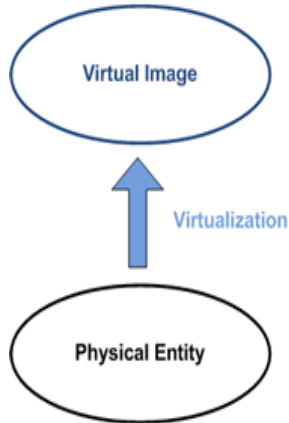


SERVER CONSOLIDATION AND VIRTUALIZATION PROJECT

SERVER VIRTUALIZATION - DEFINITIONS



- Decoupling of the Virtual Machine's operating system from the HOST MACHINE server hardware.
- Virtualization is the process of replacing physical entities with a virtual representation thereby achieving a series of technical advantages of which of foremost importance are the independence from the underlying hardware platform.
- Virtualization attempts to create a massively scalable computing system providing computing power, networking and storage facilities mostly using consolidated virtual computing and storage methodologies to provide on-demand services, resource pooling and fast provisioning (elasticity).

WORK ALREADY UNDER WAY

As part of the preliminary work of the project definition several virtual hosts have been installed with both KVM and VMware software.

SUMMARY OF PROJECT

Server Consolidation and Virtualization Project	1
Server Virtualization - Definitions	1
Work already under way	1
Summary of Project	1
Objectives	2
Project benefits	2
<i>Reduction of costs</i>	2
<i>Flexibility</i>	3
<i>Increased system utilization</i>	3
<i>More accurate and quicker Deploymnet</i>	3
<i>Higher availability Servicability</i>	3
Project deliverables	4
Optimizations of the Virtualized environment	6

OBJECTIVES

- To create a virtualized server infrastructure, in line with recent technological progress, to be used by the Dept. and eventually to replace its aging server infrastructure.
- To enable adoption of new technologies by the Dept. in the near future that will enhance its operations expand its capabilities.

PROJECT BENEFITS

Server virtualization provides sheer savings in Hardware maintenance costs, which are enough to justify the project. However benefits of server virtualization go far beyond maintenance savings. Below you can find some of these benefits in summary form.

Reduction of costs

- ***Reduction of HW maintenance costsflexibility.***

Reduction of costs. Hardware maintenance costs are dramatically affected by server virtualization, due to the reduction of the number of physical machines. Furthermore, old servers maintenance cost is typically very high.

- ***Reduction of LAN/SAN costs***

As any server consolidation project, this project typically provides significant LAN and SAN savings simply due to the reduced number of physical devices present.. Moreover, the introduction of virtual networks makes it possible to further reduce the LAN infrastructure.

These benefits are latent, in the sense that the capability of accruing them depends on specific circumstances to occur. A server virtualization project may free many LAN/SAN resources (e.g., network switch ports) but only in case the firm can actually exploit these resources the benefit is accrued.

- ***Reduction of floor spaces costs***

Server virtualization projects produce huge space savings.

As LAN/SAN cost savings, floor space reduction is a latent benefit. Only if the free space can be rented to another company or reused for other servers the benefit is really accrued. In our case in the long run this is a real benefit since expansion efforts will be feasible without further acquisition of space.

- ***Reduction of power consumption costs***

Servers consume energy even when the system is not used. As a consequence the low utilization of servers entails a high level of power energy waste. System virtualization can therefore significantly decrease the power energy consumption. To save power energy used by servers entails further savings because the heat produced by the servers needs to be offset by cooling systems that require further power energy.

New servers typically consume more than old servers despite the many power savings technologies. However, the typically very high consolidation ratio is enough to offset such increases and deliver significant power savings.

Flexibility

Virtual servers are far more flexible thereby making easier to adapt the delivered service to the new needs. New applications can be quickly deployed on existing servers by simply creating a new VM rather than having to go through the long server procurement process. Virtualization makes also possible to improve the procurement process by decoupling it, at least partially, from the application deployment process. Servers with homogeneous configurations can be purchased in batches regardless the application requirements (provided the application can be virtualized). Live migration makes it possible to move workloads across servers so that required resources are always available without server farm over sizing. Live migration makes also easier to maintain servers because VMs can be moved to other servers.

Increased system utilization

System average utilization is typically low because of the usage of multiple applications on the same OS. By putting multiple applications in their own VMs it is possible to increase utilization.

More accurate and quicker Deployment

Using virtualization, the IT department can perform more accurate and quick tests on the systems. They can apply a patch or an upgrade to a VM copy, rather than on the production VM. Furthermore, it's quicker to deploy a VM and perform some test rather than deploy a physical machine.

Higher availability Servicability

The possibility of moving VMs from one server to another server without disrupting service delivery makes it possible to increase the availability of entire server farms with very little additional effort. VMs mobility makes it also possible to reduce planned downtime by moving the VM to another server before starting maintenance on the original server. VMs make it more acceptable to have a dedicated VM for each application thereby helping to tame the risks due to application consolidation.

PROJECT DELIVERABLES

○ **SCOPE DEFINITION**

In this phase

- We define which hosts will be affected by the project
- Produce a list of physical hosts that will be included based on the definition above with an explanation of why other servers have not been included.

○ **DATA COLLECTION**

Using the list from the Scope Definition phase

- Provides a list of servers that will be included in the project with their corresponding list of all services/applications running on those machines with the requirements for each service/application (cpu, memory, disk space etc)
- Produces the current state of the environment (physical hosts) in the project with an indication of reusability
- Produces a list of currently available hardware for possible use in the project (including storage)

○ **DATA ANALYSIS**

Analysis of the data collected in the previous phase which will provide (at least)

- Which technological areas are affected by the project
- Estimation of the hardware required for the project
- A list of currently available hardware/software to be used (including storage)
- A list of new hardware required to be purchased
- Central storage
 - How much space will be required
- How the Virtual Machine services (previously based on physical hosts) will be distributed after virtualization on virtual machines
 - One service/application per VM
 - Two or more services/applications per VM
 - Groups of services/applications per VM
- Backup and Disaster Recovery System impact
 - Backup of images of Virtual Machines
- Network Impact
 - Virtual network definition
 - Bridging vs NAT
- Security Impact
 - Impact on security of virtualization

○ **VIRTUAL SERVER FARM DESIGN**

The main deliverable is a complete plan containing all parameters and attributes of the virtual server farm design, based on data analysis phase including

- What type of hardware/software will be used

- Cpu, memory, storage, network interfaces for Hosts
 - Open Source software against Commercial
 - How many servers
 - Software
 - List of which services/application will go onto which VM and which Host
 - Complete Virtual Network design
 - Security
 - VM console access
 - Definition of new filtering based on our security policy
 - Backup plan and disaster recovery plan
 - How to recover from a Virtual Host disaster
- **COST ANALYSIS**
- Main deliverable is a project cost estimation including costs of all alternatives (hardware or software) discovered in the previous phases and based on the decisions already taken
 - List of additional (not currently available) hardware/software necessary for the project
- **MANAGEMENT SYSTEM DESIGN**
- Integrating the virtual infrastructure into the management network
 - Managing the VM hosts
 - Reconfiguration, Upgrade, Shutdown, Reboot
 - Backup of the Virtual Machine hosts
 - Managing the Virtual Machines
 - Reconfiguration, Upgrade, Shutdown, Reboot
 - Backup of the Virtual Machines
 - Backup of Data within the Virtual Machines
 - Migration of Virtual Machines
 - Monitoring the Virtual Farm
 - Monitoring of Virtual Hosts
 - Monitoring of Virtual Machines
- **PROTOTYPES AND TESTS**
- Main deliverables are virtual hosts, virtual machines, consolidated storage and network infrastructure according to the virtual server farm design implemented, tested and ready for production.
- Virtual Hosts
 - Windows VM's
 - Linux VM's
 - CentOS
 - Ubuntu

- **GO LIVE! - Implementation of the project objectives**
All the knowledge gained during the above phases will be used for implementing the virtual farm, considering all the parameters reviewed or changed during the above phases

OPTIMIZATIONS OF THE VIRTUALIZED ENVIRONMENT

- Main deliverable is a study of all parameters of the virtualized infrastructure with the objective of optimizing the virtualized environment.
 - Application of the findings of the optimization study to the production environment