O26 - Microsoft and Virtualization

Virtual Server 2005

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Microsoft Virtual Server 2005
A Technical Product Overview

Agenda

- Introduction
- Microsoft Virtual Server 2005
- Key Scenarios
- Features and Benefits
  - Improved hardware efficiency
  - Increased administrator productivity
  - Broad set of partner solutions
- Summary

Businesses Need Efficiency

- **Server managers need more efficient hardware environments**
- **Application developers need greater flexibility in development and test environments**
- **Businesses need a solution to upgrade and consolidate hardware and still run legacy systems**

Virtualization

- **Allows multiple operating systems to run simultaneously on the same processor**
- **Each independent virtual machine functions as a self-contained computer**
- **Run side-by-side testing and production systems on the same machine**
  - Use off-the-shelf servers
 - Use fewer servers with higher utilization

Microsoft Virtual Server 2005

The most cost-effective virtual machine solution designed for Windows Server 2003

- Increases operational efficiency

  - Software test and development

  - Legacy application migration

  - Server consolidation scenarios

- A key deliverable of the Dynamic Systems Initiative (DSI)

Test and Development

- **Consolidate and automate software test and development environments**
  - **Virtual Server enables side-by-side testing and production on the same system**
    - **Greater flexibility**
    - **Better test coverage**
    - **Developer productivity**
    - **User experience**
- **Test distributed server applications on a single physical server**
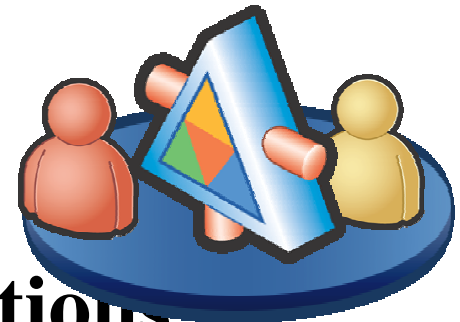
Migrate Legacy Applications

- **Applications often outlive their original OS or hardware**

- **Virtual Server enables better choice**
  - **Smooth application migration with solid application compatibility**
  - **Upgrade infrastructure without having to upgrade or rewrite applications**
  - **Run legacy applications in native environments in virtual machines**

Consolidate Proper Workloads

- **Consolidate multiple server workloads**
  - **Higher hardware utilization**
  - **Increased manageability**
- **Use Virtual Server for**
  - **Consolidation of infrastructure services**
  - **Disaster recovery environments**
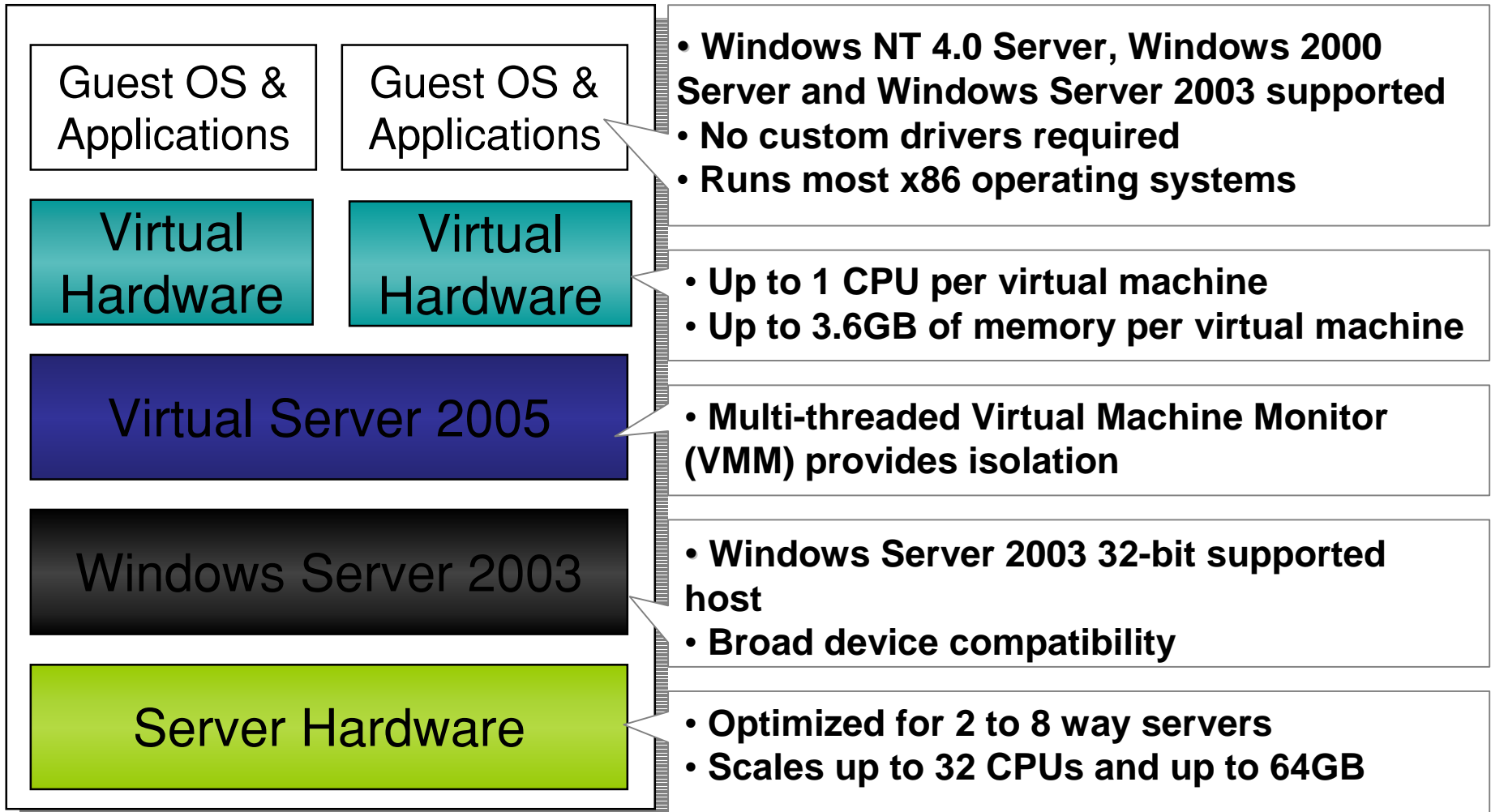 - **Departmental or branch office services**
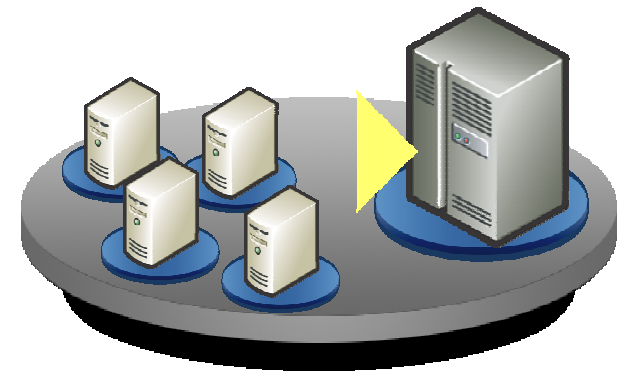
Server Consolidation

- Windows Server 2003 is best for other workloads

- Homogeneous Workloads
  – Consolidate natively on Windows Server 2003
  – File, Print, Domain, Email, Database

- Heterogeneous Workloads
  – Web can consolidate natively on Windows Server 2003
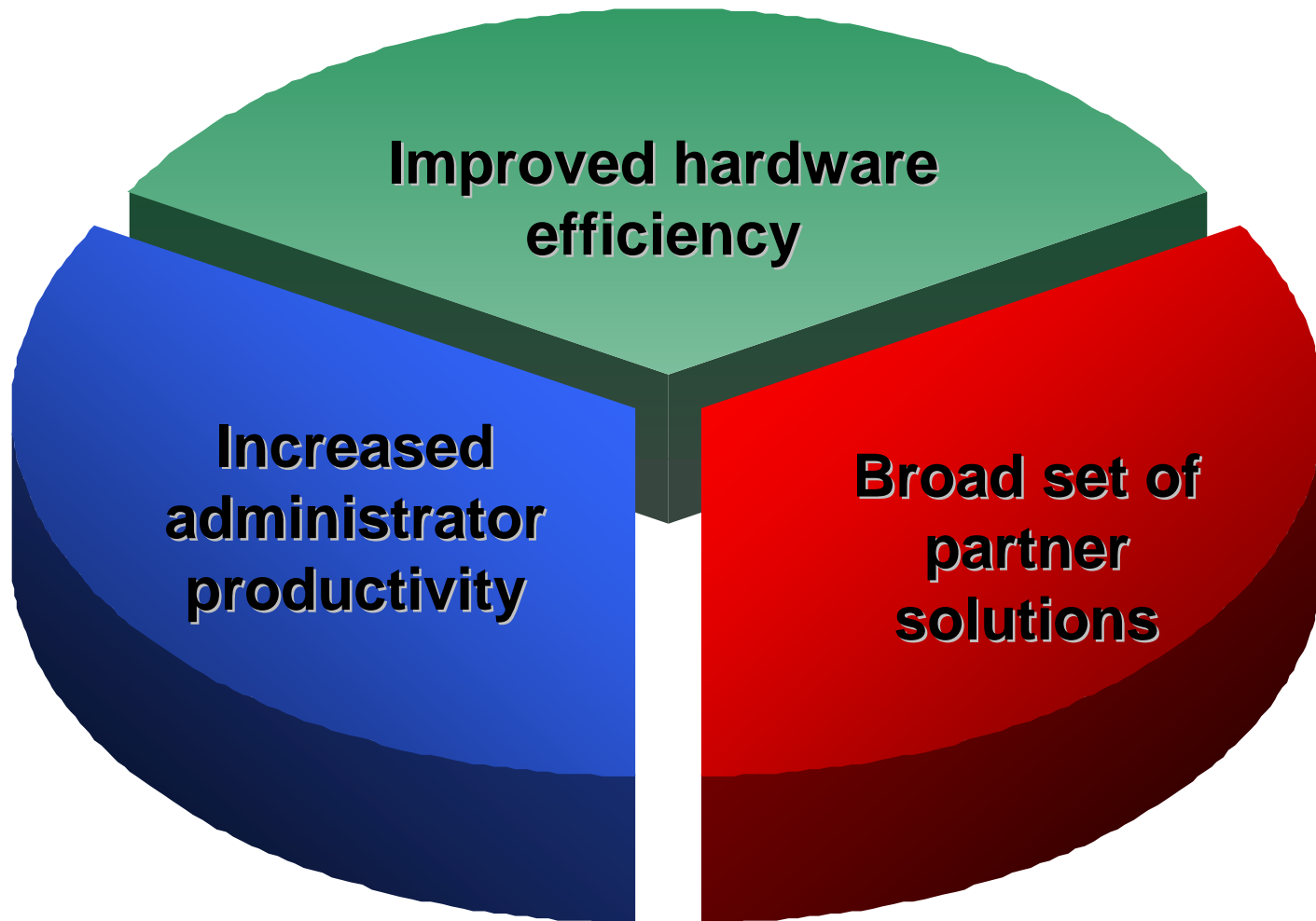 – For mixed applications choose the right tool

Server Consolidation

Tool	Hardware partitioning (HP, IBM, Unisys)	Resource Management (WSRM)	Virtualization (Virtual Server)
Best for	Very high-throughput applications Complete isolation of applications	Medium-high throughput applications Manages resource usage	Low-throughput applications Legacy applications
Limit	Re-sizing partitions requires a reboot Capacity in 4-proc increments	All applications must run on same OS level OS/HW single point of failure	More complex management Performance "tax"

Virtual Server Architecture

Guest OS & Applications	Guest OS & Applications
Virtual Hardware	Virtual Hardware

- **Windows NT 4.0 Server, Windows 2000 Server and Windows Server 2003 supported**
- **No custom drivers required**
- **Runs most x86 operating systems**

- **Up to 1 CPU per virtual machine**
- **Up to 3.6GB of memory per virtual machine**

Virtual Server 2005

- **Multi-threaded Virtual Machine Monitor (VMM) provides isolation**

Windows Server 2003

- **Windows Server 2003 32-bit supported host**
- **Broad device compatibility**

Server Hardware

- **Optimized for 2 to 8 way servers**
- **Scales up to 32 CPUs and up to 64GB**

Virtual Server Benefits

Improved hardware efficiency

Increased administrator productivity

Broad set of partner solutions

Improved Hardware Efficiency

- **Virtualization**
  - **Building on Windows Server 2003 ensures broad device compatibility**
  - **Complete support for Windows Server System environments**
  - **Can run most x86 operating systems**
  - **Windows guest operating system performance optimization**
- **Resource management**
  - **Policy-based resource management features**
  - **Fine-grained control of CPU and memory resource allocation**

Improved Hardware Efficiency

Virtual machine isolation and resource management enable multiple workloads to coexist on fewer servers.

- Virtualization
  - **Broad device compatibility and complete support for Windows server environments**
- Resource management
  - **Policy-based control for balanced workload management**

Virtualization Features

- Windows guest OS performance optimization
  - **Optimizes Windows guests for performance**
- Windows Server 2003 platform provides broad device compatibility
- Multithreaded Virtual Machine Monitor
  - **Provides robust, secure isolation between host and guest memory address spaces**
- Broad x86 guest OS compatibility
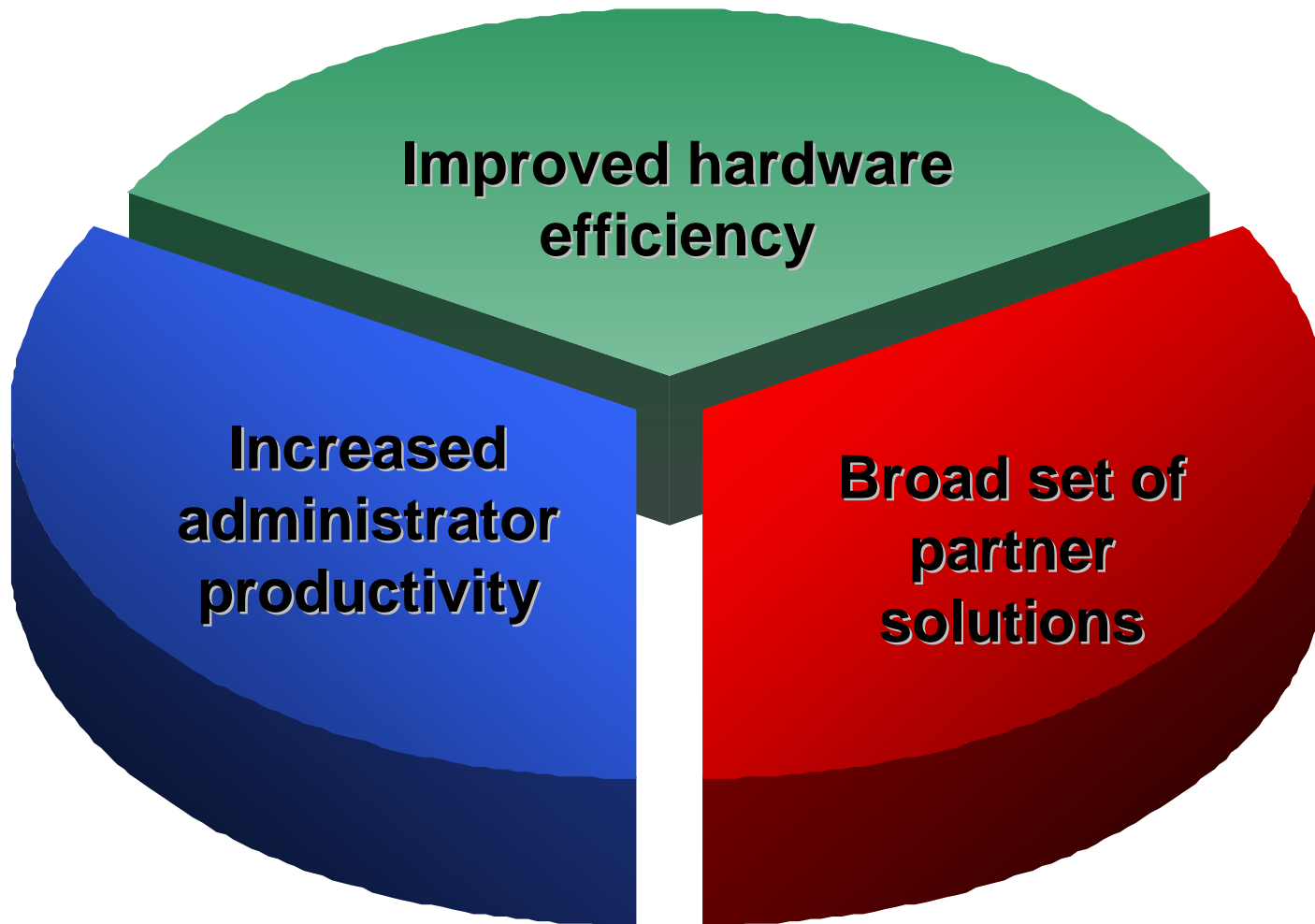 - **Can run most x86 OSes as virtual machines**

Resource Management Features

- **CPU resource allocation**
  - **Supports both weighting and constraint methods for fine-grained control**
  - **Tuned for performance on systems of up to eight physical processors**
  - **Multithreaded for performance on systems with up to 32 processors and 64 GB RAM**

Resource Management Features

- **Memory resource allocation**
  - **Supports memory resizing at virtual machine boot time**
  - **Memory cannot be over-allocated**
  - **Virtual Server is NUMA-aware**

Virtual Server Benefits

Improved hardware efficiency

Increased administrator productivity

Broad set of partner solutions

Easy to Deploy

- **Comprehensive COM API:**
  - **Enables complete scripted control of virtual machine environments**
- **Virtual Hard Disks (VHDs)**
  - **Encapsulates virtual machines**
  - **Allows flexible configuration, change and deployment**
- **Virtual Networking**
  - **Facilitates secure and versatile networking**
    - **guest-to-guest**
    - **guest-to-host**
    - **guest-to-net**

Easy to Deploy

- **Virtual Hard Disks**
  - **Portable Virtual Hard Disks (VHDs) encapsulate virtual machines**
- **Virtual Networking**
  - **Enables secure, flexible networking**
- **Comprehensive COM API**
  - **Enables complete scripted control of virtual machine environments**

Easy to Use

- **Windows guest usability**
  - **Virtual Machine Additions**
    - **An architectural feature that enhances user experience**
    - **Integrates guest and host machines**

Increased Administrator Productivity

- Deploy
  - **Complete scripted control of portable, connected virtual machines enables automated configuration and deployment**
- Manage
  - **Use Virtual Server Administration Website and standard server management tools to administer virtual machines**
- Use
  - **Unified Windows experience streamlines common virtual machine tasks**

Virtual Hard Disk Features

- Virtual Server encapsulates virtual machines in portable Virtual Hard Disks (VHDs)
  - **Enables flexible configuration, change, deployment**
- XML configuration file stores metadata
  - **Enables external configuration management**
  - **Automated provisioning and deployment**
- Each virtual machine can connect up to 32 VHDs
  - **Up to four VHDs connected via virtual IDE controller**
  - **Up to seven VHDs connected per virtual SCSI controller, up to four SCSI controllers**
 - **Maximum storage per virtual machine is 56TB**

VHD Formats and Functionality

- Dynamically expanding virtual hard disks
    - **File size grows as data is added**
- Fixed-size virtual hard disks
    - **Fixed-extent file that resides on host hard disk**
- Linked virtual hard disks
    - **Allows conversion of a linked physical data disk to a VHD**
- Differencing virtual hard disks
    - **Changes stored on a hierarchical "child" disk**
    - **Specified per-VHD**
- Undo disks
    - **Changes can be committed or discarded**
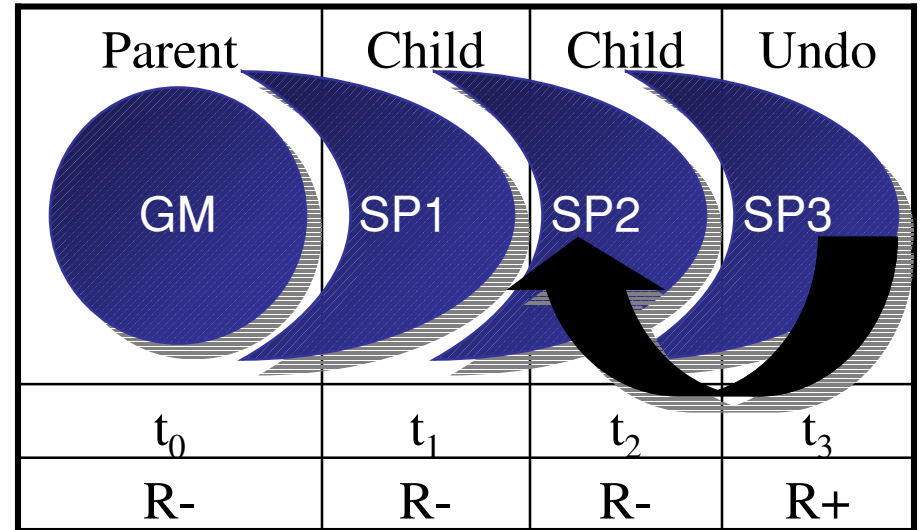   - **Specified per-virtual machine**

Differencing Disks
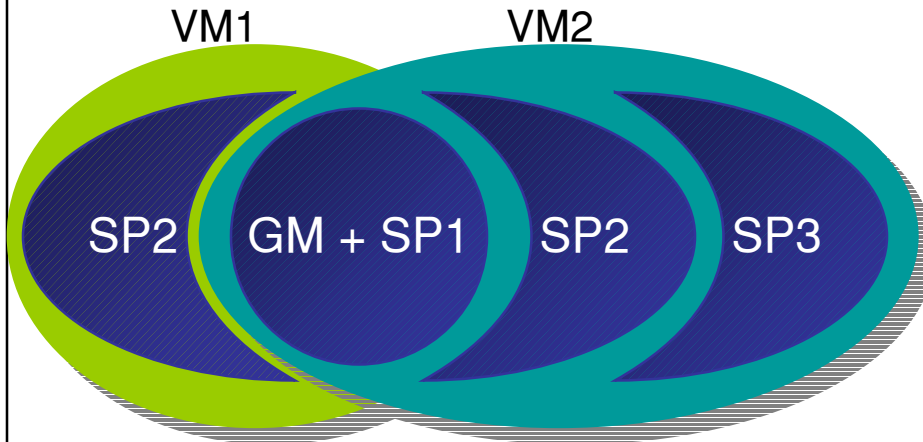
Virtual machine viewpoint: DD = single drive

R-   R+

R-   R+
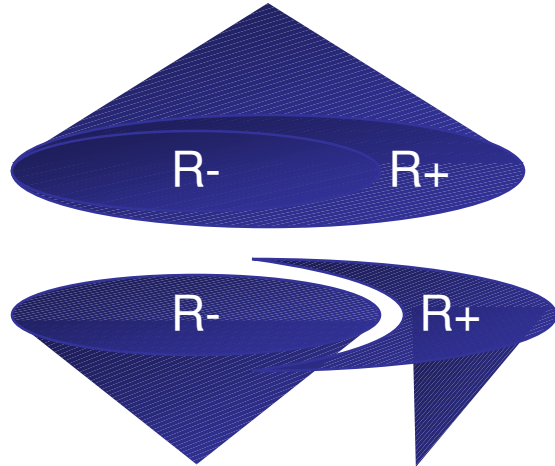
Host viewpoint: DD = two files on filesystem

Scenario: testing an application patch

Parent	Child	Child	Undo
GM	SP1	SP2	SP3
t_0	t_1	t_2	t_3
R-	R-	R-	R+

VMs can share parent drives

VM1   VM2

SP2   GM + SP1   SP2   SP3

If patch works, drives can be merged

GM   SP1   SP2   SP3
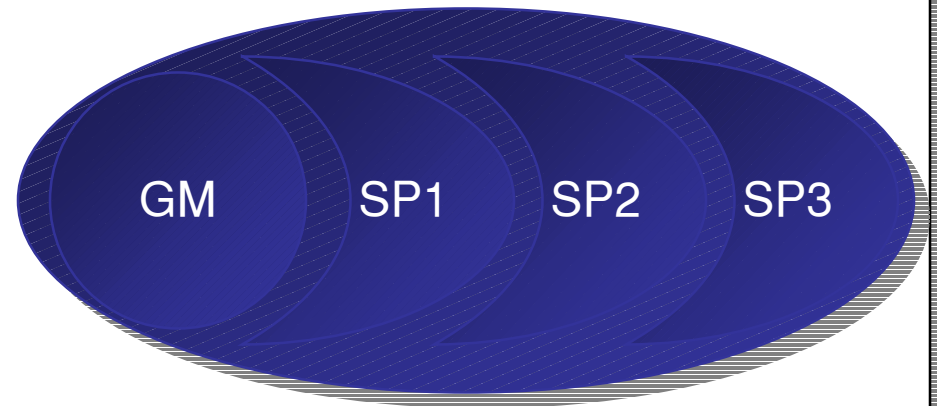
Virtual Networking

- **Virtual Server supports any Ethernet interface**
- **Create an unlimited number of virtual networks with these topologies:**
  - **Guest to network**
  - **Guest to guest via simulated Ethernet and Virtual DHCP**
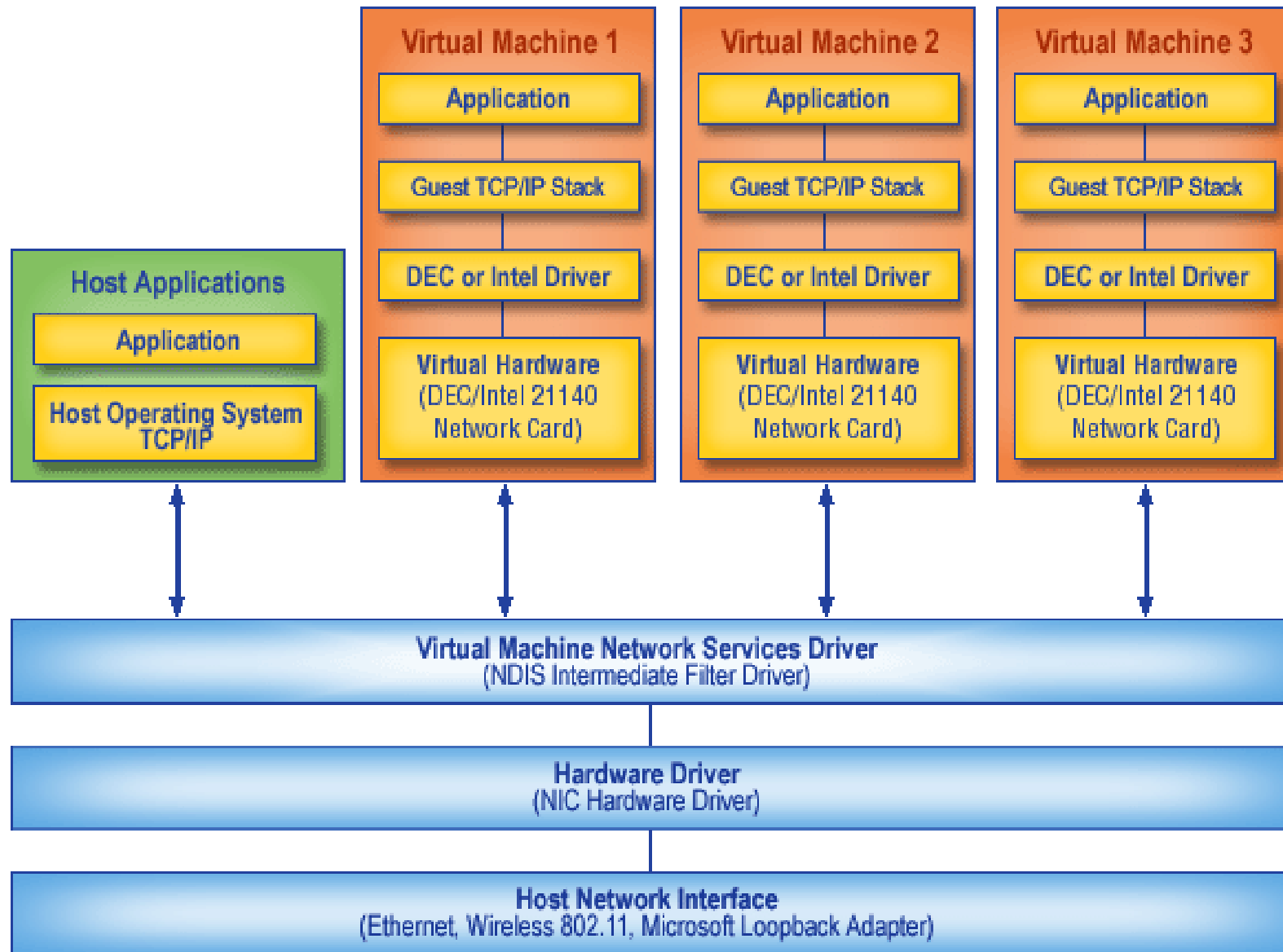 - **Guest to host system via loopback adapter**

External Virtual Networking

- **Up to 4 Virtual NICs per virtual machine**
- **Each NIC connects to any virtual network**
  - Bridge to a host Ethernet adapter
  - No custom drivers needed in guest OS
  - Support for teamed NICs
- **Performs local and external routing**

Internal Virtual Networking

- **Isolated networking**
  - **Virtual machine to virtual machine**
  - **Uses Virtual DHCP server**
  - **No host NIC interaction—no packets on wire**
  - **All routing local to Virtual Server**

Virtual Network Architecture

Host Applications
- Application
- Host Operating System TCP/IP

Virtual Machine 1
- Application
- Guest TCP/IP Stack
- DEC or Intel Driver
- Virtual Hardware (DEC/Intel 21140 Network Card)

Virtual Machine 2
- Application
- Guest TCP/IP Stack
- DEC or Intel Driver
- Virtual Hardware (DEC/Intel 21140 Network Card)

Virtual Machine 3
- Application
- Guest TCP/IP Stack
- DEC or Intel Driver
- Virtual Hardware (DEC/Intel 21140 Network Card)

Virtual Machine Network Services Driver
(NDIS Intermediate Filter Driver)

Hardware Driver
(NIC Hardware Driver)

Host Network Interface
(Ethernet, Wireless 802.11, Microsoft Loopback Adapter)

COM API Features

- **Enables complete scripted control of virtual machine environments**
- **Automates deployment and operations**
- **Enables integration with existing IT infrastructure**
- **Fully documented**
  - **42 interfaces and hundreds of calls**
- **Based on COM – users can choose between Visual Basic.NET, C#, Perl, etc.**

Easy to Manage

- **Virtual Server Administration Website**
  - **Enables secure, authenticated administration and client remote access.**
- **Microsoft integrated tools and solutions**
  - **Active Directory integration**
  - **MOM 2005, ADS, SMS 2003 SP1**
- **Physical server equivalency**
  - **Use existing management tools**

Virtual Server Administration Website

- **COM API reference implementation**
  - Installs as a headless service
  - All actions performed can be automated through the API
- **Controls each virtual machine**
  - Machine state
    - Turn on, pause, turn off, shut down, save state
  - Configuration
- **Facilitates remote access to virtual machines**
  - Virtual Machine Remote Control (VMRC)

Active Directory Integration

- **Manage virtual machines like physical machines using GPMC**
- **Enables delegated administration and secure, authenticated guest access**
- **Allows fine-grained administrative control over virtual machines**
  - **Per-virtual machine ACLs**
- **Event logs integrated with Active Directory and Microsoft Management Consoles**

Managing with MOM 2005

- **Virtual Server Management Pack for Microsoft Operations Manager 2005**
  - **Event and performance management**
    - **Extensible guest-host mapping**
    - **Provides WMI counters on host system**
    - **Event logs also displayed in host event log**
  - **Extensible XML file format**
    - **Virtual machine configuration from external management software**
    - **Leverage through COM API for automation**

Automated Deployment Services

- Virtual Server Migration Toolkit
  - Toolkit to help automate conversion of physical servers to virtual machines (P2V)
  - Command line interface only

- Requires ADS 1.0 and Virtual Server 2005
  - Uses ADS to capture and convert images
  - Combination of scripts and 3 executables

- Will be release as web download for ADS
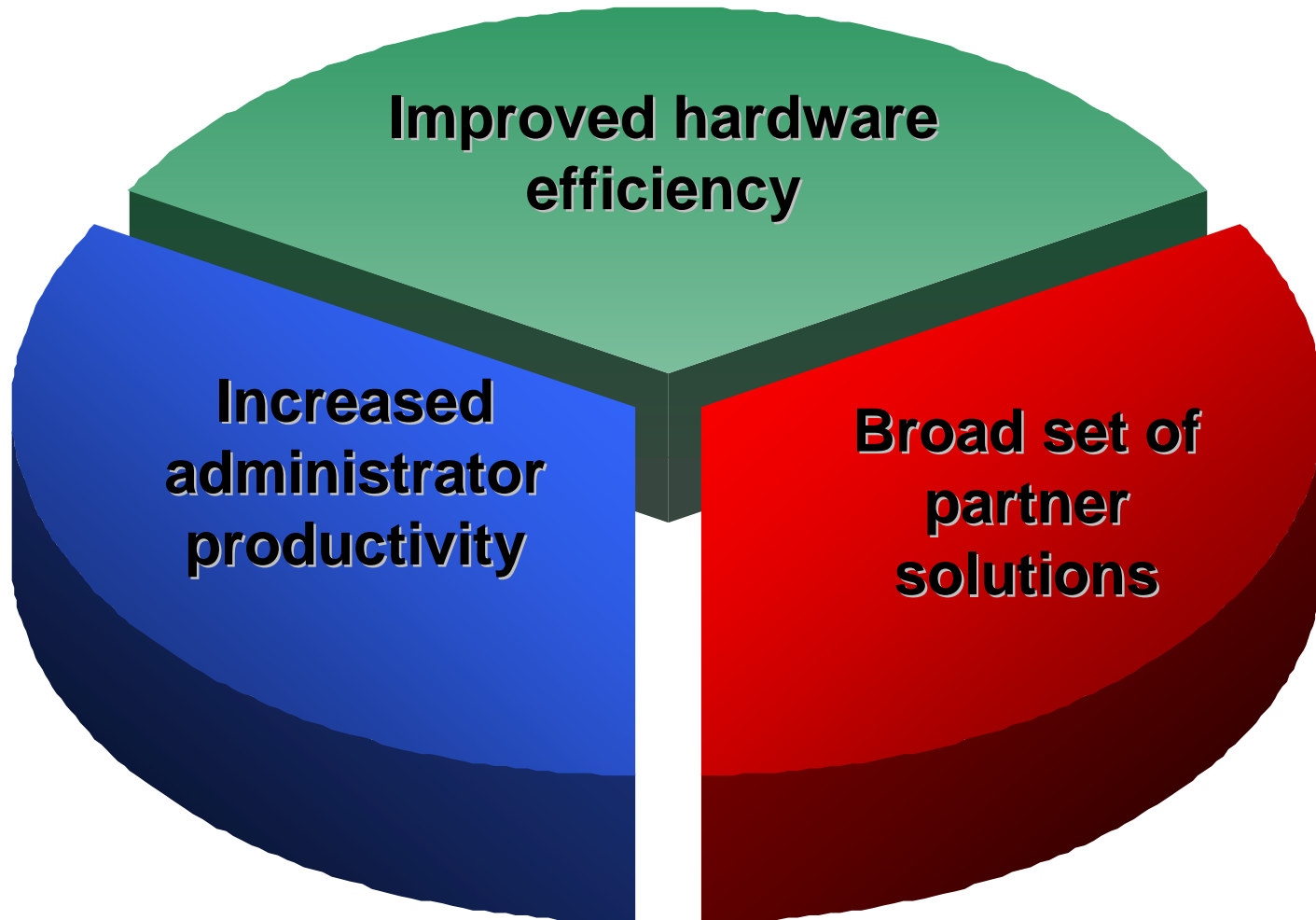 - Beta in Q3 '04, RTM in Q4 '04

Tools for SMS 2003 SP1

- Systems Management Server 2003 SP1
  - SMS Client supported in virtual machines
    - The SMS agent is supported running in a Virtual Machine environment
  - Configuration management support for virtual machines
    - Virtual PC and Virtual Server called out in hardware inventory information
    - A new node called Virtual Machine in the SMS admin console Resource Explorer
    - Discovery of virtual PC host/guest (parent/child virtual machine) relationships

Physical Server Equivalency

- Virtual machines appear and behave like physical systems
  - Utilize existing management tools to manage virtual machines

Virtual Server Benefits

Improved hardware efficiency

Increased administrator productivity

Broad set of partner solutions

Broad Set of Partner Solutions

- **A variety of product and service offerings available from Microsoft and its partners**
- **Helps businesses plan for, deploy and manage Virtual Server**
  - **Prescriptive guidance**
    - **Microsoft Solution Offerings (MSOs) help partners and customers build proven virtualization solutions**
  - **Partner offerings**
    - **Hardware OEMs**
    - **Management ISVs**
    - **Services vendors**

Microsoft Virtual Server 2005

A key deliverable of the Dynamic Systems Initiative (DSI)

- ➢ Industry initiative lead by Microsoft

- ➢ Simplify and automate how businesses design, deploy, and operate IT systems

Virtual Server: summary

- Secure isolation of multiple applications, optimized for Windows Server System
- Policy-based resource management for balanced workloads

- Complete scripted control enabling automated deployment and configuration
- Integrated with Microsoft management solutions
- Common Windows experience between host and guest

- Microsoft Solutions Accelerators provide guidance to customers and partners
- OEM, ISV, SI Partner Offering

Improved HW efficiency

Increased productivity

...oad partner solutions