IBM PowerVM

Virtualization without limits

Highlights

- Deliver services with superior economics by consolidating virtualized workloads

- Deliver services built for the cloud faster by automating deployment of virtual machines (VMs) and storage

- Optimize utilization of server and storage resources to control cost and boost return on investment (ROI)

- Scale out or scale up your virtualized deployments without paying underlying performance penalties

- Eliminate scheduled downtime by deploying live mobility between servers

- Deliver higher quality services by improving virtual resource management

IBM® PowerVM® provides the industrial-strength virtualization solution for IBM Power Systems™ servers and blades that run IBM AIX®, IBM i and Linux workloads. Based on more than a decade of evolution and innovation, PowerVM represents the state of the art in enterprise virtualization and is broadly deployed in production environments worldwide by most Power Systems owners.

The Power Systems family of scale-out and scale-up servers includes proven[1] workload consolidation platforms that help clients control costs while improving overall performance, availability and energy efficiency. With these servers and PowerVM virtualization solutions, an organization can consolidate large numbers of applications and servers, fully virtualize its system resources, and provide a more flexible, dynamic IT infrastructure. In other words, Power Systems with PowerVM deliver the benefits of virtualization without limits.

PowerVM also offers a secure and resilient virtualization environment, built on the advanced RAS (reliability, availability and serviceability) features, extreme scalability and leadership performance[2] of the Power Systems platform, based on the outstanding Power processors.

Employing virtualization

You can employ virtualization in many ways to achieve improvements in efficiency and flexibility:

- Consolidation of multiple workloads, including those on underutilized servers and systems with varied and dynamic resource requirements
- Rapid deployment and scaling of workloads to meet changing business demands
- Aggregation of system resources such as central processing units (CPU), memory and storage into shared pools for dynamic reallocation between multiple workloads
- Application development and testing in secure, independent domains
- Live mobility of active workloads between servers to support platform upgrades, systems balancing, or to avoid planned maintenance downtime

Processor virtualization

The Power Systems family gives you the freedom to either use the scale-up or scale-out processing model to run the broadest selection of enterprise applications without the costs and complexity often associated with managing multiple physical servers. PowerVM can help eliminate underutilized servers because it is designed to pool resources and optimize their use across multiple application environments and operating systems. Through advanced VM capabilities, a single VM can act as a completely separate AIX, IBM i, or Linux operating environment, using dedicated or shared system resources. With shared resources, PowerVM can automatically adjust pooled processor, memory or storage resources across multiple operating systems, borrowing capacity from idle VMs to handle high resource demands from other workloads.

With PowerVM on Power Systems, you have the power and flexibility to address multiple system requirements in a single machine. PowerVM Micro-Partitioning® supports multiple VMs per processor core and, depending upon the Power Systems model, can run up to 1000 VMs on a single

server—each with its own processor, memory, and I/O resources. Processor resources can be assigned at a granularity of 1/100th of core. Consolidating systems with PowerVM can help cut operational costs, improve availability, ease management and improve service levels, while allowing businesses to quickly deploy applications.

Multiple Shared processor pools allows for the automatic non-disruptive balancing of processing power between VMs assigned to shared pools, resulting in increased throughput. It also provides the ability to cap the processor core resources used by a group of VMs to potentially reduce processor-based software licensing costs.

Shared Dedicated Capacity allows for the "donation" of spare CPU cycles from dedicated processor VMs to a shared processor pool. Since a dedicated VM maintains absolute priority for CPU cycles, enabling this feature can increase system utilization without compromising the computing power for critical workloads.

Because its core technology is built into the system firmware, PowerVM offers a highly-secure virtualization platform that has received the Common Criteria Evaluation and Validation Scheme (CCEVS) EAL4+ certification[3] for its security capabilities.

Memory virtualization

PowerVM features IBM Active Memory™ Sharing (AMS), a technology that allows you to intelligently and dynamically reallocate memory from one VM to another for increased utilization, flexibility and performance. AMS enables the sharing of a pool of physical memory among VMs on a server, helping to increase memory utilization and drive down system costs. AMS has a capability to optimize memory by removing duplicate memory pages further minimizing memory usage.

I/O virtualization

The Virtual I/O Server (VIOS) is a special purpose VM that can be used to virtualize I/O resources for AIX, IBM i, and Linux VMs. VIOS owns the resources that are shared by VMs. A physical adapter assigned to the VIOS can be shared by many VMs which reduces cost by eliminating the need for dedicated I/O adapters. Shared storage pools allow storage subsystems to be combined into a common pool of virtualized storage that can be shared by the VIOS on multiple Power Systems servers.

N_Port ID Virtualization (NPIV) support provides direct access to Fiber Channel Adapters from multiple VMs, simplifying the deployment and management of Fiber Channel SAN environments.

Single Root I/O Virtualization (SR-IOV) support provides optimized I/O virtualization within the hardware of the I/O network adapter. This I/O virtualization option provides direct access to the network adapters from the VM or VIOS server which provides improved performance and enhanced quality of service control.

Feature	Benefits
PowerVM hypervisor	• Supports multiple operating environments on a single system
Micro-partitioning	• Enables up to 20 VMs per processor core*
Dynamic logical partitioning	• Processor, memory, and I/O resources can be dynamically moved between VMs
Shared processor pools	• Processor resources for a group of VMs can be capped, reducing software license costs • VMs can use shared (capped or uncapped) processor resources • Processor resources can automatically move between VMs based on workload demands
Shared storage pools	• Storage resources for Power Systems servers and VIOS can be centralized in pools to optimize resource utilization
Integrated virtualization manager	• Simplifies VM creation and management for entry Power Systems servers and blades
Live Partition Mobility *(Enterprise edition feature)*	• Live AIX, Linux and IBM i VMs can be moved between servers, eliminating planned downtime
Active Memory Sharing (AMS) *(Enterprise edition feature)*	• Intelligently flows memory from one VM to another for increased memory utilization
Active Memory Deduplication *(Enterprise edition feature)*	• Reduces memory consumption for AMS configurations by detecting and eliminating duplicate memory pages
NPIV	• Simplifies the management and improves performance of Fibre Channel SAN environments
SR-IOV[†]	• Hardware based I/O virtualization enhanced performance and enhanced quality of service controls
System planning tool	• Simplifies the planning for and installation of Power Systems servers with PowerVM
VIOS performance advisor	• Checks performance and health of the VIO Server then makes recommendations for performance improvement.
IBM PowerVP™ Monitor* *(Enterprise edition feature)*	• Provides performance intelligence to proactively address performance issues mapping virtual workloads to physical hardware • Simple performance color coded health view of virtualized server
Little Endian Linux Guest Support[‡]	• Enables flexibility to run little endian Linux distributions such as SLES 12, Ubuntu 15.04 and RHEL 7.1 on systems with AIX, IBM i and older Linux versions concurrently
System and partition templates	• Enables repeatable error free deployment of VMs

Live partition mobility

Live partition mobility (LPM) supports the movement of a running AIX or Linux or IBM i VM from one Power Systems server to another without application downtime, helping avoid application interruption for planned system maintenance, provisioning, and workload management. LPM can be used to simplify migration of operating environments to new servers temporarily or permanently.

Systems management

PowerVM virtualization features are managed through the Hardware Management Console (HMC) or the Flex System Manager, which is part of the IBM PureFlex® System, or by the Integrated Virtualization Manager (IVM) on entry-level Power Systems. The advanced virtualization management solution for PowerVM is IBM PowerVC which allows managing pools of resources and simplifies managing the virtual machine lifecycle.

For more information

To learn more about IBM PowerVM, please contact your IBM representative or IBM Business Partner, or visit the following website:

ibm.com/systems/power/software/virtualization/index.html

* Available on systems with 7.7 firmware and above, and all POWER8 systems

† Available on select Power Systems

‡ Available on systems POWER8 systems with firmware 8.30 or higher

[1] PowerVM Case Studies: ibm.com/systems/power/success/index.html

[2] Power Systems benchmark results: ibm.com/systems/power/hardware/benchmarks/index.html

[3] Common Criteria Evaluation and Validation Scheme (CCEVS) EAL4 Augmented with ALC_FLR.2 certification:
http://www.commoncriteriaportal.org/files/epfiles/ISCB-5-RPT-C043-CR-v1b.pdf
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