IBM Systems

Virtualization

Version 2 Release 1

IBM Systems

Virtualization

Version 2 Release 1

Note

Before using this information and the product it supports, be sure to read the information in "Notices," on page 9.

First Edition (December 2005)

This edition applies to version 2, release 1, modification 0 of IBM Virtualizaton and to all subsequent releases and modifications until otherwise indicated in new editions. This version does not run on all reduced instruction set computer (RISC) models nor does it run on CISC models.

Contents

Virtualization

Virtualization improves IT resource utilization by treating your company's physical resources as pools from which virtual resources can be dynamically allocated.

Virtualization involves a shift in thinking from physical to logical, treating IT resources as logical resources rather than separate physical resources. Using virtualization in your environment, you are able to consolidate resources such as processors, storage, and networks into a virtual environment, which provides the following:

- Consolidation to reduce hardware cost
- Optimization of workloads
- IT flexibility and responsiveness

What's new

Learn about the new supported hypervisors, VMware Server and Xen, for IBM® systems.

What's new as of 28 September 2006

"Virtual systems overview" on page 2

Changes to Virtual systems overview include the addition of VMware Server and Xen in the list of supported hypervisors for IBM systems.

How to see what's new or changed

To help you see where technical changes have been made, this information uses:

- The » image to mark where new or changed information begins.
- The « image to mark where new or changed information ends.

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Virtualization overview

View this topic to learn more about virtualization and the different types of virtualization support available to support your business infrastructure.

Virtualization is the creation of substitutes for real resources, that is substitutes that have the same functions and external interfaces as their counterparts, but that differ in attributes, such as size, performance, and cost. These substitutes are called *virtual resources*, and their users are typically unaware of the substitution. Virtualization is commonly applied to physical hardware resources by combining multiple physical resources into shared pools from which users receive virtual resources. With virtualization, you can make one physical resource look like multiple virtual resources. Virtual resources can have functions or features that are not available in their underlying physical resources.

Virtualization provides the following benefits:

- Consolidation to reduce hardware cost:
  - Virtualization enables you to efficiently access and manage resources to reduce operations and systems management costs while maintaining needed capacity.
  - Virtualization enables you to have a single server function as multiple virtual servers.
- Optimization of workloads:
  - Virtualization enables you to respond dynamically to the application needs of its users.
  - Virtualization can increase the use of existing resources by enabling dynamic sharing of resource pools.
- IT flexibility and responsiveness:
  - Virtualization enables you to have a single, consolidated view of, and easy access to, all available resources in the network, regardless of location.
  - Virtualization enables you to reduce the management of your environment by providing emulation for compatibility, improved interoperability, and transparent change windows.

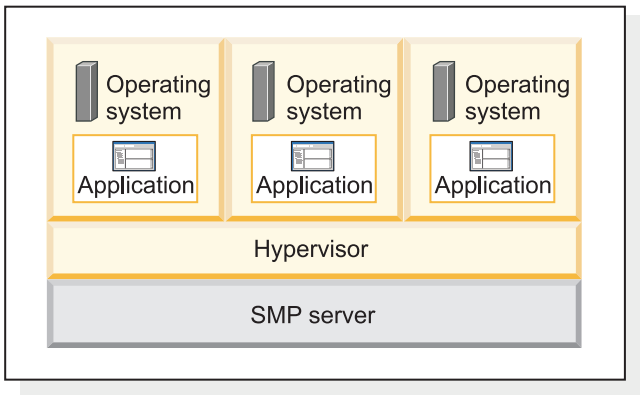
When you think about applying virtualization to your current environment, you must think about consolidating logical resources rather than physical resources into a system designed to support server, storage, and network virtualization. By adding any of these virtualization technologies to your environment, you create an on demand, secure, and flexible infrastructure prepared to handle workload changes in your environment.

Virtual systems overview

System virtualization enables you to consolidate systems, workloads, and operating environments, optimize resource use, and improve IT flexibility and responsiveness.

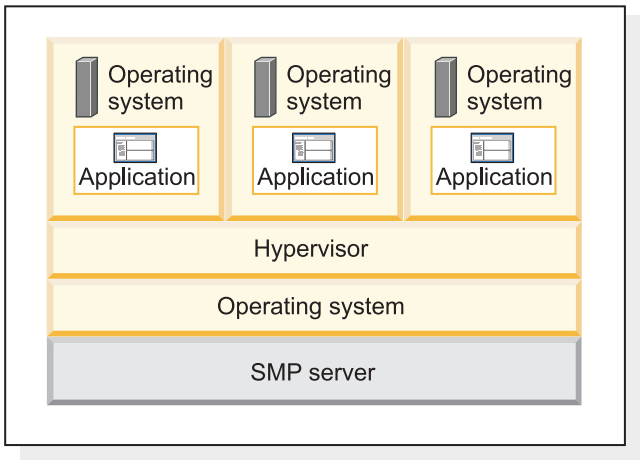
System virtualization creates many virtual systems within a single physical system. *Virtual systems* are independent operating environments that use virtual resources. System virtualization can be approached through hardware partitioning or hypervisor technology. *Hardware partitioning* subdivides a physical server into fractions, each of which can run an operating system. These fractions are typically created with coarse units of allocation, such as whole processors or physical boards. This type of virtualization allows for hardware consolidation, but does not have the full benefits of resource sharing and emulation offered by hypervisors. *Hypervisors* use a thin layer of code in software or firmware to achieve fine-grained, dynamic resource sharing. Because hypervisors provide the greatest level of flexibility in how virtual resources are defined and managed, they are the primary technology of choice for system virtualization.

There are two types of hypervisors. Type 1 hypervisors run directly on the system hardware. The following figure shows one physical system with a type 1 hypervisor running directly on the system hardware, and three virtual systems using virtual resources provided by the hypervisor.



EICAY501-2

Type 2 hypervisors run on a host operating system that provides virtualization services, such as I/O device support and memory management. The following figure shows one physical system with a type 2 hypervisor running on a host operating system and three virtual systems using the virtual resources provided by the hypervisor.



EICAY502-3

Type 1 hypervisors are typically the preferred approach because they can achieve higher virtualization efficiency by dealing directly with the hardware. Type 1 hypervisors provide higher performance efficiency, availability, and security than type 2 hypervisors. Type 2 hypervisors are used mainly on client systems where efficiency is less critical. Type 2 hypervisors are also used mainly on systems where support for a broad range of I/O devices is important and can be provided by the host operating system.

IBM supports at least one hypervisor for each IBM system. The following table lists IBM systems and the hypervisors that they support.

Table 1. IBM systems and supported hypervisors

Hypervisor	Hypervisor type	IBM system that runs hypervisor
Microsoft® Virtual Server	Type 2	System x™ and BladeCenter®
POWER5™	Type 1	System i™ and System p™
Processor Resource/System Manager	Type 1	System z™
VMware ESX Server	Type 1	System x and BladeCenter
VMware GSX Server	Type 2	System x and BladeCenter
VMware Server	Type 2	System x and BladeCenter

Table 1. IBM systems and supported hypervisors (continued)

Hypervisor	Hypervisor type	IBM system that runs hypervisor
Xen	Type 1	System x and BladeCenter
z/VM®	Type 1	System z

System virtualization yields the following benefits:

- Consolidate systems, workloads, and operating environments:
  - Multiple workloads and operating systems can be combined onto one physical server, reducing the costs of hardware and operations.
  - New versions of software can be tested on the hardware that they will later use in production mode without affecting production workloads.
  - Virtual systems can be used as low-cost test systems without jeopardizing production workloads.
  - Multiple operating system types and releases can run on a single system. Each virtual system can run the operating system that best matches its application or user requirements.
- Optimize resource use:
  - Hypervisors can achieve high resource use by dynamically assigning virtual resources (such as processors and memory) to physical resources through mechanisms such as dispatching and paging. The virtual resources that they provide can exceed the physical system resources in quantity and functionality.
  - System virtualization enables the dynamic sharing of physical resources and resource pools. This results in higher resource use, especially for variable workloads whose average needs are much less than an entire dedicated resource.
  - Different workloads tend to show peak resource use at different times of the day and week, so implementing multiple workloads in the same physical server can improve system use, price, and performance.
- Improve IT flexibility and responsiveness:
  - Service providers can create one virtual system or clone many virtual systems on demand, achieving dynamic resource provisioning.
  - Virtual systems with variable resources enable the manual or automated management of workload resources.

Related information

Virtualizing a system

Managing a virtual system

Virtual storage overview

This topic provides a brief overview of storage virtualization products used across a storage area network (SAN), as well as, server-level solutions provided by IBM eServer™ systems.

Storage Area Network (SAN) solutions

Storage virtualization resolves the increasing complexity of managing storage by combining multiple storage devices into a single, logical resource with a single view.

All IBM systems can benefit from storage virtualization benefits, such as the ability to add additional space and volumes, to move to different types of disks and to replace failing disk subsystems. These benefits occur without the knowledge of host systems or applications. IBM provides these and many other Storage Area Network (SAN)-based storage and data management benefits through the combination of IBM storage virtualization software and Tivoli® storage management software.

The key components of storage virtualization include the following products:

- SAN Volume Controller

  The SAN Volume Controller (SVC) reduces the complexity and costs of managing SAN-based storage and increases storage resource utilization. It combines the capacity from multiple disk storage systems into a single storage pool, which can be managed from a central point.
- SAN File System

  The SAN file System (SFS) consolidates file systems across UNIX®, Windows®, and Linux® environments. With SFS, files and file systems are viewed and managed as a centralized IT resource with a single point of administrative control.
- IBM TotalStorage® Productivity Center with advanced provisioning

  The IBM TotalStorage Productivity Center with advanced provisioning allows you to automate the steps necessary to provision storage in a consistent manner, reducing error. *Provisioning* is the process of configuring servers, software, networks, and storage resources. Provisioning capabilities are provided by the TotalStorage Productivity Center, while Tivoli Provisioning Manager facilitates the automation of the provisioning tasks through the use of storage workflows.

Virtual storage solutions for IBM systems

SAN storage and data management is one part of storage virtualization. However, IBM systems provide virtual storage solutions as well. The virtual storage technology, provided by iSeries™ and pSeries® systems, allows multiple logical partitions to share storage adapters and devices. On IBM eServer hardware systems, virtual SCSI adapters and serial adapters can be created. These virtual adapters interact with the operating system like any other adapter card, except that they are not physically present. A logical partition can use virtual SCSI to connect to a hard disk drive or optical device that is shared by multiple logical partitions on the system. For more information about virtual storage support, see the IBM Systems Hardware Information Center.

xSeries® and zSeries® systems are often integrated as nodes within a SAN-based solution or use POWER5 servers for additional storage. For more information about SAN-based storage solutions, see the IBM TotalStorage virtualization solutions.

Related concepts

Virtual optical storage on iSeries servers

Virtual storage

zSeries storage management

IBM TotalStorage Virtualization

IBM TotalStorage Productivity Center with Advanced Provisioning

Related information

Virtualization and the On Demand Business

Virtualization in a SAN

Virtual networks overview

Network virtualization is the ability to manage and prioritize traffic in portions of a network that might be shared among different enterprises.

This ability allows administrators to use performance, resources, availability and security more efficiently. There are various network technologies that provide this level of management. Network virtualization technologies include virtual private networks (VPNs), Hipersockets, and virtual LANs, which provide the following capabilities:

Virtual IP address (VIPA) takeover

The assignment of a virtual IP address to an existing interface. If one system becomes unavailable, VIPA takeover allows for automatic recovery of network connections between different servers.

Hipersockets
A mainframe-based hardware feature that provides high performance internal communications between logical partitions (LPARs) within the same central processor complex (CPC) without the use of any additional or external hardware equipment such as a channel adapter.

Virtual Ethernet
An iSeries and pSeries technology that enables internal TCP/IP communication between partitions.

virtual LAN (VLAN)
A logically independent network. Several virtual LANs can exist on a single physical switch.

virtual private network (VPN)
An extension of a company's intranet over the existing framework of either a public or private network. A VPN ensures that the data that is sent between the two endpoints of its connection remains secure.

All IBM systems have existing network virtualization technologies. These virtualization technologies primarily exist at the system level and require hypervisor and Licensed Internal Code support to enable sharing between different operating systems.

Table 2. Existing network virtualization for IBM systems

IBM System	Network virtualization
iSeries	• Using 1 GB connections between partitions and integrated xSeries solutions with no LAN adapters/switches • Virtualizing of IP addresses and IP address takeover • Provisioning of network resources through IBM Tivoli Provisioning Manager **Note:** *Provisioning* is the process of configuring servers, software, networks, and storage resources. • Using Virtual Ethernet
pSeries	• Virtualizing of IP addresses and IP address takeover • Provisioning of network resources through IBM Tivoli Provisioning Manager • Using Virtual Ethernet
xSeries	• Using network blades, including Layer 2 and Layer 3 switches • Provisioning of network resources through IBM Tivoli Provisioning Manager
zSeries	• Sharing network adapters, including mapping applications to network priorities • Virtualizing of IP addresses and IP address takeover • Using Hipersockets • Sharing Linux® firewalls and load-balancers under z/VM • Using z/VM Guest LAN, VSWITCH, and VLAN support

Related concepts

Overview of iSeries virtualization technologies

Overview of pSeries virtualization technologies

Overview of xSeries and BladeCenter virtualization technologies

Overview of zSeries virtualization technologies

Related information

Virtualization and the On Demand Business

On Demand Operating Environment: Managing the Infrastructure (Virtualization Engine Update)

Virtual systems

Use this topic to learn more about getting started with virtualization by setting up and managing a virtual system.

Every IBM system has virtualization functions and capabilities that allow system administrators the ability to create virtual systems within a single physical system. After creating these virtual systems, managing these resources across a homogeneous environment becomes critical to improving the resource utilization of your system. Virtualization technologies and the virtualization tools associated with each IBM system help you operate a single system as a multi-system environment.

Virtualizing a system
Use this information to find an overview of each IBM server virtualization technologies and instructions for how to plan for and deploy those virtualization technologies.

Managing a virtual system
Use this information to learn how virtual systems management is an extension to traditional systems management.

Virtual enterprise

Use this topic to learn about more advanced ways to use and manage virtualization across your enterprise.

The previous information introduced you to the concept of virtualization. As you may know, virtualization can improve IT resource utilization by allowing system administrators to access and manage resources across a homogeneous and heterogeneous environment. Every IBM system has built-in virtualization technologies that enable a business to achieve all of the things on demand promises. After virtualization technologies are configured and running on a single system (or group of like systems), the next step is to use virtualization management and virtualization access tools to achieve one, single management view across heterogeneous systems.

The following topics provide an overview of how to benefit from virtualization technologies across a heterogeneous environment, tools available to manage this environment, and additional resources to explore.

Managing a virtual enterprise
Learn more about managing an enterprise using virtualization technologies that focus primarily on removing the boundaries between platforms.

Virtualization Engine™

The Virtualization Engine can help you automate the management of the resources based on your business goals and make basic systems management of multiple systems possible.

The IBM Virtualization Engine is a set of technologies and systems services that can help you aggregate pools of resources and get a consolidated view of them throughout your IT environment. It uses key IBM virtualization technologies to give you a logical rather than physical view of data, computing power, storage capacity, and other resources.

The IBM Virtualization Engine delivers the following benefits:

- Simplifies network infrastructure

- Reduces cost and complexity by optimizing resource utilization
- Increases the business value of IT investments

  Virtualization Engine Systems Edition
  Learn more about the virtualization technologies and management tools that are integrated and delivered with each IBM system.

  Virtualization Engine management collection
  Learn how the Virtualization Engine management collection provides workload, performance and resource managers as well as mapping, dependency, and modeling capabilities.

Appendix. Notices

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