



MindTree's experience on Consolidation and Virtualization Technology

This paper highlights MindTree's experience on
Virtualization:

Consult, Design, Test, Deploy, and Maintain
White Paper | Case Studies

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ACKNOWLEDGEMENTS

While this paper reflect the experience of MindTree Minds who have either directly contributed or assisted in the various virtualization implementation, the basics information about virtualization are derived from various materials on the internet. I wish to fully acknowledge the contribution of all the minds from the respective project teams who helped me articulate these different case studies.



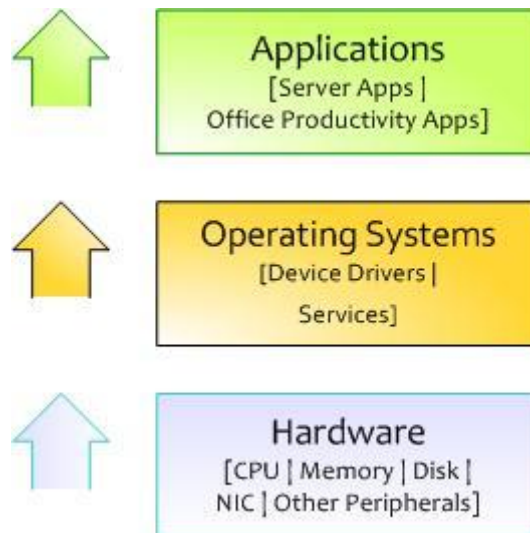
INTRODUCTION: CONSOLIDATION AND VIRTUALIZATION

The rapid spread of server virtualization on platforms (Intel or AMD) over the past few years is making virtualization an important solution for scale-out hardware resource sharing. As virtualization is increasingly being used for production workloads, less complex and more efficient implementation strategies for deploying virtualization are being developed. With the uptake of the technology, it is increasingly important that integration occur between the hardware and virtualization layers in order to ensure the most efficient, high-performance and reliable platform possible.

WHAT IS VIRTUALIZATION?

Virtualization is the form of partitioning a physical server into multiple virtual servers or virtual machines (VMs) and is a long-established and widely accepted solution for hardware resource sharing on large, scale-up server platforms.

The term “virtualization” is a general one, and it can apply to many different technologies. For example, Storage Systems, Physical Appliances can all be virtualized in one way or other. Much of the current buzz about virtualization focuses on “server virtualization” – the ability to allow multiple independent operating systems to run on the same hardware at the same time. Products from VMware, Citrix, and Microsoft lead in this area. MindTree has delivered Server Consolidation and Virtualization to its clients and has acquired immense experience in this area. In this paper, I’ll provide some details related to the various approaches to Virtualization. The goal is to determine the appropriate method.





The figure provides a high-level overview of when areas of a standard server “stack” can be virtualized. Moving up from the bottom is the hardware layer, followed by the OS and finally the application layer.

THE KEY GOALS OF VIRTUALIZATION ARE:

- a) Ensure independence and isolation between the applications and the operating systems on a specific piece of hardware
- b) Provide access to as much of the underlying hardware system as possible
- c) Minimize performance overhead
- d) Optimizing data center space utilization – more densely populated data centers
- e) Increase utilization of servers | storage with improved reliability and performance
- f) Increase availability

HARDWARE-LEVEL VIRTUALIZATION AND HYPERVISORS:

We'll start from the bottom of the “stack” – the hardware layer. All virtualization platforms that run directly on the base hardware should provide the best performance by minimizing overhead. Typically, the VM Server installs directly on a supported hardware platform and included a minimal operating system. Administration is performed through either a web-based application or client software. The thin layer that the VMs normally install directly on the supported hardware is called as Hypervisor and is the main concept behind hardware level virtualization. The biggest challenge in hardware level virtualization is the issue of device compatibility followed by the ability to manage these hypervisors.

SERVER-LEVEL VIRTUALIZATION:

The most commonly used and best known virtualization mechanisms operate at the server level. Server-Level virtualizations are achieved through softwares which are installed over a host operating system. In this approach, the virtual machines run within a service / application that then communicates with the underlying hardware by leveraging the host operating systems. The biggest advantage of this model includes ease of administration, increased list of compatible hardwares, and integration with directory services / network security however the challenges include the additional overheads in terms of memory, CPU, disk, network etc and these are not as efficient as the hardware based virtualizations.

APPLICATION-LEVEL VIRTUALIZATION

In many cases, running multiple independent OS is overkill. If the need is to run multiple isolated environments that allow multiple users to concurrently run instance of a few



applications, there's no need to create a separate VM for each concurrent user. We could leverage on application level virtualization. These products run on top of host operating systems and provide standard applications in isolated environments. The advantages of this approach include greatly reduced overhead and improved scalability however the challenges are that only the software settings will be independent while hardware settings changes would be applicable across the users.

SELECTING THE BEST APPROACH:

There is no cookie cutter approach for selecting the best approach. We will have to carefully assess the needs of each and every IT environment. For example, the following table provides some selection criteria based on workloads. In general, as you move from Hardware – to server – to application level virtualization, you gain scalability at the cost of overall independence. The best solution would be based on the specific workload and other related constraints.

Workload	Virtualization Recommendation	Remarks
Data Center Server Consolidation	Hardware-Level or Server-Level	Performance is a key factor Consider server application complexity
Software Development Testing QA Environment	Server-Level	Manageability is a key requirement. Users must be able to change HW settings and OS Settings
Sharing End-User Productivity Applications	Application-Level or Remote Application Execution	Scalability is important. Standard applications are less complex. Traditional thin-client or terminal services should be a good start

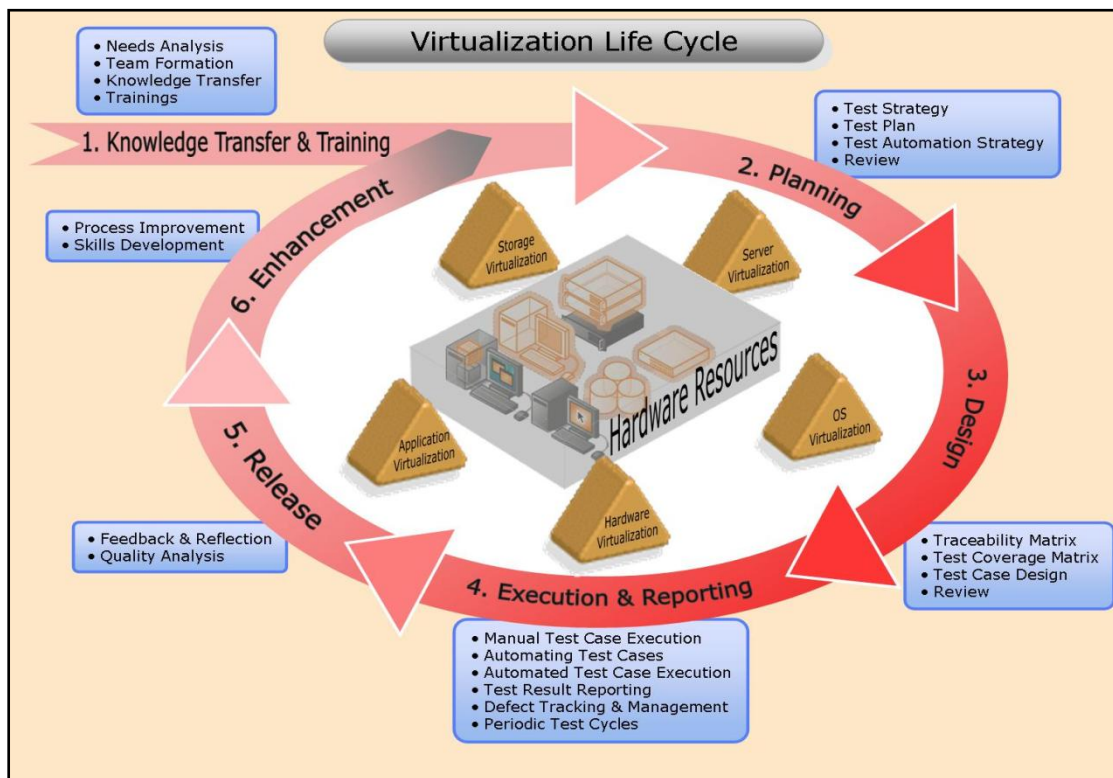


VIRTUALIZATION @ MINDTREE

MindTree adapts to leading edge technologies, validates and assists its customers with the benefit of advent of such technologies. Our experience in Virtualization spans across Consulting, Design, Consolidation, Testing and Operations. On one hand we work closely with the virtualization product companies in assisting them with development, testing and technical support assistance, and on the other we work with enterprises and users in assisting them adapt to these technologies and derive the complete benefit, essentially covering the entire spectrum. The case studies enclosed in this document is a testament for the same.

We have assisted in Server Virtualization, Desktop Virtualization, Storage Virtualization, Database Virtualization and Application Virtualization. We assist in leveraging on virtualization for Data Center Consolidation building Enterprise Clouds. We assist organization with all aspect of virtualization from strategy initiative to ongoing management.

We also bring with us several man years of experience in testing virtualization products. While we work with enterprises in assisting them to take the benefits of the virtualization services we have also developed our methodology (as defined in the following diagram) around Virtualization Product Consulting, Testing and Implementation.





CASE STUDY 1 – DESIGN AND IMPLEMENTATION OF SERVERS USING VMWARE

Client Largest not-for-profit managed care organization, United States

Challenges	<ul style="list-style-type: none">• Build robust infrastructure to support 24 x 7 environment• Improve the enterprise resource utilization and reduce the server sprawl• Reduce development deployment time for servers• Standardize hardware infrastructure and reduce administrative overheads• Optimized manageability of virtual environment
Solution	<p>The entire solutions were developed around VMware suite for the Infrastructure Virtualization</p> <ul style="list-style-type: none">• VMware ESX Server• VMware Virtual SMP• VMware VirtualCenter• VMware VMotion• VMware P2V Assistant• VMware DRS
Results / Benefits	<ul style="list-style-type: none">• An virtual infrastructure that provides the mainframe class reliability thus assuring maximum system uptime• A consolidation of 10:1 per ESX server reduced the increasing server requirement• Faster provisioning of new systems• A centralized console to manage the entire virtual infrastructure• Improved Productivity with higher reliability



CASE STUDY 2 – SERVER AND APPLICATION CONSOLIDATION FOR PRODUCTION

Client Leading global provider of interactive distribution solutions and marketing services to hotels worldwide

Challenges	<ul style="list-style-type: none">• Different server environment grown mainly through M & A• Increased cost of maintenance of physical server environment• Manageability of the # of Servers• Procuring new hardware for enhanced service offerings• Hosting Data Center cost vs. space ratio• Optimal utilization for Development QA beds• Ability to optimally manage resources without having to compromise on performance• Security and Reliability• Increased agility at Lower cost
Solution	<p>The entire solutions were developed around Citrix Xen Server Enterprise</p> <ul style="list-style-type: none">• Native 64-bit Xen Hypervisor Support• Multiple guest operating systems• XenAPI for management and control scripting• XenCenter Unified management console• XenMotion Live Migration
Results / Benefits	<ul style="list-style-type: none">• Ease of installation and deployment• High performance environment for guest OS (Windows Linux)• Highly scalable and support for 64-bit applications• Use of resource pools (Multiple servers and pools)• Faster provisioning of new systems• A centralized console to manage the entire virtual infrastructure• Resource QoS Controls



CASE STUDY 3 – INFRASTRUCTURE LABS

Client Leading IT Infrastructure and Professional services practice

Challenges	<ul style="list-style-type: none">• Procuring new hardware for enhanced service offerings• Security and Reliability• Increased agility at Lower cost• Optimum Reutilization of Hardware• Product and Technology agnostic environment
Solution	<p>The entire solutions were developed around Microsoft Virtualization</p> <ul style="list-style-type: none">• Native enhancement of all Microsoft Platform• Windows 2008 and Latest Release• Hyper-V Virtual Server Environment• Center of Excellence around Microsoft Technologies
Results / Benefits	<ul style="list-style-type: none">• Ease of installation and deployment• Use of resource pools (Multiple servers and pools)• Better utilization of Centre of Excellence resources• Ability to provide multiple hands-on lab• Ease of management



CASE STUDY 4 – ENTERPRISE BUSINESS APPLICATIONS VIRTUALIZATION

Client A leading holding company which offers the blue-collar staffing marketplace

Challenges	<ul style="list-style-type: none">• Multiple brands under single parent entity• Corporate business applications to be offered enterprise wide• Security and Reliability• Optimum Reutilization of Legacy Hardware• Scalability to accommodate business growth
Solution	<p>The entire solutions were developed around VMware suite for the Infrastructure Virtualization</p> <ul style="list-style-type: none">• VMware ESX Server• VMware Virtual SMP• VMware VirtualCenter• VMware VMotion• VMware P2V Assistant• VMware DRS
Results / Benefits	<ul style="list-style-type: none">• Ease of installation and deployment• Use of resource pools (Multiple servers and pools)• Ability to provide enterprise-wide Messaging and Mailing solution• Ability to provide enterprise-wide directory services• Single consolidated storage to enable online replication and e-vaulting• Ease of management• Simplified Disaster Recovery needs



CASE STUDY 5 – VIRTUALIZATION OF DEVELOPMENT | TEST BEDS

Client A world leader in storage products and management services

Challenges	<ul style="list-style-type: none">• Multiple environments for Development Bug Fix Testing• Ability to reproduce problems on 32-bit or 64-bit platforms• Changes applies to both hardware and software• Ability to connect to multiple environments without having to compromise on the quality and environment settings
Solution	<p>The entire solutions were developed around VMware suite for the Infrastructure Virtualization</p> <ul style="list-style-type: none">• VMware ESX Server• VMware VirtualCenter• VMware P2V Assistant
Results / Benefits	<ul style="list-style-type: none">• Optimal use of hardware• Connectivity to both Production and Lab environments without having to compromise on security• Virtual SAN Environment• Ease of deployment and time to recreate environment for effective testing and debugging.



CASE STUDY 6 – CONSOLIDATION AND VIRTUALIZATION OF TEST BEDS

Client Leading Communication Service Provider for Enterprises through secured appliances

Challenges	<ul style="list-style-type: none">• Multiple virtual machines for different n/w segment on same physical machine• Assigning separate Public IP for each VM and resolve conflicts• Configuring & Accessing USB drives of specific VMs• Software Firewall configuration on the physical systems as well as the VMs.• Configuring DHCP environment with VM instance• Disaster recovery management – Back up, Restore
Solution	<ul style="list-style-type: none">• Analyzed and recommend VMware workstation edition• Associated physical NIC with target VMs• Bridged/Grouped VMs under the same network segments• Configured selective access to external devices using VMware tools• All VMs were configured with Windows firewall for enhanced security / allow-deny specific ports/protocols• Configured VMware Snapshot and Norton Ghost for DR
Results/Benefits	<ul style="list-style-type: none">• Reduction in the no. of physical machines saving more than 50% h/w cost.• Reduction of rack space in Lab, leading to cost savings on space• Efficient way of appliance VM distribution with other third party vendors/service providers



MINDTREE'S COMMITMENT TO VIRTUALIZATION AND CONSOLIDATION SERVICES

The industry is clearly heading towards Optimization – Application Infrastructure Optimization or Core Infrastructure Optimization, with core focus on improved efficiencies and reduced cost. With the portfolio of services across the virtualization lifecycle that include product engineering, product testing, product support and services for enterprise IT Operations, we offer end-to-end virtualization solutions in improving utilization, increasing availability and resiliency, high-performance infrastructure to adapt to business needs, and the ongoing management.

MindTree services teams across Infrastructure Management & Technical Support (IMTS) and Independent Testing would continue to be virtualization product vendor and technology agnostic. We focus on our customer needs to optimize the IT Infrastructure from Enterprise Cloud, Data Center to Applications. The ability to consult and implement virtualization solutions and consolidation services, unique virtualization product testing methodology, combined with the offshore – dedicated centers of excellence, remote infrastructure support model across the different platforms makes MindTree a preferred partner. This combination, orchestrated by our service delivery model, will address the critical needs of our Customers' IT Organization and build the foundation for a mature Dynamic IT Organization.

Virtualization and Dynamic IT are all about helping you provide the resources, making your organization much more agile and in the end helping you achieve your goals.



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