1. Introduction

What is virtualization? How does it benefit me? What is the VMware Infrastructure? These questions are answered in this short topics booklet in relation to the VMware technologies used in the enterprise.

Virtualization applies to many different areas in the computer world, including graphics, sound, and computing. In this booklet we focus on the server virtualization space. Server virtualization allows multiple operating systems to run at the same time on the same hardware. It does this by logically partitioning the hardware and presenting a standardized set of resources and devices to the running operating systems. VMware has extended server virtualization to include management capabilities for server provisioning and management with tools such as VMware VMotion, which can migrate a running virtual machine to different hardware platforms without rebooting or changing device drivers. Regardless of the underlying hardware, an operating system can be confident that migration between different ESX host hardware will not impact the system and its applications.

Virtualization benefits the datacenter by reducing hardware and infrastructure costs, reducing power and cooling costs, increasing utilization of hardware, and simplifying provisioning and budgeting processes.

The VMware Infrastructure consists of ESX and ESX host hardware, which allows the server virtualization platform to run multiple operating systems; the VMware vCenter Server, which offers monitoring, provisioning, and management of the environment; and a set of tools to provide additional functionality. These tools include DRS for distributed resource scheduling, VMware HA for distributed availability services, VMotion for migrating virtual machines without downtime, and a number of other tools described later. We also provide use cases for virtualization, performance, and optimization, and the return on investment (ROI) for deploying the VMware Infrastructure.

VMware Technology Overview

VMware was founded in 1998 with the goal of putting mainframe-level virtualization technology, and the associated resource partitioning capabilities, on an x86 platform. VMware software provides hardware virtualization capabilities that present an x86/x64 platform and associated devices to a guest operating system running in a virtual machine.

The suite of products from VMware includes virtualization platforms to run virtual machines, migration and conversion tools, assessment tools, and management tools to support the VMware Infrastructure. This suite has the following technologies and associated products:
Virtualization Management Software
VMware vCenter Server manages all virtualized components of the VMware Infrastructure, spanning multiple clusters and datacenters through one centralized interface. The following virtualization tools are managed through VMware vCenter:

- VMware Virtual SMP—Enables multiprocessor virtual machines.
- VMware Distributed Resource Scheduler (DRS)—Dynamically allocates and balances resources across multiple virtual machines.
- VMware High Availability (HA)—Provides automated recovery of any applications running in a virtual machine, regardless of the underlying operating system or hardware configuration.
- VMware VMotion—Enables live migration of virtual machines from one physical server to another with no impact on end-users.
- VMware Storage VMotion—Enables live migration of virtual machine disk files across storage locations while maintaining service availability.
- VMware DPM—Distributed Power Management for the VMware Infrastructure, allowing dynamic startup and shutdown of ESX host hardware.

Native Virtualization Software
VMware ESX—ESX is the core enabling technology of the VMware Infrastructure. ESX version 3 (ESX 3) runs directly on physical hardware, not on top of an operating system, and is designed for maximum performance and availability. ESX version 3i (ESX 3i) can be embedded on a motherboard in a 32MB footprint.

Hosted Virtualization Software
Hosted virtualization software is virtualization software that runs on top of a standard operating system, including:

- VMware Workstation—Desktop virtualization product designed for end-users and developers to create and run virtual machines on their own Windows- or Linux-based desktop computers.
- VMware Player—Free virtualization product for running (but not creating) multiple virtual machines on Windows or Linux desktops.
- VMware Server—Free server virtualization product for running (but not creating) multiple virtual machines on existing physical Windows or Linux servers.
- VMware Fusion—Virtualization product for Intel-based Mac OS X systems.
- VMware ACE—Virtualization product for enterprise desktop deployments providing a highly configurable, secure, portable PC environment with centralized administrative control of software versioning and updates, and all facets of security and admission control.

Migration Tools
VMware Converter—Used for physical-to-virtual machine migrations, as well as importing virtual machines based on other virtualization vendors. VMware Converter can
import multiple machines concurrently and non-disruptively while the servers are running, or offline using a converter boot disk.

**Security Enablers**

- VMware ACE—See preceding page.
- VMware VMsafe—Provides an open approach to security through an application program interface (API) sharing program. This enables selected partners to develop security products for VMware environments. VMsafe gives fine-grained visibility over virtual machine resources, making it possible to monitor every aspect of the execution of the system and stop previously undetectable viruses, rootkits, and malware before they can infect a system. VMsafe provides inspection of virtual machine memory pages and CPU states, filtering of network packets inside hypervisors as well as within the virtual machine itself, and in-guest, in-process APIs that enable complete monitoring and control of process execution. Guest virtual machine disk files can be mounted, manipulated, and modified as they persist on storage devices.

**Desktop Virtualization Software**

VMware Virtual Desktop Infrastructure (VDI)—A system for managing connectivity, security, and administration of centralized virtual desktop computers hosted on ESX clusters. VMware Desktop Manager (VDM) is the VMware technology supporting connection brokering for VDI.

**Application Virtualization Software**

VMware Application Virtualization (formerly Thinstall)—An application virtualization platform that enables complex software to be delivered as self-contained EXE files which can run instantly with zero installation from any data source. The core of the technology is the Virtual Operating System, a small, lightweight component which is embedded with each “thinstalled” application.

**Virtualization Assessment**

VMware Capacity Planner—Identifies server inventories and resource utilization to determine virtual machine candidates, server consolidation ratios, and resource requirements for migrating to a VMware Infrastructure.

**Software Lifecycle Automation**

- VMware Lab Manager—Provides a self-service portal for real-time provisioning, managing, and collaboration of virtualized development and testing environments. Lab Manager allows developers and testers to create and share a library of virtualized application environments used in software development and testing.
- VMware Stage Manager—Automates the management of service transition and release management of preproduction resources. Production application systems can be captured for testing or updating, then promoted or demoted in and out of production through a predefined release management workflow.
Workflow Management
VMware Lifecycle Manager—Manages the lifecycle of virtual machines from request through provisioning and eventual archiving or destruction. Lifecycle Manager provides a self-service portal for virtual machine requests, which are routed through a predefined workflow, streamlining provisioning, reducing overhead, and providing consistent management of the virtual machine lifecycle.

Disaster Recovery
- VMware Site Recovery Manager (SRM)—Provides disaster recovery automation and workflow management for a VMware Infrastructure. SRM automates setup, testing, failover, and failback of virtual infrastructures between primary and disaster recovery sites, as well as simplifying and centralizing the management of disaster recovery plans.
- VMware High Availability (HA)—Provides fault tolerance in the event of an ESX host failure. VMware HA allows the definition of rules for the automated restart of virtual machines on other hosts in a cluster upon host failure, providing minimal downtime during hardware failure without the cost of OS-level clustering.
- VMware Consolidated Backup (VCB)—Provides the capability to support SAN-based backup and recovery of virtual machines using a backup proxy server without any network or virtual machine overhead.

Benchmarking
- VMmark—A benchmark tool specifically designed for measuring scalability of virtualization host systems.

This collection of software, used together, can provide a dynamic environment that can reduce costs and provide significant improvement to the life-work balance of IT professionals.