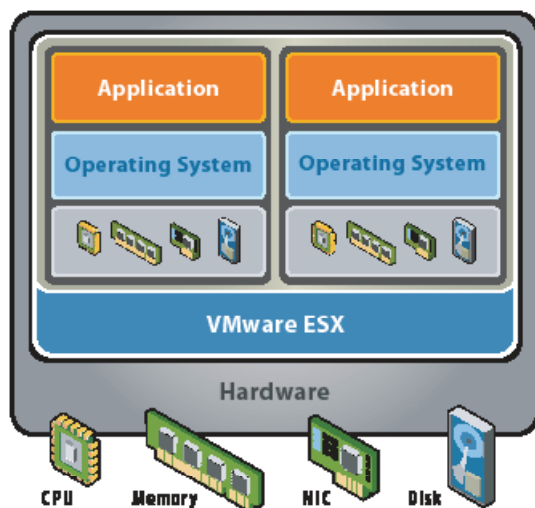# VMware ESX 3.5
Virtualize Your Servers, Storage and Networking Resources

AT A GLANCE

VMware® ESX 3.5 is the foundation for building a dynamic, self-optimizing IT infrastructure. A robust, production-proven virtualization layer that abstracts processor, memory, storage and networking resources into multiple virtual machines, VMware ESX delivers the highest levels of performance, scalability and robustness required for enterprise IT environments.

BENEFITS

• Increase hardware utilization and dramatically decrease capital and operating cost by sharing hardware resources across a large number of virtual machines that run side-by-side on the same server.

• Improve service levels even to the most resource-intensive applications with advanced resource management, high availability and security features.

VMware ESX virtualizes server storage and networking, allowing multiple applications to run in virtual machines on the same physical server.

What is VMware ESX?

VMware® ESX is the foundation for the dynamic, self-optimizing IT infrastructure. VMware ESX is a robust, production-proven virtualization layer that abstracts processor, memory, storage and networking resources into multiple virtual machines. VMware ESX delivers the highest levels of performance, scalability and robustness required for enterprise IT environments.

VMware ESXi 3.5 offers all the same functionality but with a thin 32-MB footprint designed for server integration. The thin architecture provides unparalleled security and reliability, while integration as server firmware makes deployment fast and easy.

How Is VMware ESX Used in the Enterprise?

VMware ESX allows enterprises to dramatically reduce hardware and operating costs by sharing resources across a virtual environment. With VMware ESX, IT administrators can:

• Implement production server consolidation and containment. Contain server sprawl by running software applications in virtual machines on fewer, highly scalable, reliable enterprise-class servers.

• Provide advanced business continuity protection at lower cost. Deliver high availability for critical applications with cost-effective virtualization-based solutions.

• Streamline software test & development. Consolidate disparate development, testing and staging environments involving multiple operating systems and multi-tier applications on the same hardware.

• Secure and manage enterprise desktops. Provide standardized enterprise desktop environments hosted in virtual machines accessed through thin clients or PCs.

• Re-host legacy applications. Migrate legacy operating systems and software applications to virtual machines running on new hardware for better reliability.

How Does VMware ESX Work?

VMware ESX installs directly on the server hardware, or "bare metal," and inserts a robust virtualization layer between the hardware and the operating system. VMware ESX partitions a physical server into multiple secure and portable virtual machines that can run side by side on the same physical server. Each virtual machine represents a complete system—with processors, memory, networking, storage and BIOS—so that Windows®, Linux®, Solaris® and NetWare® operating systems and software applications run in virtualized

environment without any modification. Sharing the physical server resources among a number of virtual machines increases hardware utilization and dramatically decreases capital cost. The bare metal architecture gives VMware ESX complete control over the server resources allocated to each virtual machine and provides for near-native virtual machine performance and enterprise-class scalability.

Virtual machines have built-in high availability, resource management and security features that provide better service levels to software applications than static physical environments. They are also totally isolated from each other by the virtualization layer, thus preventing a crash or misconfiguration of one virtual machine to affect the others. This isolation extends to the other server resources such as network and storage.

Key features of VMware ESX

Architecture

Bare-metal architecture. VMware ESX inserts a robust virtualization layer directly on the server hardware for near-native virtual machine performance, reliability and scalability.

New – Small Footprint. VMware ESXi 32MB disk footprint is a fraction of the size of a general purpose operating system, reducing complexity and providing unmatched security and reliability.

New – Server Integration. VMware ESXi is available built into server hardware as an embedded component, simplifying and speeding deployment of virtualization

CPU virtualization. VMware ESX uses intelligent process scheduling and load balancing across available processors to manage the execution of virtual machine processing.

Virtualization for storage. VMware ESX leverages high performance shared storage to centralize virtual machine file storage for greater manageability, flexibility and availability.

- **Virtual disk files**. Virtual machines see their own private virtual disk files. However, outside the virtual machine, the virtual disks are simply large files that can be copied, moved, archived and backed up as easily as any other file.

- **VMFS cluster file system**. Store virtual disk files on high performance shared storage such as Fibre Channel or iSCSI SAN. VMFS is a cluster file system which enables multiple installations of VMware ESX to have concurrent fast access to the same virtual machine storage. Since virtual machines are hardware independent and portable across servers, VMFS ensures that individual servers are not single points of failure and enables resource balancing across multiple servers.

- **Logical volume manager**. Manage the interaction between the physical storage arrays and VMFS with flexibility and reliability.

  » **Dynamic volume resizing.** Aggregate multiple storage disks into a single VMFS volume. Resize LUNs and add new heterogeneous LUNs to a VMFS volume on the fly.

  » **Automatic volume re-signaturing.** Simplify the use of array-based snapshot technology by automatically recognizing snapshot VMFS volumes.

  » **Partial online operation.** Volume continues to function even if some LUNs are lost.

- **Raw device mapping**. Optionally, map SAN LUNs directly to a virtual machine in order to enable application clustering[1] and array-based snapshot technology while profiting from the manageability benefits of VMFS.

- **Fibre Channel HBA consolidation**. Share expensive storage network components across many virtual machines while maintaining hardware fault tolerance.

- **Write-through I/O**. Ensures recovery by enabling virtual machines to have the same recovery characteristics as a physical system running the same operating system.

- **Boot from SAN**. Run VMware ESX installations on diskless configurations of blade and rack mount servers to eliminate the need to separately backup local attached server disks.

Virtualization for networking. Network virtual machines like physical machines. Build complex networks within a single VMware ESX or across multiple installations of VMware ESX for production deployments or development and testing purposes.

- **Virtual NICs**. Configure each virtual machine with one or more virtual NIC, each with its own IP and MAC address, to make virtual machines indistinguishable from physical machines.

- **Virtual switches**. Create a simulated network within an VMware ESX with virtual switches that connect virtual machines.

- **Expanded port configuration policies**. Simplify port configuration with a single configuration object across large groups of ports that specifies all information needed to enable a port: NIC teaming policy (now per port instead of per virtual switch), VLAN tagging, Layer 2 security, and traffic shaping.

- **VLAN.** Overlay a logical LAN on top of physical LANs to isolate network traffic for security and load segregation. VMware ESX VLANs are compatible with standard VLAN implementations from other vendors. Modify network configurations without having to change actual cabling and switch setups.

New – Support for IPv6 in guest virtual machines

Performance and Scalability

VMware ESX delivers unparalleled performance and scalability. With VMware ESX, even the most resource intensive production applications can be virtualized.

NEW – Enhanced virtual machine performance. VMware ESX delivers new performance optimizations that benefit Citrix®, Terminal®, Windows®, Services®, SQL Server®, Oracle® workloads and other large databases running inside virtual machines:

---

[1] **Microsoft Clustering Services requires direct access to a SAN LUN.**

KEY FEATURES

- Support for hardware nested page tables such as AMD's Rapid Virtualization Indexing®.

- Support for large memory pages to improve efficiency of memory access for guest operating systems.

- Networking performance optimizations such as TCP Segment Offload and Jumbo Frames that reduce the CPU overhead associated with processing network i/o.

- Support for paravirtualized Linux guest operating systems (Linux kernel 2.6.21 onwards).

Advanced memory management

- **RAM over-commitment**. Increase memory utilization by configuring virtual machine memory that safely exceeds the physical server memory. For example, the sum of the memory of all virtual machines running on a server with 8GB physical memory can be 16GB.

- **Transparent page sharing**. Use available memory more efficiently by storing memory pages identical across multiple virtual machines only once. For example, if several virtual machines are running Windows Server 2003, they will have many identical memory pages. Transparent page sharing consolidates those identical pages into a single memory location.

- **Memory ballooning**. Shift memory dynamically from idle virtual machines to active ones. Memory ballooning artificially induces memory pressure within idle virtual machines, forcing them to use their own paging areas and release memory for active virtual machines.

Improved power management. Lower the datacenter utility bill with improved power management. VMware ESX enters a low power "halt" state when a CPU is not scheduled.

4-Way Virtual SMP. Enable a single virtual machine to use up to four physical processors simultaneously. VMware ESX extends this unique feature from two to four processors. With 4-way Virtual SMP®, even the most processor intensive software applications can be virtualized.

New – 64GB RAM for virtual machines. Extend a virtual machine's memory limit to 64GB.

New – Support for powerful physical server systems. Take advantage of very large server systems with up to 32 logical CPUs and 128GB RAM for large scale server consolidation and disaster recovery projects.

Support for up to 128 powered-on virtual machines. Support up to 128 powered-on virtual machines on a single server for enterprise-class server consolidation and containment projects.

Flexible virtual switches. Scale up to handle more virtual machines. Create virtual switches with any number of ports, from 8 to 1016, and use up to 248 virtual switches.

Wake-on LAN. Enable higher consolidation ratios by allowing virtual machines to go on stand-by mode when not used.

New – Support for NPIV enabled HBAs. Assign worldwide names to individual virtual machines, thus enabling QoS analysis through SAN management tools.

Interoperability

VMware ESX is the only virtualization product optimized, rigorously tested and certified across the complete IT stack of servers, storage, operating systems, and software applications allowing for enterprise-wide standardization.

Hardware. VMware ESX has been certified with industry-leading rack, tower and blade servers from Dell, Fujitsu Siemens, HP, IBM, NEC, Sun Microsystems and Unisys.

Storage. VMware ESX is certified with a wide range of storage systems from Dell, EMC, Fujitsu, Fujitsu Siemens, HP, Hitachi Data Systems, IBM, NEC, Network Appliance, StorageTek, Sun Microsystems and 3PAR.

- **Heterogeneous storage arrays.** Use a wide variety of heterogeneous storage devices in the same VMFS volume.

- **NAS and iSCSI SAN support.** Reduces total cost of ownership of IT environments. Advanced VMware Infrastructure features like VMotion and VMware High Avaialability (HA) are fully supported with NAS and iSCSI environments.

- **4GB Fibre Channel SAN support.**

- **New -** Support for select SATA devices in servers. Allow SATA local storage to be used with VMware ESX.

- **New -** Support for new high performance 10 GigE network cards.

- **New -** Support for Infiniband technology

Operating systems. VMware ESX is the only virtualization platform that supports a wide range of unmodified operating systems, including Windows, Linux, Solaris and Novell NetWare.

- **New –** Support for Ubuntu 7.04, which runs as a paravirtualized guest OS.

Software applications. Run any software application in VMware virtual machines.

Support for other virtual machine formats. VMware ESX can run virtual machines created in non-VMware formats. Using the free VMware Virtual Machine Converter, users can run Microsoft® Virtual Server and Virtual PC, and Symantec® LiveState Recovery virtual machines in VMware ESX.

Manageability

Advanced manageability and usability features in VMware ESX enable management of entire virtualized IT environment.

SMI-S-compliant management interfaces. Monitor virtual storage using any standard SMI-S-aware storage management tool.

Virtual Infrastructure Client. Manage VMware ESX, virtual machines and (optionally) VirtualCenter Server with a common user interface.

Virtual Infrastructure Web access. Manage VMware ESX with a simple Web interface.

Virtual machine shortcuts. Enable self-help for end users with direct access to virtual machines through a Web browser.

Remote devices. Install software in a virtual machine running on a server from the CD-ROM of a desktop, without leaving your desk.

TCP Segment Offload and Jumbo frames are supported for a limited set of guests operating systems. Refer release notes for the list

KEY FEATURES

Remote Command Line Interface.
Manage VMware ESXi 3.5 through a remote execution environment that can run VMware ESX command scripts.

Agent-less Hardware Management with CIM. Common Information Model (CIM) provides a protocol for monitoring hardware health and status through VirtualCenter or CIM-compatible third-party tools.

Distributed Resource Optimizations

VMware ESX offers advanced resource management and distribution capabilities.

Resource management for virtual machines. Define advanced resource allocation policies for virtual machines to improve service levels to software applications. Establish minimum, maximum and proportional resource shares for CPU, memory, disk and network bandwidth. Modify allocations while virtual machines are running. Enable applications to dynamically acquire more resources to accommodate peak performance.

- **CPU capacity prioritization.** CPU capacity is assigned to virtual machines on a "fair share" basis, and CPU resource controls provide an absolute minimum level of CPU capacity to critical virtual machines.

- **Storage I/O traffic prioritization.** Ensure that critical virtual machines receive priority access to storage devices by prioritizing I/O traffic on a "fair share" basis.

- **Network Traffic Shaper.** Ensure that critical virtual machines receive priority access to network bandwidth. Network traffic from virtual machines can be prioritized on a "fair share" basis. Network Traffic Shaper manages virtual machine network traffic to meet peak bandwidth, average bandwidth and burst size constraints.

Resource Pools. Aggregate collections of hardware resources virtualized by VMware ESX into unified logical resources that can be allocated to virtual machines on-demand.

High Availability

VMware ESX delivers data center-class high availability for virtual machines.

Shared storage. Eliminate single points of failure by storing virtual machine files on shared storage such as Fibre Channel or iSCSI SAN, or NAS. Use SAN mirroring and replication features to keep updated copies of virtual disk at disaster recovery sites.

SAN transparency. Use native SAN storage for virtual machines with the same ease and flexibility as virtual disk files. Raw device mapping lets virtual machines use standard SAN LUN data stores in addition to special-purpose VMFS formatted LUNs for virtual disk files. Offload file-level backup and replication of virtual machine data to SAN-based utilities. Easily configure clusters of virtual and physical machines with shared SAN data stores for cost effective high availability.

Built-in storage access multipathing. Ensure shared storage availability with SAN multipathing for Fibre Channel or iSCSI SAN, and NIC teaming for NAS.

Enhanced NIC teaming. Give each networked virtual machine built-in NIC failover and load balancing enabling greater hardware availability and fault tolerance. New NIC teaming policies allow users to configure multiple active and standby adapters. Teaming configuration may be different for different port groups on the same virtual switch and different groups can even select different teaming algorithms for the same team.

Support for Microsoft® Clustering Services. Cluster virtual machines running Microsoft® Windows operating system across physical hosts.

Security

Security features protect stored data in your virtual environment.

Compatibility with SAN security practices. Enforce security policies with LUN zoning and LUN masking.

VLAN tagging. Enhance network security by tagging and filtering network traffic on VLANs.

Layer 2 network security policies. Enforce security for virtual machines at the Ethernet layer. Disallow promiscuous mode sniffing of network traffic, MAC address changes and forged source MAC transmits.

How Can I Purchase VMware ESX?

For more information on how to purchase, refer to the "How to buy" page http://www.vmware.com/products/vi/buy.html

Product Specifications and System Requirements

For detailed product specifications and system requirements refer to the VMware ESX requirements in the VMware Infrastructure Installation and Upgrade guide.

Compatibility guides:

- Systems Compatibility Guide: VMware ESX
- SAN Compatibility Guide: VMware ESX