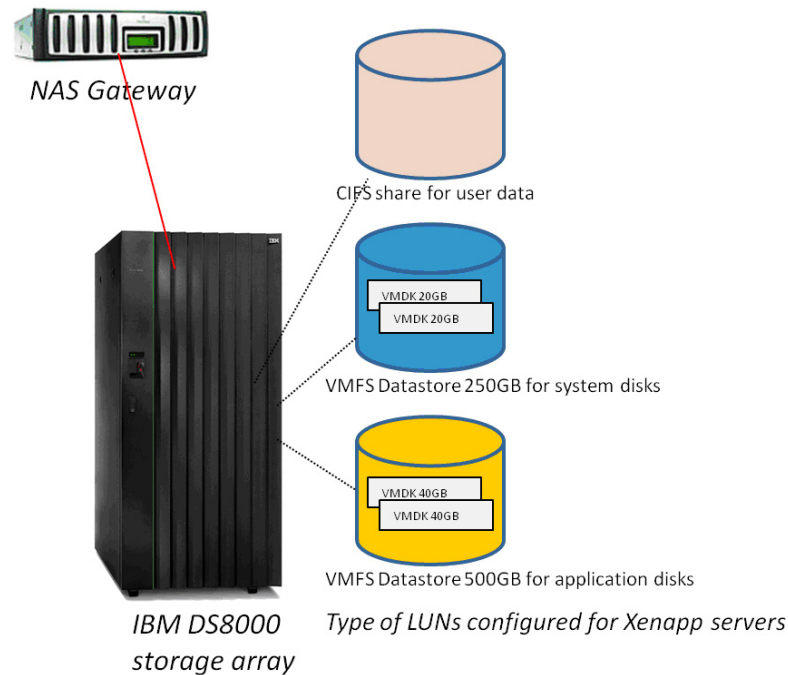


Figure 3. Storage Array Configuration for the XenApp Server

Other details of the storage configuration are:

- 250 Gb LUNs for the encapsulated guest operating systems disks within the virtual machines. These are VMFS formatted.
- 500 Gb LUNs for the non-OS data disks within the virtual machines. These LUNs may reside on VMFS or on RDM.
- The SAN is implemented using an IBM DS8000 model disk array using fiber channel communication.

Operations Support

The current service level agreement (SLA) with the business users of the XenApp service is to provide 99.97 percent uptime between the hours of 8am and 8pm. When support requests arrive into the Help Desk, the IT staff promises a 30 minute initial response time and one hour to problem resolution time. The applications are also extensively used outside of the hours mentioned above.

Approximately half of the Citrix XenApp production traffic is handled by each datacenter. Each datacenter has additional spare capacity, which means that if a datacenter crash were to occur, then the systems at the remaining datacenter would be able to handle the extra traffic.

High Availability

The XenApp server environment relies on VMware HA for high availability. A cluster of ESX host servers is constructed to provide a failover point for resident virtual machines. This setup is done in the vCenter user interface. If one physical server machine were to fail unexpectedly, its resident virtual machines would be restarted automatically on the other server. To date, neither an ESX host server nor a XenApp server virtual machine failure has occurred.

Templates

The Windows 2003 Server software is installed and configured in a VMware ESX template along with the most current Windows patches and then sealed with Sysprep. The IT department can deploy a new virtual machine from this template and install and configure XenApp server software in less than 15 minutes. The template allows the IT team to deploy a new virtual machine quickly for load-balancing purposes or in case of an issue with an existing virtual machine.

Operations and Performance Monitoring

A combination of tools is used to monitor guest operating system health, virtual machine disk usage and SQL Server health. These include

- VMware vCenter for virtual machine and ESX host management and performance monitoring
- Computer Associates UniCenter NSM suite for systems management
- Citrix Monitoring Tools
- Windows Update Services (for guest OS updates)
- Citrix EdgeSight for Application Performance and User Experience Performance Management

Disaster Recovery (DR)

The current core component XenApp server virtual machines are replicated across two sites for overall systems resiliency.

Best Practices

By moving from ESX 3.5 to vSphere (ESX 4.0) the XenApp implementation gained appreciably in performance. The outline nature of this gain is documented in a white paper listed in the References section.

The company also found through testing with different combinations of virtual CPUs that virtual machine configured with two virtual CPUs worked best for their XenApp implementation.

Benefits Achieved

This deployment was one of the most successful virtualization rollouts the UK department has done. Using VMware vSphere as the platform for these servers, the department was able to achieve improvements such as:

- Reduced physical server count
- Increased high availability using VMware HA
- Reduced provisioning times
- Reduced planned downtime with VMotion and
- Dynamic load balancing with DRS

Conclusions

The virtualization of the XenApp configuration at the insurance company is successful from both a business and technical perspective. The XenApp virtualized servers, along with their associated helper servers, are now serving the needs of over 1400 concurrent users in the company. The deployment was achieved without adding to the number of physical servers in the IT department. The virtualized environment provides a 24/7 level of service for the company and is considered one of the most reliable and easiest to manage IT services provided by the company to its internal customers in Europe and Asia.

References

- “What’s New in VMware vSphere 4 : Performance Enhancements” white paper:
<http://www.vmware.com/files/pdf/VMware-vSphere-Performance-WP-EN.pdf>

