




Virtualization Concepts and Products

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What is Virtualization?

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Problems today – Think about

- One server = One system (hardware)
- Underutilized servers
- Downtime, Maintenance (HW, Patches)
- How to move installations to new hardware?
- How costly is disaster recovery for each server?
- Plan, Buy, Install new server takes days/weeks



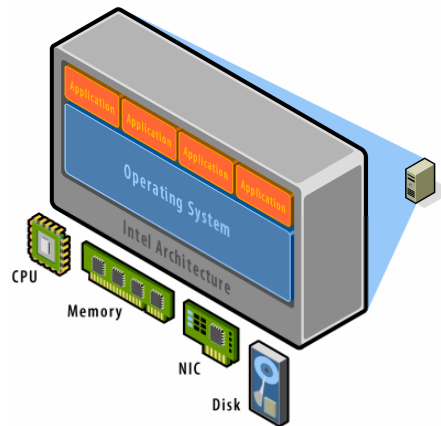
What is a Virtual Machine?

- A Virtual Machine (VM) is a software construct that appears as if it is a physical server.
- It consists of only some files.
- Multiple VM's can run on one physical server.
- An OS doesn't know it is running as a VM.
- A VM is no emulation.
- VM's are isolated. If one fails, it does not affect others.

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Traditional Intel System Architecture



- Single OS image per machine
- Underutilized system resources
- Software and hardware tightly coupled

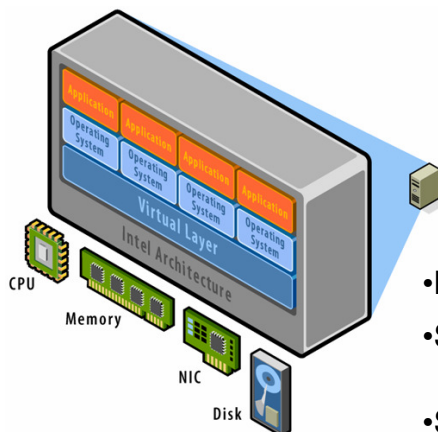
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“Virtualized” Intel Architecture



- Multiple OS images per machine
- System resource utilization increased
- Software and hardware loosely coupled

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Key Benefits of VM's

- Compatibility: Guest OS sees a standard x86-based PC
- Isolation: A VM is totally unaffected by other VM's
- Encapsulation: VM only consists of a set of files
- Independence from underlying hardware: Flexibility



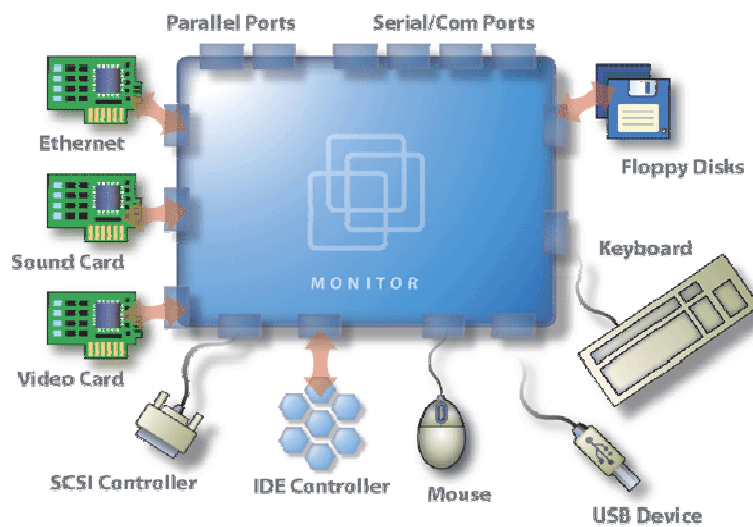
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Example of a VM



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Advantages of Virtualization?

- Server consolidation
- Virtual Machines (VMs) are hardware-independent
- Different OSs on one physical host (only VMware)
- Deploy new servers in minutes
- High availability
- Zero-downtime maintenance (only ESX)
- Most efficient usage of hardware resources
- Backup and restore servers in minutes
- Test environments
- Installations, Patching (REDO logs)

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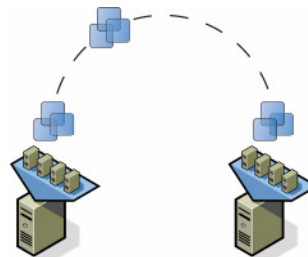
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More Key Features

- Suspend and Resume (Hibernation)
- Snapshots / Undo Disks (Revert or Preserve)
- Differencing Disks (saves disk space)
- Portability (move or failover to more powerful host)



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Drawbacks

- Investments in Hardware, Software and Training
- For ESX (Service Console), Linux skills are advantageous
- Investigation in SAN structure for ESX
- Highly dependant on hardware reliability
- Microsoft does not support OS in VMs (use V2P)

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Candidates to become a VM

All depends on number of users and hardware resource requirements


Ideal Candidates

- Legacy NT Servers
- Development Servers
- Passive Cluster Nodes
- Medium Utilized File Servers
- Medium Utilized Application Servers
- Medium Utilized Web Servers
- Print Servers
- Domain Controllers
- Enterprise File Servers (High I/O Load)
- Enterprise Web Servers
- Enterprise Application Hosts (4 Quad Exchange)
- Enterprise DB Hosts (4 Quad SQL/Oracle)

Bad Candidates

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Practical Scenarios

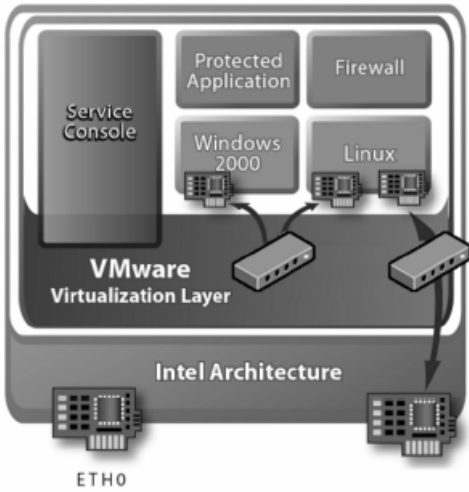
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One-Box Firewall Environment



- One internal switch
- One external switch as DMZ

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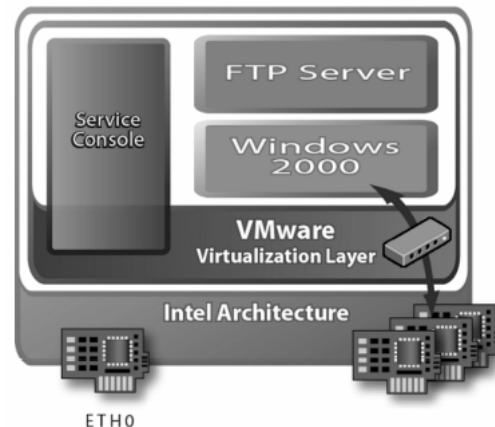
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High-Performance Application

- Automatic network load balancing
- Redundant network connectivity



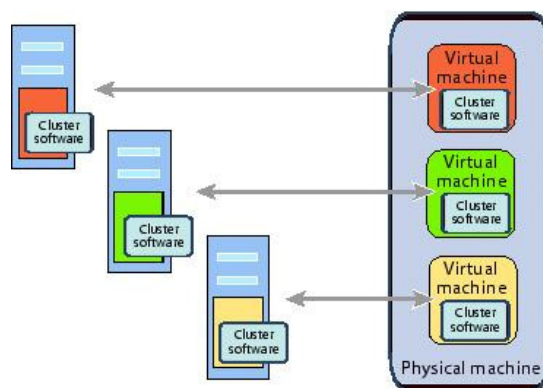
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Standby Cluster




- Only N+1 systems needed
- Failover of heterogeneous OS servers
- Scalable: Additional servers can be added
- Hardware of Standby can be anything

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Products

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Microsoft Virtualization Products



Virtual PC 2004



Virtual Server 2005, Standard Edition (4 CPU)	Virtual Server 2005, Enterprise Edition (32 CPU)
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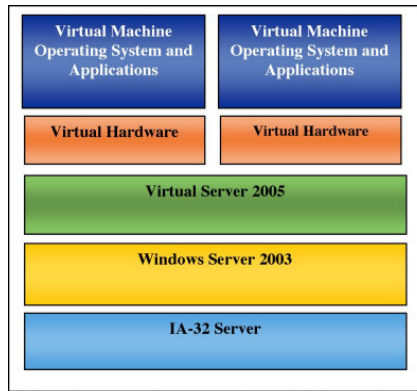
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Architecture Virtual Server 2005

- Hosted on Windows 2003
- Only Windows guests
- Installs like an application
- Low price



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VMware Virtualization Product Line



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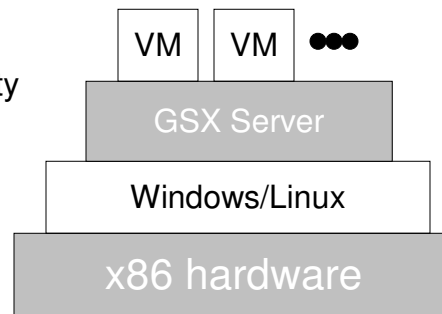
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Architecture GSX

- Hosted
- Maximum device compatibility
- Installs like an application
- Lower price point



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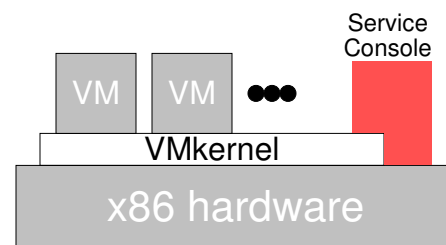
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Architecture ESX

- Runs on „Bare-Metal“
- Maximum performance
- Lowest overhead
- Dynamic resource controls
- Virtual SMP



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Demo

Deploy a new server with Virtual Server 2005

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Feature Hunt: Key Specs

	VS 2005	GSX 3.1	ESX 2.5
Platform	Hosted on W2K3	Hosted on Windows or Linux	Own OS (Bare Metal)
VM Performance	70-90%	70-90%	83-98%
Guest OS (VMs)	Windows-only (others run, but not supported)	Windows, Linux, Novell, Solaris, FreeBSD	Windows, Linux, Novell, FreeBSD
Virtual SMP	No. Next release?	No – Only single CPU	Yes. 2 CPU VMs. 4 CPU VM in next release
Snapshots (Undo/Redo Disks)	Yes - Undo Disks (VM must be powered off)	Yes – Snapshot (VM can be powered on)	Yes – Only one Snapshot per VM
Suspend / Resume (Hibernation)	Yes (Save state)	Yes (Suspend)	Yes (Suspend)
Virtual Machine Disk Storage	Any storage that host sees (Local, NAS, SAN, Network Drive)	Any storage that host sees (Local, NAS, SAN, NFS, iSCSI)	Local, SAN, Storage Arrays. iSCSI, NAS in next release?
Resource Controls	Dynamic: CPU Static: Memory	Static: Memory	Dynamic: Memory, CPU, Disk, Network
Administration	Web interface	Web Interface, VM Console or Virtual Center	Web Interface, Service Console or Virtual Center
Production-ready	1st Generation in 2004	3rd Generation	2nd Generation

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Feature Hunt: Some Specs




	VS 2005	GSX 3.1	ESX 2.5
Platform	Hosted on W2K3	Hosted on Windows or Linux	Own OS (Bare Metal)
Guest OS (VMs)	Windows-only (others run, but not supported)	Windows, Linux, Novell, Solaris, FreeBSD	Windows, Linux, Novell, FreeBSD
Max. VMs per Server	64	64	80
CPUs per Server	4 (Standard), 32 (Ent. Ed.; optimized for 8)	32	16
Max. Mem. per Server	64 GB	64 GB	64 GB
64-bit support	No official plans	Yes, for Intel and AMD But VM still runs 32-bit	Not yet, but planned.
Devices supported	Many	Many	Limited
Production-ready	1st Generation in 2004	3rd Generation	2nd Generation
Performance of VM compared to Physical	70-90%	70-90%	83-98%

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Feature Hunt: VMs



	VS 2005	GSX 3.1	ESX 2.5
PXE support in VMs	No	Yes - LAN boot of VMs via PXE	Yes - LAN boot of VMs via PXE
SCSI devices per VM	28	21	60
Virtual SMP	No. Addressed in the future	No - Only single CPU	Yes. 2 CPU VMs. 4 CPU VM in Q3/2005
Max. Number of VMs per CPU	4	4	8
Max. Memory per VM	3.6 GB	3.6 GB	3.6 GB
Migration from	Virtual PC 2004	VMware Workstation	GSX and Workstation
P2V migration	VSMT (free)		P2V (license needed)


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Feature Hunt: Networking

	VS 2005	GSX 3.1	ESX 2.5
Virtual NIC Teaming	No – Only one physical NIC per Virtual Network	No – But physical NIC teaming on the host	Yes – To boost throughput or failover
Physical NICs per Host	8 Gigabit or Fast Ethernet?	8 Gigabit or Fast Ethernet?	8 Gigabit Ethernet or 16 10/100 Ethernet
Number of Virtual Ethernet Switches	Unlimited Virtual Networks	10 on Windows Host, 100 on Linux Host	Unlimited Virtual Switches?
VMs (Ports) per Switch	Unlimited number of VMs per Virt. Network	Unlimited number of VMs per Virt. Switch?	32; VLANs (Port Groups) available
Max. number NICs per VM	4	8	4
Modes	Bridged, Host-only, NAT (simulated with loopback)	Bridged, Host-only and NAT modes	Bridged, Host-only


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Feature Hunt: Disks, CPU, Memory

	VS 2005	GSX 3.1	ESX 2.5
Snapshots (Undo/Redo Disks)	Yes - Undo Disks (VM must be powered off)	Yes – Snapshot (VM can be powered on)	Yes – Only one Snapshot per VM
Suspend / Resume (Hibernation)	Yes (Save state)	Yes (Suspend)	Yes (Suspend)
Differencing Disk (to save disk space)	Yes – One parent disk, multiple diff. disks	No	No
Virtual Machine Disk Storage	Any storage that host sees (Local, NAS, SAN, Network Drive)	Any storage that host sees (Local, NAS, SAN, NFS, iSCSI)	Local, SAN, Storage Arrays
Raw disk devices	No	Yes	Yes


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Feature Hunt: Management

	VS 2005	GSX 3.1	ESX 2.5
Administration	Web interface	Web Interface, VM Console or Virtual Center	Web Interface, Service Console or Virtual Center
Central Monitoring	MOM MP	Virtual Center	Virtual Center
Templates (Easier Provisioning)	No	Virtual Center	Virtual Center
Resource Controls	Dynamic: CPU Static: Memory	Static: Memory	Dynamic: Memory, CPU, Disk, Network
Multi-Host Management	No	Yes – With Virtual Center	Yes – With Virtual Center
Triggers and Alerts, Scripting, Reporting	Yes	Yes	Yes

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ESX unbeatable?

- Live Migration with Vmotion
- Intra-Host and Cross-Host Clustering
- Fully supported Hyperthreading
- CPU Affinity for VMs
- Fine-grained control of all resources (guaranteed service levels, schedule resources)
- Memory Over-commitment (virtual memory) up to 200% (Transparent Page Sharing)
- SMP (4-way SMP support coming soon)
- SAN Multipathing for failover
- Integrated NIC Teaming for failover and throughput
- Best Administration with Virtual Center
- Best performance for VMs
- Raw-device mapping (access raw LUN instead of VMFS)
- Boot from SAN (diskless host)
- Multiple OS guest

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Pricing & Support

Pricing


- Virtual Server 2005 Standard (4 CPU Host): \$499
- Virtual Server 2005 Enterprise (32 CPU Host): \$999
- Virtual Server Migration Tool (VSMT): Free
- GSX 3.1 (2 CPU Host): \$1,400
- GSX 3.1 (32 CPU Host): \$2,800
- ESX 2.5 (4 CPU Host; list price): \$ 7,500
- SMP license (for 4 CPU Host): \$2,500
- P2V (unlimited migrations): \$6,000
- Virtual Center: \$5,000
- VC Management Pack for ESX 4-CPU): \$1,200

Support

- VMware is improving
- Microsoft's support good and well-organized. Excellent support structures.
- Best choice is HP to get all one-stop.

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Microsoft versus VMware

- Please no feature race between VS and ESX
- One platform, one call support, one of the bests support organizations world-wide
- Broadest, most robust compatibility with industry-standard hardware
- Open standards such as COM/COM+, HTTP/S, SSL/TLS, RFB+, RDP, XML
- Broadest device support
- No support for Windows servers running on VMware hosts
- Higher level of automation (richer APIs with more calls)
- Management Integration into MOM and SMS
- "VMware's proprietary host operating systems severely limit device compatibility and support" (Eric Berg, Group Product Manager)
- „VMware has proprietary management tools and limited APIs“ (Eric Berg)
- VS 2005 is key deliverable on the Dynamic Systems Initiative (DSI)
- Most cost-effective virtual machine solution


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VMware versus Microsoft

- They do like the feature race between ESX and Virtual Server
- They like Paul Thurrott's (Editor for Windows IT Pro) quote: „Microsoft's server plans are single-minded, and I suspect it purchased Connectix's VM technologies solely as an NT Server consolidation solution
- Virtualization is VMware's core business
- VMware is the market leader and innovation leader for virtualization
- VMware delivers a complete virtual infrastructure
- „VMware has become the de facto standard for Intel server virtualization... Overall, we believe VMware continues to have a 12- to 18-month lead over Microsoft (Connectix). Future offerings look promising..." (Meta Group March 2004)
- GSX is in 3rd generation, Virtual Server has just started
- „Virtual Server is primarily suited to low-volume legacy OS migrations“ (Comparative Brief)
- „The premium pricing of GSX Server reflects its richer functionality, higher value and proven production-ready focus when compared to Virtual Server 2005, along with its unrivaled enterprise platform support.“(Comparative Brief)

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Virtualization: Tasks that Change...

Key Task	Traditional Approach	With Server Virtualization
Provision a new server	<ul style="list-style-type: none"> • 3 - 10 days hardware procurement • 1 - 4 hours provisioning new server 	<ul style="list-style-type: none"> • 5 - 10 minutes provisioning new VM
Moving an application to a new server; Repurposing a server	<ul style="list-style-type: none"> • 4 - 6 hours for migration • Service interrupted for duration of maintenance window • Requires days/weeks of change management preparation 	<ul style="list-style-type: none"> • 2 - 5 minutes using VMotion (no service interruption) • 10 - 30 minutes without VMotion
Hardware maintenance	<ul style="list-style-type: none"> • Requires 1 - 3 hour maintenance window • Requires days/weeks of change management preparation 	<ul style="list-style-type: none"> • Zero downtime hardware upgrades with VMotion

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Why buy Virtual Server 2005?

- Departmental server consolidation
- Smaller servers
- Only want one platform (Windows)
- Smaller budget
- Virtualize Windows servers only
- Microsoft-minded

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Why buy VMware GSX?

- Departmental server consolidation
- Smaller servers
- Only want one platform (Windows or Linux)
- Smaller budget
- Virtualize different OSs
- Host should be Linux
- To integrate into ESX/VC environment
- Primary focus of VMware is virtualization

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Why buy VMware ESX?

- Want to have datacenter solution
- Virtualize powerful servers
- Virtualize different OSES
- Best HA / Disaster Recovery solution
- Excellent SAN integration
- Best administration framework with VC

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Why choose HP?

- We provide complete solution for Virtual Server, GSX and ESX
 - Consulting
 - Planning
 - Hardware
 - Implementation
 - Support

Microsoft, Linux, Storage and SAN support personnel on staff
Microsoft and Linux supported running in a VMware Virtual Machine
Platinum Support Contract (24x7) with VMware
Gold Support Contract (24x7) with Microsoft

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Questions?

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