



Virtualization, Not If, But When!

A presentation for

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Prof. Russ Mattern

Prof. Paul Flanagan

matternr@ndu.edu

flanagan@ndu.edu

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- **Working Definition**
- **History**
- **Why Virtualization?**
- **Types of Virtualization Schemas & Examples**
- **Virtualization Challenges**
- **Case Studies**
- **8 Things to Consider Before you “Virtualize”**
- **Questions**

- **“Server Virtualization is the masking of server resources, including the number and identity of individual physical servers, processors, and operating systems, from server users.”**
 - » Techtarget.com, 5 Jun 2007
- **Use partitioning of your hard drive as a metaphor**

A Brief History of Virtualization*

- **1959:**
 - Time Sharing in Large Fast Computers"-- Christopher Strachey
- **Early 1960s:**
 - Multi-programming for spooling in the Atlas Computer
- **Mid 1960s:**
 - IBM M44/44X Project, IBM 704 (M44) hosted virtual machines (44Xs)
- **1963:**
 - MIT Project MAC, IBM lost to GE but developed the CP-40 which would become the IBM 360/40

» * Paper by Amit Singh

➤ 1967:

- Next came CP67 for the IBM 360/67, and later the VM/370

➤ **All used Virtual Machine Monitor (VMM); identical copies of the underlying hardware**

➤ 1968-72:

- Numerous releases of CP/CMS (Control Program/Conversational Monitor System)

» * Paper by Amit Singh

➤ **According to Gartner:**

- **Consolidation:**
 - Run multiple operating system instances on one server
 - Reduces the physical number of servers
 - Increases utilization rate of remaining servers
 - Reduces consumption of energy for heating and cooling
- **Deployment**
 - Once OS is virtualized, it's easy to deploy to any server capable of hosting virtual images of the same format
 - Eliminates install & configuration hassles
 - Deployments are accomplished in minutes vs. days

- **Agility:**
 - Once deployed, an image can be redeployed numerous times
 - Image can be moved from one server to another
 - Can move an entire software stack
 - Much easier to respond to changes in workload
- **Freedom of Choice**
 - Virtual images are hardware independent
 - e.g. create image on a Dell x86, move it to an HP x86, then to an IBM x86
 - Reduces overhead associated with maintaining servers from multiple vendors
 - Also allows moves from Intel x86 and AMD x86 architectures

- Protection:
 - Due to easy mobility of virtual images, virtualization lowers the barriers to disaster recovery
 - Virtualization provides organizations with an easy, dependable means for Continuity Of Operations (COOP)
 - » Gartner Group, June, 2006

➤ **With Virtualization:**

- Sys Admins & others move further up the food chain to:
 - Better manage/balance server performance/workload
 - Better scalability
 - Reduce the number & size of data centers
 - Better utilize limited data center space and HVAC resources
 - Spend less time setting up (provisioning) environments and therefore, more flexibility to meet customers' specialized needs

- **Virtual Machine**
- **Paravirtual Machine**
- **Virtualization at the OS level**

- **Guest/host paradigm**
 - Host is the physical server
 - Guest runs on a virtual imitation of the hardware
- **Administrator can create guests that run on different Oss**
- **Uses Hypervisor to coordinate instructions to the CPU**
 - Hypervisor is called Virtual Machine Monitor (VMM)
- **Examples: VMware & MS Virtual Server**
 - » Techtarget.com

- **Also uses Guest/Host paradigm & an VMM**
- **But, VMM modifies the guest's OS code**
 - Called "Porting"-minimizes privileged system calls
- **Can run multiple OSs**
- **Examples: Zen & UML**
 - » Techtarget.com

- **Not based on Guest/Host paradigm**
- **Host runs a single OS kernel & exports operating system functionality to each guest**
- **Guest must use same OS as host**
- **This architecture eliminates system calls between layers**
 - Reduces CPU usage & overhead
- **Examples: Solaris Zones & Vituozzo**
 - » Techtarget.com

➤ **Analysis & Planning**

- Compatibility & support
- Licensing
- Planning Development
- Staff Training
- Evaluating ROI

➤ **Adaptation & Post-adaptation Period**

- Reliability
- Deployment & Preparation in an Industrial Environment
- Evaluating Efficiency

➤ Further Maintenance of a Virtual Infrastructure

- Scalability
- Security
- Responsibility
- Evaluation of the Virtualization Market

➤ **University of Pittsburgh Medical Center**

- **Background**
 - \$6B: 43,000 employees: 19 hospitals; operates internationally
- **Issues**
 - 167 Unix and legacy servers
 - 347 x86 servers
 - Consolidation and standardization
- **Solution**
 - IBM p5 595 servers
 - VMware
- **Benefits**
 - Unix server reduction of 167 down 4 IBM p5 595 servers
 - 80% reduction in x86 servers and 80% reduction in cost
 - Use of VMware to consolidate Windows servers cut cost from \$10k to \$1.9k per image

➤ University of Maryland

■ Issues

- Constrained budget x2 years & 40 servers
- Significant down time to move service from one server to another
- Short on storage, Ethernet switches and lacked remote access to their servers

■ Solution

- Dell using VMware & EMC SAN storage

■ Benefits

- Can deploy servers in minutes vs. hours/days
- Can install ESX server in 15 min and build a server in 5-10 min
- SAN provides built-in COOP capability
- VMware allows performance monitoring—not possible before
- Overall, a more powerful system with increased scalability

8 Things to Consider Before You Virtualize

- **How important is motioning?**
- **Maintenance windows & change freezes**
- **Consistency of workload patterns**
- **Disaster recovery strategy**
- **Overhead & scalability**
- **Software licensing models**
- **Security**
- **Prepares your organization for change**

➤ **Questions?**