IBM PowerKVM available with the Linux only scale-out servers

IBM Redbooks Solution Guide

The IBM® POWER8™ processors are built for big data and open innovation. Now, Linux administrators and users can maximize this power through the new open virtualization offering of PowerKVM. This IBM Redbooks® Solution Guide describes the Linux open source technology of Kernel-based Virtual Machine (KVM) virtualization, which is designed to complement the performance, scalability, and security qualities of Linux.

With the introduction of the Linux only scale-out systems with POWER8 technology, a new virtualization option is supported on IBM Power Systems™. This virtualization is known as Kernel-based Virtual Machine (KVM) and the offering for the IBM Power Systems is called PowerKVM. PowerKVM uses the qualities of performance, scalability, and security that are inherent in Linux.

This solution is for cost-conscious enterprises and Linux administrators looking for easy configuration and operation of PowerKVM technology (a simple but powerful functioning KVM host). Many of the cloud managers, such as OpenStack, were developed around KVM technology so this is a logical fit for cloud deployments. Figure 1 shows the 12-core IBM POWER8 architecture.
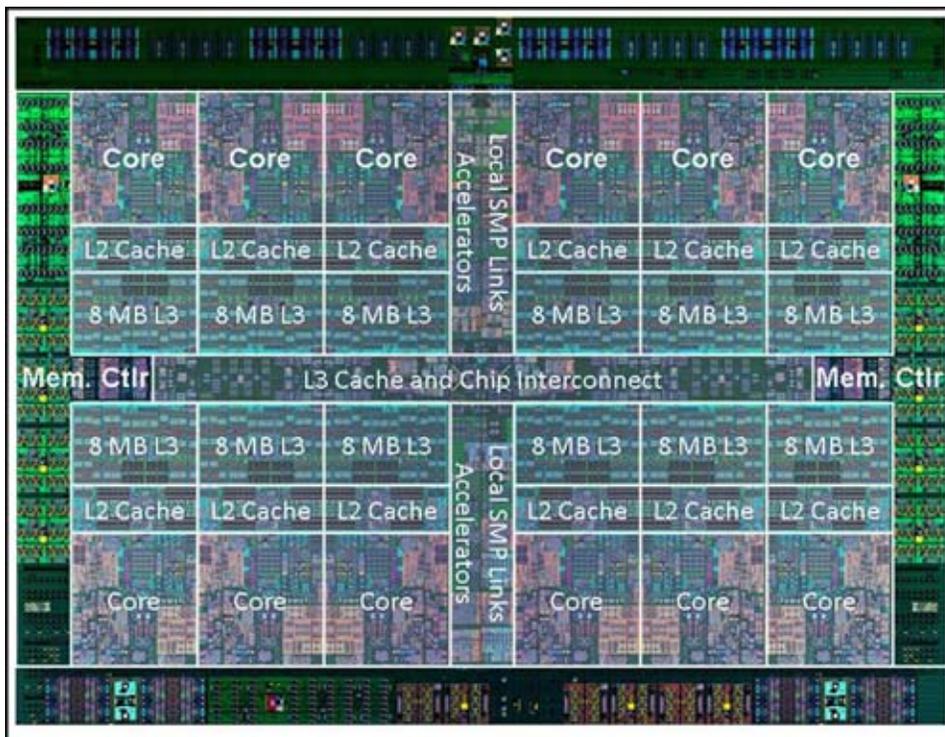

Figure 1. IBM POWER8 architecture (12 cores)

Did you know?

Did you know that PowerKVM can help you get more from your resources by resource over-commitment?

Virtualization allows physical resources to be shared by diverse workloads with complete segregation. Assets, such as the hardware platform, operating system, storage devices, and network, can be more effectively used in a virtual environment. In virtualization, two main components exist: the hypervisor and the guest. KVM is a part of open source virtualization that turns the Linux kernel into an enterprise-class hypervisor. Hypervisors consolidate huge amounts of work on a single server. Virtualization (through a mechanism called overcommitment) exposes more CPU, I/O, and memory to the guest machine than exist on the real server, therefore increasing resource utilization and improving the server consolidation. KVM is designed to deliver optimal performance by using virtualization. Imagine IBM Power technology and POWER8 processors being applied with PowerKVM to deliver incredible enterprise-grade performance to your virtual environment.

Business value

IBM PowerKVM is a product that blends the resilience and performance of Power technology with the openness of KVM. Your enterprise can anticipate many advantages from this combination:

- Higher workload consolidation with processors' overcommitment and memory sharing
- Dynamic addition and removal of virtual devices
- Micro-Threading scheduling granularity
- Integration with IBM PowerVC and OpenStack
- Simplified management using open source software
- Avoidance of vendor lock-in
- Maximized superior POWER8 hardware features, such as SMT8 and Micro-Threading

These advantages in real terms mean that your enterprise's hardware processor utilization can be more efficient, memory access and architecture can be vastly improved, server utilization can be increased, and data movement can occur faster. Therefore, more business interactions, transactions, and services can be supplied to your customers and more revenue opportunities occur in a shorter period of time. All of these advantages can be afforded with fewer costs in a virtual environment. You'll have real power with IBM PowerKVM.

Solution overview

IBM Power Systems is a family of servers built for big data solutions using advanced POWER8 processors. This family of servers includes scale-out servers and enterprise-class servers from small to large configurations. The IBM Power Systems are known for high availability and extreme performance.

The IBM scale-out systems can run a mixture of workloads, including IBM AIX®, IBM i, and Linux. This allows the scale-out workload to include the Linux applications (supporting a complete stack of open software ranging from the hypervisor to cloud management). With the introduction of the Linux only scale-out systems, POWER8 processing can be applied to the actual open source virtualization mechanism known as KVM.

Whether you want to revolutionize your processing power for hypervisor or cloud, POWER8 processing is available to your enterprise with the ease of KVM management using PowerKVM.

Solution architecture

For Linux administrators to get the value and ease of PowerKVM advantages, the architecture is simple.

Currently, there are two IBM Scale-out systems from IBM Power Systems that are built for scale-out Linux only workloads. The IBM Power Systems built on POWER8 processors that support IBM PowerKVM v2 are listed:

- IBM Power System S812L (8247-21L)
- IBM Power System S822L (8247-22L)

The IBM Power System S812L (8247-21L) is a powerful single-socket entry server with the following assets:

- One POWER8 dual-chip module (DCM) that offers 3.42 GHz (#EPLP4) or 3.02 GHz (#ELPD) performance

- Support for up to 12 POWER8 cores

- Capability to provide up to 96 CPU threads when using SMT8 mode

The IBM Power System S822L (8247-22L) offers the following assets:

- Support for up to two POWER8 processors that offer 3.42 GHz (#EPLP4) or 3.02 GHz (#ELPD) performance

- Support for up to 24 POWER8 cores

- Capability to provide up to 192 threads when using SMT8 mode

The IBM POWER8 processor is the most recent in the family of processors available for the IBM Power Systems. Each POWER8 chip is a high-end processor with the following assets:

- Up to 12 cores
- Two memory controllers per processor and a PCI generation 3 controller
- Processor capacity of 96 MB of L3 shared cache plus 512K per core

Additional features can augment the performance of the IBM POWER8 processor:

- Support for dynamic device reconfiguration (DDR) 3 and DDR4 memory through memory buffer chips that offload the memory support from the IBM POWER8 memory controller.

- L4 cache within the memory buffer chip that reduces the memory latency for local access to memory behind the buffer chip. (The operation of the L4 cache is transparent to applications running on the IBM POWER8 processor.) Up to 128 MB of L4 cache can be available for each POWER8 processor.

- Hardware transactional memory.

- On-chip accelerators, including on-chip encryption, compression, and random number generation accelerators.

- Coherent Accelerator Processor Interface, which allows accelerators plugged into a PCIe slot to access the processor bus using a low-latency, high-speed protocol interface.

- Adaptive power management.

- Micro-Threading that allows up to four concurrent virtual machines (VMs) to be dispatched simultaneously on a single core.

PowerKVM v2 is an easy-to-use administrative solution that is available on these two systems with POWER8 technology. This widely accepted platform allows your enterprise to maximize the efficiency and processing power of the IBM Power System while keeping application portability simple and costs at a minimum. Figure 2 shows the IBM Power System S812L (8247-21L) and Figure 3 shows the IBM Power System S822L (8247-22L).

Figure 2. IBM Power System S812L (8247-21L)
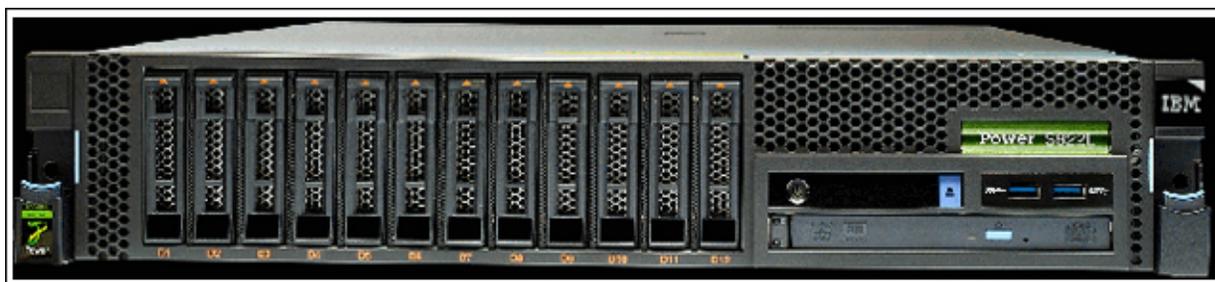
Figure 3. IBM Power System S822L (8247-22L)

Scenario

Consider this scenario of a virtualized enterprise with the ability to get additional processing power through overcommitment.

CPU overcommit allows under-utilized CPU to be shared among other virtual machines (VMs). The CPU overcommit is usually enabled when the VMs are not expected to use all the CPU resources at the same time. Therefore, when one VM is not using its share of the CPU, another VM can use it.

A CPU assigned to a VM is called a virtual CPU (vCPU). Within an overcommitted scenario, the number of vCPUs is larger than the number of available CPUs. For example, Figure 4 shows a hypervisor with four CPUs that hosts two VMs that use three vCPUs each. Therefore, the guest operating system can use up to three CPUs if another VM is not using more than one CPU.

If all the vCPUs get 100% at one time, the hypervisor will multiplex the vCPU in the real CPU according to the hypervisor policies.
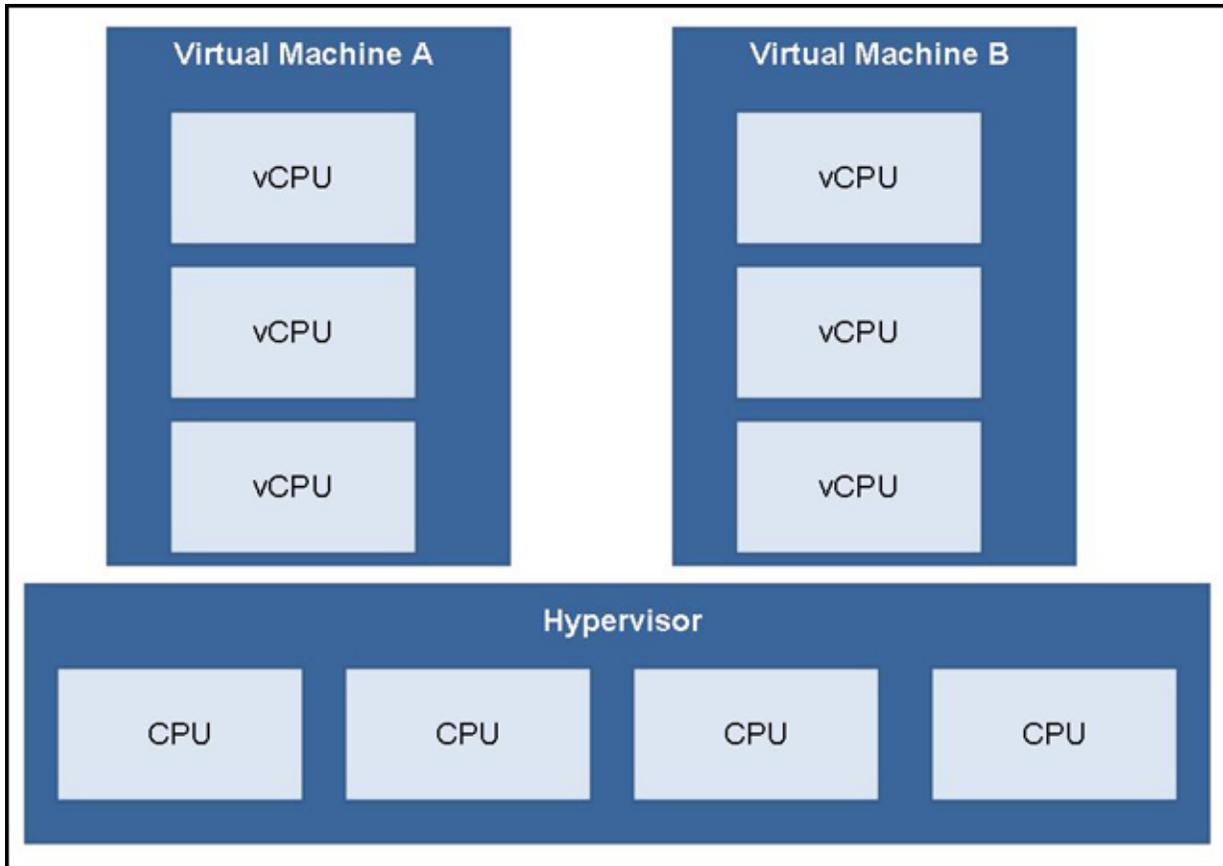
Figure 4: Overcommit scenario using vCPU

Integration

IBM PowerKVM hosts can be managed just like another KVM host. Kimchi is included in the IBM PowerKVM to provide a user-friendly interface for platform management in a single server. For cloud management, you can use IBM PowerVC or IBM Cloud Manager with OpenStack. The following list includes details about this integration:

● Kimchi is an open source project for virtualization management within a single server. IBM PowerVC and IBM Cloud Manager with OpenStack are advanced management solutions that are created and maintained by IBM and built on OpenStack.

● OpenStack is a cloud operating system that controls large pools of compute, storage, and networking resources throughout a data center. OpenStack Compute (Nova component) has an abstraction layer for compute drivers to support different hypervisors, including QEMU/KVM through the libvirt virtualization API. (Off the shelf OpenStack integration is available, as well.)

● IBM PowerVC is an advanced virtualization manager for creating and managing virtual machines on IBM Power Systems servers using the PowerKVM or IBM PowerVM® hypervisors. PowerVC simplifies the management of virtual resources in your Power Systems environment and is built on OpenStack technology to deliver Infrastructure as a Service (IaaS) within the cloud.

● IBM Cloud Manager with OpenStack for Power can be used to get started with private clouds and continue to scale with users and workloads. It is based on the OpenStack project, providing advanced resource management with a simplified cloud administration and full access to OpenStack APIs.

● IBM PowerKVM can run multiple guest operating systems. This capability enables a large number of workloads to run within guest VMs. This integration boosts application portability and ease of use.

- A PowerKVM host can be managed by the open source controller services maintained by the OpenStack community. The compute and controller services on OpenStack enable you to launch VM instances.

For integration-specific resources, see the following list:

- For more detailed information about how to install and configure PowerVC, see *IBM PowerVC Version 1.2 Introduction and Configuration*, SG24-8199.
- To learn more about which operating systems run on Endianness and easier application migration, see this blog on Linux flavors.

Supported platform

At the moment, only IBM PowerLinux™ Systems built on POWER8 processors support PowerKVM as the hypervisor:

- IBM Power System S812L (8247-21L)
- IBM Power System S822L (8247-22L)

The available version for the PowerKVM stack is IBM PowerKVM V2.1 (with 1 or 3 years of subscription).

Note the following considerations about PowerKVM in this first release:

- Power KVM does not support AIX or IBM i operating systems.
- PowerKVM cannot be managed by the Hardware Management Console (HMC).
- The SPICE graphical model is unsupported.
- PowerKVM supports a subset of the I/O adapters.
- Only one operating system is allowed to run on the host system. PowerKVM does not include multi-boot support.

IBM is always innovating and integrating products with systems. For current information about the supported platforms, operating systems, and prerequisites, see the following websites:

- PowerKVM
- IBM Power Systems

Ordering information

PowerKVM is available as a subscription for 1 or 3 years, and typically ordered with the Power scale-out server. When bundled with the hardware order, it comes pre-loaded and ready to use. As well, PowerKVM can be added after the initial order.

For complete ordering information, see the RFA document on PowerKVM.

Related information

- For the IBM Redbooks publication, see IBM PowerKVM Configuration and Use

- For information about the IBM Linux Scale-out systems, see IBM Power Systems S812L and S822L Technical Overview and Introduction, REDP-5908

- For more information about IBM Power Systems

- For announcements about IBM Power Systems and IBM PowerKVM

- For more information about IBM PowerVC Version 1.2.1, Introduction and Configuration

- For a blog about IBM PowerVC Version 1.2.1 enhancements

- To search the IBM Information Center about IBM PowerKVM

- To search the IBM Information Center about IBM PowerVC and server virtualization

- For more information about IBM Cloud Manager with OpenStack and to Discover OpenStack: Architectures, Functions, and Interactions

- To learn more about how IBM Tackles Big Data Challenges with Open Server Innovation model

- For the IBM Offering Information page (to search on announcement letters, sales manuals, or both), see http://www.ibm.com/common/ssi/index.wss?request_locale=en

  On this page, enter IBM PowerKVM, select the information type, and then click **Search**. On the next page, narrow your search results by geography and language.

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