

KVM and open virtualization: Who's using it, how and why?

*Build a strong virtualization platform using scalable, secure,
cost-effective open technology*



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Introduction

By now, most organizations are familiar with the advantages of virtualization and cloud computing to the IT infrastructure—from the added agility, performance and scalability, to the ease of management, to the extreme savings in time, costs and even space. But not every organization has taken the next step and begun implementing its own virtualization solution. With several solid options on the market, how do you know which is best for your specific infrastructure and applications? Are all virtualization technologies created more or less equal, or are some stronger in the areas that matter most to your organization? What about open-source, compared with commercial, proprietary solutions? These are all very valid questions, as the choice you make will greatly affect the future flexibility and cost effectiveness of your infrastructure.

Alongside current—and more well-known—virtualization solutions is open-source *Kernel-based Virtual Machine (KVM)*. In fact, KVM hypervisor technology has advanced to the point where it now competes directly with leading commercial virtualization solutions. While you may have heard of KVM, perhaps you aren't familiar with how many organizations are using it, how it is being used and what type of success users are achieving. In the same way Linux has replaced many proprietary operating systems, KVM also has risen from the ranks to become a top contender in enterprise-class virtualization. The reason is clear: KVM provides organizations with a scalable, cost-effective alternative to other x86 hypervisors and enables a lower-cost, secure and open cloud.

As a recognized industry leader with more than 40 years of experience virtualizing its own servers, IBM has now focused its longstanding commitment to enterprise virtualization and open-source technology on open virtualization with KVM. In fact, in 2011 IBM and other key industry leaders formed the Open Virtualization Alliance (OVA) to accelerate the adoption of KVM and foster an ecosystem of third-party solutions based on the strength of this technology.

This white paper will discuss the benefits of using KVM technology to virtualize the infrastructure, and will also describe use cases in which IBM clients have found success with KVM. These examples will clarify why IBM and other industry leaders have chosen to support open-source KVM alongside proprietary virtualization solutions and why your organization should consider using KVM to virtualize your infrastructure.

IBM strongly believes that open source can enable both flexibility and cost savings for our clients, which is why we are supporting KVM for enterprise virtualization.

What is KVM?

Providing enterprise-class performance and scalability, KVM is an open-source hypervisor that can efficiently and effectively run both Microsoft Windows and Linux workloads in virtual machines. KVM enables kernel page sharing, transparent large page support and a new user-mode device driver infrastructure, in addition to other benefits that include:

- **No vendor lock-in**—KVM is developed by an open-source community, helping users avoid being locked in with specific vendors to proprietary virtualization technologies.
- **Lower total cost of ownership (TCO)**—Because it is open source, there are no up-front license costs, so KVM can save on software costs in addition to savings through consolidating workloads. In fact, KVM has been shown to be 39 percent less expensive over a three-year TCO, compared to competitors.¹

- **Enterprise-class performance**—In recent SPECvirt benchmarks, KVM demonstrated the highest performance and the highest number of virtual machines running on a single host.² In addition, IBM and Red Hat recently published the first virtualized TPC Benchmark C (TPC-C) online transaction processing benchmark, delivering as much as 88 percent of “bare-metal” performance for demanding business-critical workloads.
- **Hardened security**—Organizations can use KVM to create secure, open virtualization IT environments as well as both public and private clouds. KVM meets government security standards through Common Criteria Certification at Evaluation Assurance Level 4+ (EAL4+). It also provides advanced security protection between virtual machines through the Mandatory Access Control security in SELinux.
- **Ecosystem of software and hardware support**—One reason why KVM is becoming well-known as an open, cost-effective and enterprise-ready virtualization solution is that it is surrounded by extensive ecosystem support that includes hardware, independent software vendors (ISVs) and virtualization management tools—including IBM® SmartCloud® Provisioning, IBM Systems Director VMControl™ and Red Hat Enterprise Virtualization. And due to its integration with Linux, KVM shares the entire Linux device ecosystem and can access any device supported by the OS. Because Linux is a general-purpose OS compatible with a wide variety of devices and systems, KVM can run on almost every current x86 hardware platform.

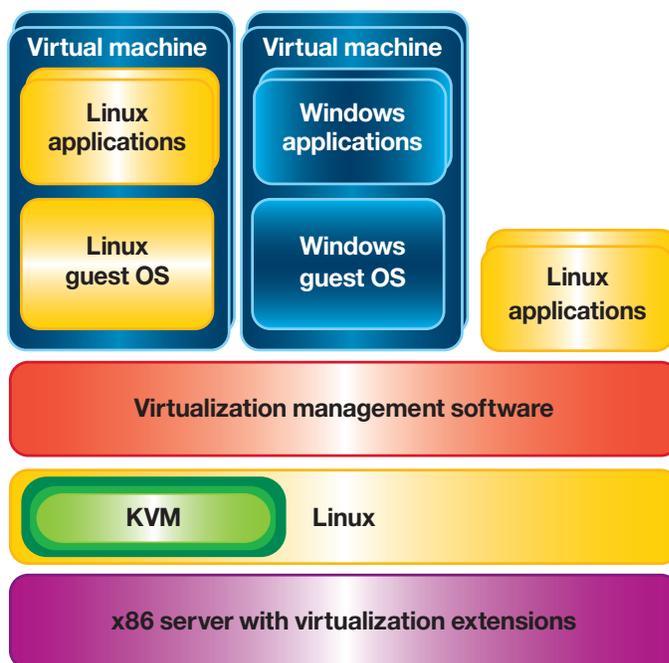
How is KVM being used?

Many organizations have already deployed KVM in their virtualization infrastructures with IBM hardware and/or software. Following are some of the most common KVM use cases, including examples from IBM clients.

Using KVM to consolidate and virtualize Linux servers

Since analysts have projected that Linux server virtualized deployments will grow more than 12 percent by 2016,³ it makes sense that KVM is pre-integrated and pre-tested with Linux—and even packaged with several versions, including Red Hat Enterprise Linux, SUSE Linux Enterprise Server and Canonical Ubuntu Long-Term Support (LTS). This positions KVM as the obvious choice for organizations looking to consolidate Linux workloads and virtualize Linux servers. Virtualization also enables users to build a flexible infrastructure for the future.

KVM for Linux servers



KVM turns the Linux kernel into a bare-metal hypervisor, creating virtual machines as Linux processes that can then run either Linux or Windows as a guest operating system. Within Linux, the KVM module implements essential capabilities that enable virtual machines to function, using established and proven Linux OS functions for other tasks, including managing memory, scheduling processes, handling drivers and performing input/output. Virtualization management for Linux servers can be provided through IBM Systems Director VMControl, Red Hat Enterprise Virtualization or one of many ISV virtualization management tools.

Organizations can trust KVM to virtualize even the most business-critical applications, as it offers the high performance, scalability, flexibility and high availability they require. IBM clients have been successfully using KVM virtualization technology to handle business-critical workloads such as enterprise resource management, customer resource management and supply chain management; transactional databases; and business analytics. IBM offers supporting hardware and software to further secure crucial applications, including IBM PureSystems™, the IBM WebSphere® portfolio and the IBM Information Management portfolio.

Here is a recent success story in which KVM is used to virtualize Linux servers. Bonhams, a London-based auction house, needed to replace its aging servers with a reliable, scalable, cost-effective platform that enabled remote management of its global IT assets—while also supporting full disaster recovery. To add efficiency and stability to its operations, Bonhams consolidated 34 servers down to eight using IBM System x® 3650 class servers running Red Hat Enterprise Virtualization 3.1 with KVM. They also added an IBM System Storage® DS3524 disk system to boost their disaster-recovery capabilities. This KVM-based IBM solution helped the auction house reduce its number of servers by 75 percent, save 50 percent on software licensing costs and provide a stable platform for global business continuity.

Using KVM to implement cloud computing

Virtualization is the first step in the evolution to the cloud, and open virtualization is a first step toward the *open cloud*—which analysts believe is key for 72 percent of cloud users.⁴ With cloud service providers seeking virtualization solutions that enable them to build cost-effective, reliable and secure cloud platforms with maximum virtual machine density, KVM technology is an ideal solution.

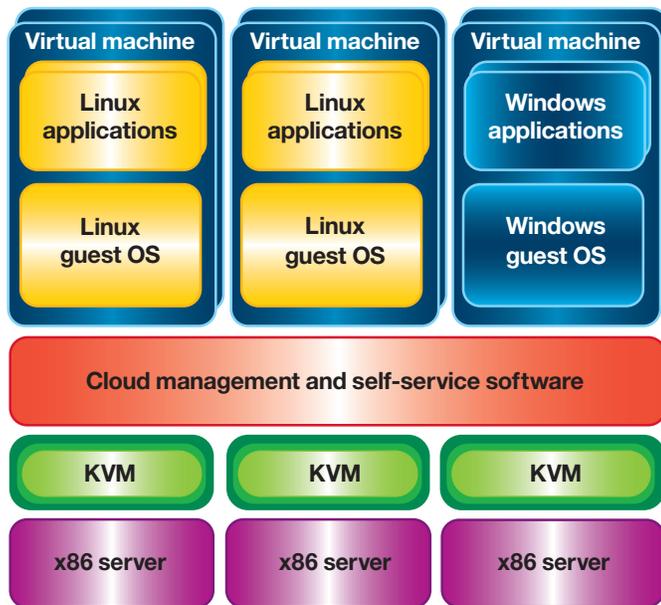
Private, public and hybrid clouds all share three key characteristics: virtualization, standardization and automation. KVM and its ecosystem support them all, with:

- **Scalability and performance**—Allows higher densities of virtual machines per physical server
- **Security capabilities**—Delivers isolation between multiple tenants in the cloud leveraging Mandatory Access Control
- **Lower cost**—Enables cloud providers to offer their services at a more attractive price point
- **Flexibility**—Enables support for different management interfaces, to more easily integrate with data center automation

Cloud management and self-service software can be provided through IBM SmartCloud Provisioning, IBM SmartCloud Orchestrator or IBM SmartCloud Entry, along with a range of ISV cloud management tools. In addition, the industry is coalescing around the OpenStack open-source project as a framework for cloud computing.

One IBM client who has experienced great success using KVM to implement cloud computing is Dutch Cloud BV, a cloud service provider in the Netherlands. The company offers a range of cloud-based services from fully managed Infrastructure as a Service (IaaS) to disaster-recovery solutions. In building its offering, Dutch Cloud needed to find a balance between standardizing its platform to enable easy scalability and offering specific features best suited to different types of workloads. It found this

KVM for cloud computing



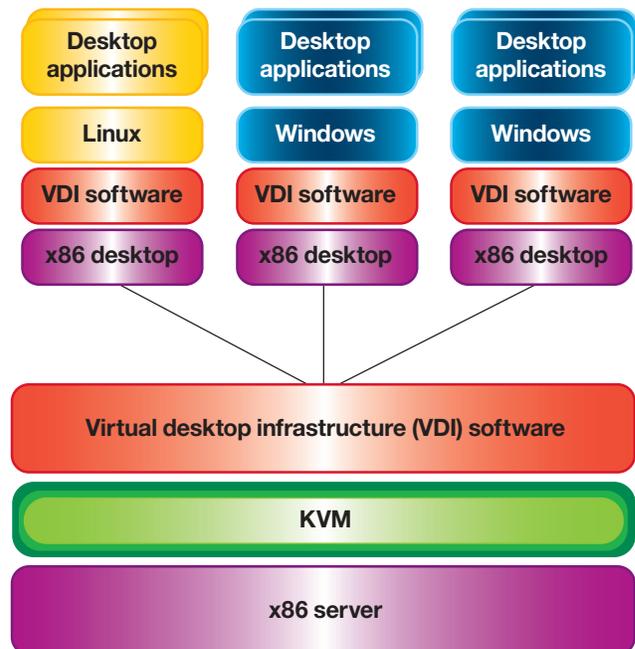
balance with a fully virtualized infrastructure based on System x3650 class servers connected to multiple IBM Storwize® V7000 disk systems. A mixture of KVM and VMware virtualization technologies enables their clients to run multiple virtual machines with either Linux or Windows images. Most impressive is that this solution has supported a sixfold increase in revenue while operational costs remain flat; reduced the time required to provision 200 virtual machines by more than 90 percent; and decreased the company's administrative workload by 70 percent.

Using KVM with virtual desktop infrastructures

Since virtual desktop infrastructures (VDIs) provision virtual desktops from shared servers, most organizations interested in implementing VDIs are seeking high reliability and

performance, as well as low-cost—yet highly effective—virtual desktop management software. For these hosted environments, KVM enables desktop virtualization by combining server virtualization capabilities with VDI software.

KVM for virtual desktops



Virtual desktop infrastructure software can include IBM Virtual Desktop for Smart Business or Red Hat Enterprise Virtualization – Desktop, along with a range of ISV VDI solutions.

One company that has realized significant benefits using KVM in a VDI environment is Vissensa, a managed service provider in England. The company was able to create a high-availability environment where its clients can cost-effectively test, quality

assure and benchmark their applications on a Linux platform. Vissensa provisioned these flexible virtual desktops using VDI technology built on a Linux base with KVM as the hypervisor, as well as IBM BladeCenter® HS22, System x3650 class servers, Storwize V7000 disk system and IBM Tivoli® Storage Manager. This solution has helped them:

- Reduce costs by 75 percent
- Increase flexibility in provisioning new users, new applications and new hardware
- Centralize desktop and “bring-your-own-device” (BYOD) management
- Optimize storage allocation and usage with shared resources and processes

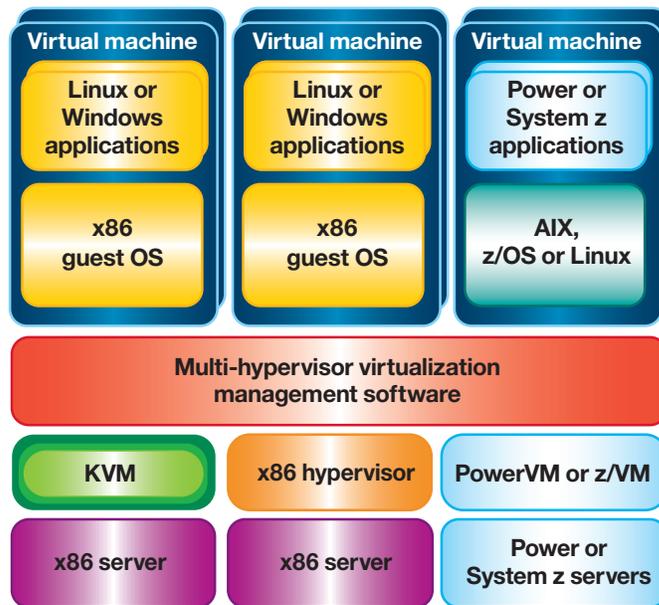
“Virtual desktop infrastructure and device mobilization has fuelled the need for organizations to rethink how to deliver corporate information to their workforces. Using virtualization with KVM on System x servers and the Storwize V7000, Vissensa is able to provision mobile corporate applications to a world of varied devices, delivering a “single pane of glass” to the corporate workforce and ensuring their connection to common desktop services and corporate applications.”

—Steve Groom, CEO, Vissensa Ltd.

Using KVM as part of multi-hypervisor environments

Enterprise-quality KVM technology is well-suited for organizations that may be only partially virtualized, but have plans to add new virtualized servers or to virtualize their remaining servers. KVM provides low-cost server consolidation and resource sharing, even in environments containing multiple hypervisors. To further increase efficiency in these environments, IBM offers multi-hypervisor management solutions such as IBM Systems Director VMControl and IBM SmartCloud Provisioning.

KVM for multi-hypervisor environments



An IBM client successfully using KVM in this type of environment is SLTN, an information and communications technology managed service provider and system integrator in the Netherlands. This company implemented KVM and VMware virtualization technology in its new data center comprising IBM BladeCenter, System x3550 class servers and IBM XIV® Storage System technologies. This solution enables SLTN's clients to run multiple virtual machines with either Linux or Windows images, depending on their needs. In addition, IBM SmartCloud Provisioning enables SLTN to rapidly provision virtual machines with minimal administrative effort. Now able to deliver new cloud services more quickly and cost-effectively, SLTN expects to realize a 24-month return on its investment.

Conclusion

As a founding member of OVA, IBM continues to invest significantly in KVM development as part of the open source community. The IBM contributions to KVM are consistent with our decade-plus Linux commitment and fulfill our broad strategy of providing customer choice, bringing open technology

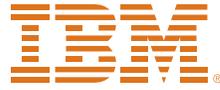
to vital segments of the technology market, and ensuring that all IBM platforms, middleware and services have the best and most timely hypervisor technology available.

Our customer successes speak for themselves: open-source KVM provides an enterprise-grade, cost-effective virtualization solution for many common use cases and should be seriously considered when choosing a virtualization solution for your IT environment. In fact, IBM supports the technology so completely that we use KVM for our own leading public and private clouds.

For more information

To learn more about KVM and IBM products that support this technology, contact your IBM representative or IBM Business Partner, or visit ibm.com/systems/kvm

Additionally, IBM Global Financing can help you acquire the IT solutions that your business needs in the most cost-effective and strategic way possible. We'll partner with credit-qualified clients to customize an IT financing solution to suit your business goals, enable effective cash management, and improve your total cost of ownership. IBM Global Financing is your smartest choice to fund critical IT investments and propel your business forward. For more information, visit: ibm.com/financing



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¹ Red Hat Enterprise Virtualization for Servers: Competitive pricing guide, 2010.

² Standard Performance Evaluation Corporation, “SpecVirt_sc2010 results.” http://www.spec.org/virt_sc2010/results/specvirt_sc2010_perf.html

³ Al Gillen and Iris Feng, “Worldwide Linux Client and Server Operating Environments 2012 – 2016 Forecast and 2011 Vendor Shares: Digging in for the Long Term,” IDC, July 2012. <http://www.idc.com/getdoc.jsp?containerId=236064#.UTUAgTBcjCA>

⁴ IDC. “2012 Cloud System Software Survey.”