

Virtualization & Consolidation

Technical Presentation

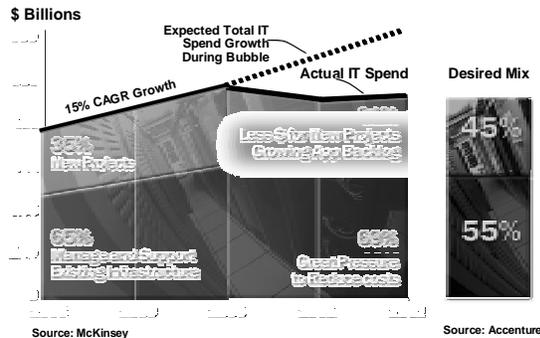
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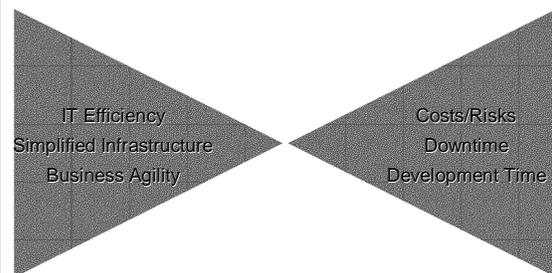
Agenda

- Requirements
- Solution strategy
- Architecture
- Advantages
- Licensing
- Support
- Availability

IT Spending – Opposing Forces



Do More with Less

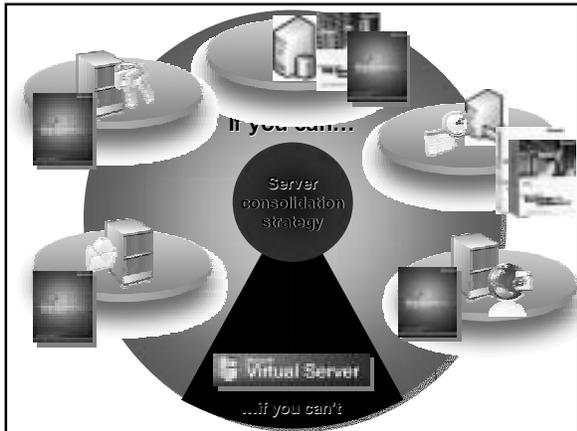


Today's infrastructure and operations are not aligned with business objectives

- Infrastructure is complex, brittle, inflexible
 - "One server, one app"
 - Server sprawl → underutilized servers
 - Diminishing hardware support for NT4
- Departmental line of business server-based applications drive operational costs
 - Care/feeding of application servers consumes disproportionately high system administrator time
 - High cost/risk to upgrade ISV/custom applications

Situation: Customer Concerns

- Server consolidation / optimization
- NT4 end-of-life approaching
- Difficult to migrate application servers
- Legacy OS/Applications still exist (OS2)
- Smooth transition to W2K3
- Reduce Client SW Maintenance costs → bring applications to the Server backend
- Support centralized Deployment Scenarios



Server consolidation strategy

	Windows Server 2003 and SQL Server 2000	Enterprise customer consolidates enterprise databases on ES7000 running test and production WS03/SQL partitions
If you can...	Email	Windows Server 2003 and Exchange 2003 Medium-sized business consolidates email servers via Exchange on scalability
	Web	Windows Server 2003 and IIS 6.0 Hosting service provider consolidates legacy web applications on IIS6 blade
	File/print	Windows Server 2003 Small-sized business consolidates on single file/print server WS03 using NAS
	Enterprise applications	Windows Server 2003 and WSRM Medium-sized customer consolidates entire ERP application suite onto clustered 8-way systems running WS03
...if you can't	Windows Server 2003 and Virtual Server	Enterprise customer migrates multiple NT4 applications on 1,000 stand-alone servers onto 50 4-way servers running VS

Workload Management Strategy

Tool	Hardware partitioning (HP, IBM, Unisys)	Workload management (WSRM)	Virtualization (Virtual Server)
Best for	Very high-throughput applications Complete application isolation	Medium-high throughput applications Manages resource usage	Low-throughput applications Legacy applications
Limit	Resizing partitions requires a reboot Capacity in 4-proc increments	All applications must run on same version of OS OS/HW single point of failure	More OSes to manage Performance overhead

Core Products for the vision

- Virtual PC 2004
- Virtual Server 2004
- Windows Resource Manager (WSRM)
- Automated Deployment System (ADS)

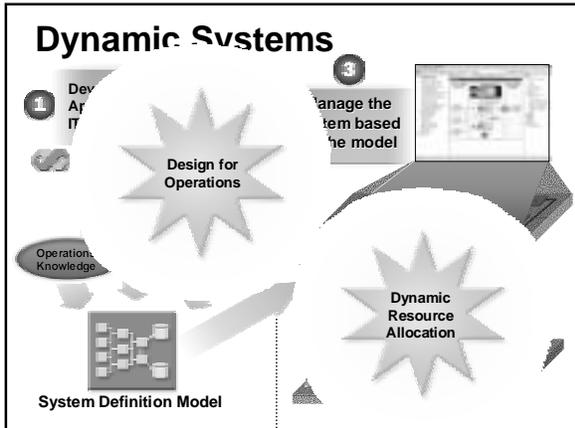
Windows System Resource Manager

- Allows an administrator to set application resource consumption policies (CPU and memory)
 - > Select processes to be managed
 - > Set resource consumption targets or limits
- Manage machine resources according to policies
 - > CPU utilization (percent CPU)
 - > Process working set size (physical resident pages)
 - > Committed memory (page table and page file usage)
- Apply policies based on a date/time schedule
- Generate, store, view and export accounting records
- Generate email notification for events



Dynamic Systems Initiative

- **Objective:** simplify and automate IT operations, leveraging industry-standard hardware
- **Virtual Server role:**
 - > Addresses legacy OSes and applications
 - Simplified application migration
 - > Complements ADS bare-metal provisioning
 - Flexible server consolidation
 - > Enables capacity on demand
 - Automated rapid VM deployment



Virtual Server

A more detailed view...

Customer Requirements

- **NT4 application migration**
 - Maximum application compatibility
 - Lower capital and operational costs
 - Increased compatibility
- **Test/development and training lab automation**
 - Fast, economical VM deployment
 - Increased developer productivity and quality
 - Increased flexibility
- **Departmental/branch server consolidation**
 - Higher hardware utilization
 - Increased manageability

Virtual Machine Strategy

- Customers have been asking for a VM solution from Microsoft
- Feb. 20 Microsoft acquired Virtual Server and Virtual PC from Connectix
- **Current status - Availability**
 - VM development team → Windows Core OS team, completed security scrub
 - Virtual PC RTM
 - 15-OCT-2003 – VPC English 2004
 - 15-DEC-2003 – VPC German 2004
 - Virtual Server RTM CY04 Q1

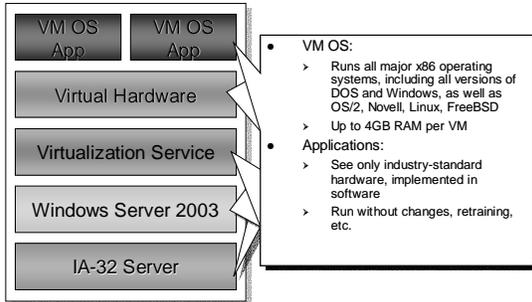
Where we are

- **2/20: acquired Virtual PC/Server code**
 - Virtual PC for Windows, and Virtual PC for Mac
- **4/15: JDP program**
- **Virtual Server**
 - Available since May 2003 as Customer Preview, v219
 - Download from www.betaplace.com, vspreview
 - Must now register individually with Betaplace to get license extension
 - Rapid Adoption Program starting Oct/Nov 2003
 - Beta for VS planned Q4 CY2004

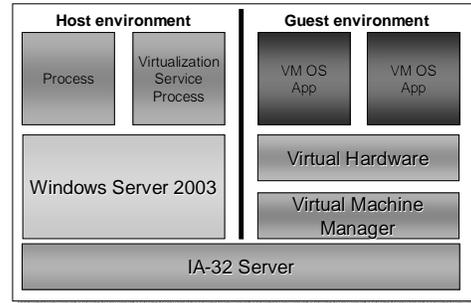
Licensing & Support

- **Licensing**
 - Virtual Server packaged as stand-alone product
 - Licensed on per-server basis
 - VM = a computer, within a computer
 - Same requirements as standalone servers
 - One license per installed OS in VM
 - Special Case for Datacenter Licenses
 - Up to 8 WS2003 DC Licenses per Server allowed (ex: 1 host, 7 virtual)
 - For applications licensed per-processor
 - VM = uniprocessor environment → 1-proc license
- **Support**
 - Host OS = Windows Server 2003
 - Guest OS = All currently supported Windows Server OSes
 - All Microsoft server applications are supported in VM
 - Customer support for other OSes from OS support provider

Virtual Server architecture



Virtual Server run-time view

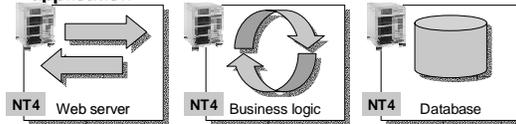


Virtual Server features via customer scenario

- Customer scenario
- Isolation
- Compatibility
- Portability
- Automation
- Connectivity
- Manageability
- Integration
- Performance

Customer scenario: before

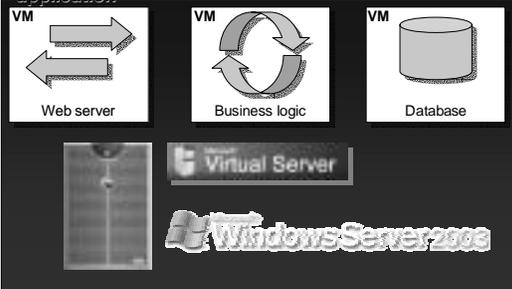
Situation: 3-tier orphaned partner management application



- Tightly coupled to business logic
- Application leaks memory, need rebooting daily
- Highly customized, undocumented code
- ISV out of business (consultants have given up as well)
- Frequent data-dependent crashes
- SLA: > x transactions/hour with < y latency
- Central IT can't (re)host in datacenter

Virtual Server solution

Situation: 3-tier NT4 partner management application



Isolation: Multiple OSES run concurrently on single server

Virtual Device Models

- 440BX chipset with PIIX4
- System BIOS (AMI)
- PCI Bus
- ISA Bus
- Power Management
- SM Bus
- 8259 PIC
- PIT
- DMA Controller
- CMOS
- RTC
- Memory Controller
- RAM & VRAM
- COM (Serial) Ports
- LPT (Parallel) Ports
- IDE/ATAPI Controllers
- SCSI Adapters (Adaptec 2940)
- SVGA Video Adapter (S3 Trio64)
- VESA BIOS
- 2D Graphics Accelerator
- Hardware Cursor
- Ethernet Adapter (DEC 21140)
- Keyboard
- Mouse

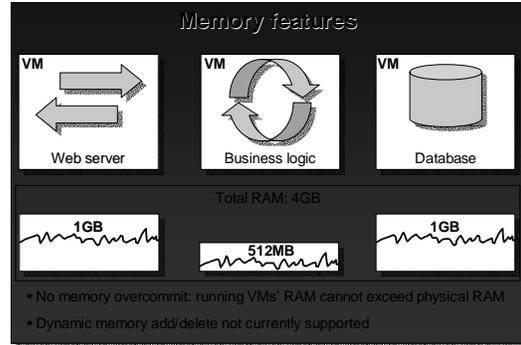
- Virtual Server virtualizes:
 - > CPU
 - > Memory management
 - > Synthetic hardware
- Virtual Server emulates:
 - > Device accesses are trapped and emulated in software through virtual device models
- VMs have no access to:
 - > Host system physical memory
 - > Other VMs' virtual memory or virtualized devices

Standardization: runs every major x86 operating system

- **Support: Virtual Server only VM solution available supported by Microsoft**
 - > PSS supports Microsoft OS/apps in VM
 - > Customer support for other OSes/apps comes from other support provider

VM Operating Systems	
MS-DOS	OS/2 Warp
PC DOS	OS/2 LANManager
Windows 1.0	NetWare 5
Windows 2.0	NetWare 6
Windows 3.11	NetWare 7
Windows 95	RedHat Linux
Windows 98	SuSE Linux
Windows Me	Turbo Linux
Windows NT	Slackware Linux
Windows 2000	Mandrake Linux
Windows XP	FreeBSD
Embedded XP	NetBSD
Windows Server 2003	OpenBSD
Windows CE	Solaris 7
	Solaris 8
	OpenStep
	Darwin

Memory features in action

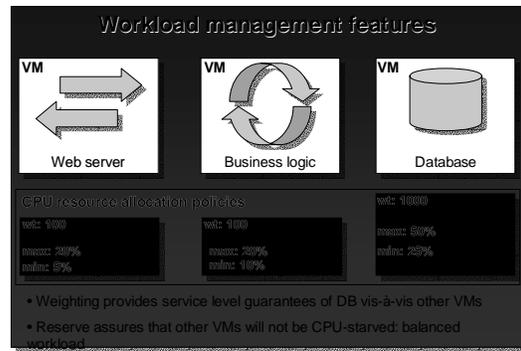


Workload management features

- **Multithreaded service**
 - > 1 VM ≤ 1 physical CPU
 - > Each VM operates in own thread of execution, I/O occurs in child threads
- **CPU resource allocation policies**
 - > Weight-based (priority)
 - > Constraint-based (min. reserve/max)



CPU features in action



Portability → flexibility

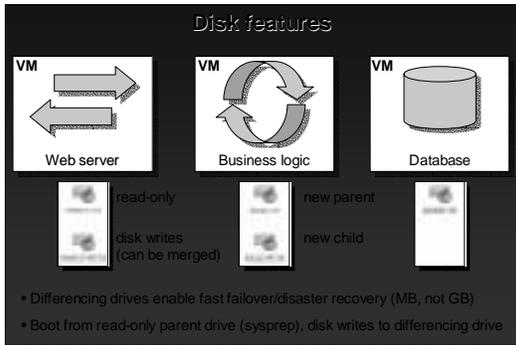
- VHD contains VM data, and XML file contains all configuration metadata
 - > Dynamic drives
 - > Fixed-size drives
 - > Differencing drives
 - > Undo drives
- **Benefits: fast, flexible, economical deployment**
 - > Leverages existing storage, networking, security and management infrastructures
 - > VHDs on SAN enable effective VM-based disaster recovery



VHD usage scenarios

Scenario	Default Size	Initial State	Alerts	Parent	Child	Notes
Dynamic drives	16GB (default)	Sparse file: 32kb initially, growing as needed. COM API fires alert on low disk warning.	Yes, as parent.	Yes.	Yes.	Flexible, portable, simple
Fixed-size drives	16GB (default)	16GB. COM API fires alert on low disk warning.	Yes, as parent.	Yes.	Yes.	Quotas/capacity planning policies
Differencing drives	Single drive (read-only parent/read-write child)	COM API fires alert on low disk warning.	N/A	No.	No.	Powerful DR capabilities (child back up/restore)
Undo drives	Single drive (read-write parent/read-write child)	Parent drive plus saved state file	No.	N/A	N/A	Development/test/demonstration
Saved state	"RAM-to-disk"	N/A	No.	N/A	N/A	Hibernation → failover

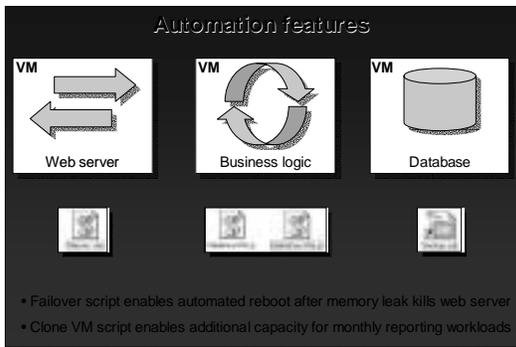
Virtual Hard Drives in action



Automation features

- COM API enables extensible platform for automation
 - Web console = reference implementation
 - Fully-documented: 28 classes and 363 calls
 - Support for all COM-capable languages
 - Partner management solutions
- XML configuration files
 - Extensible VM descriptors
 - Management solutions can leverage/enrich metadata

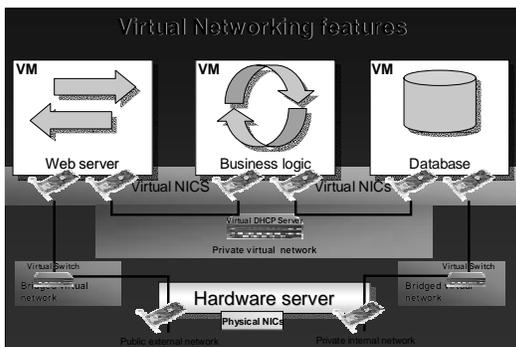
Automation in action



Virtual Networking features

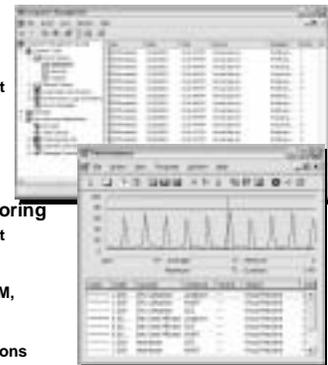
- Virtual Networks (VM to any)
 - Up to 4 Virtual NICs per VM
 - Each NIC connects to any virtual network
 - Bridge to a host Ethernet adapter
 - No custom drivers needed in VM OS
 - Support for teamed NICs
 - Virtual switch performs local and external routing
- Local-only Networks (VM to VM)
 - Uses Virtual DHCP server
 - No host NIC interaction—no packets on wire
 - All routing local to VS

Virtual Networks in action

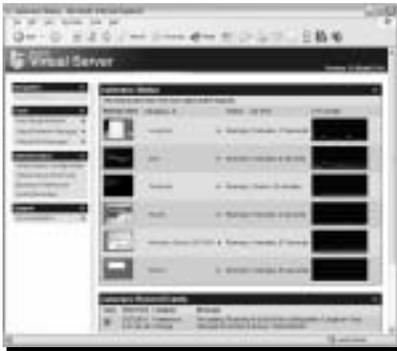


Manageability features

- Event Logging
 - Integrated with host Windows event log
 - Integrates with management solutions
- Performance Monitoring
 - Integrated with host PerfMon
 - Multiple counters available: CPU, RAM, heartbeat, etc.
 - Integrates with management solutions



Virtual Server demo



Virtual Server benefits

