



# KVM

## *A Hypervisor Whose Time Has Come*

### *Introduction*



The Holy Grail of IT, especially SMB IT, is to have a datacenter that's simple and easy to use. Preferably as easy as an iPhone or Android phone with enterprise software that is as easy to access and run as Angry Birds is from an app store. Thanks to KVM and Scale Computing, that vision is possible. And, well on its way.

In August 2012, Scale Computing launched the first and only hyper-converged infrastructure based on KVM (Kernel-based Virtual Machine) into the marketplace. Called HC<sup>3</sup>, the multi-award winning solution integrates servers, storage and networking into a clustered appliance with a single operating system called ICOS™ (Intelligent Clustered Operating System).

HC<sup>3</sup> delivers a highly available, easy-to-use and extremely affordable "datacenter cluster" to SMB customers who have not yet virtualized their environments. It's a perfect solution for the times. According to CRN Magazine, 70 percent of SMBs have not yet virtualized due to the complex labyrinth of technologies that need to be woven together into a fully functional, integrated and highly available infrastructure. KVM plays a crucial part in bringing hyperconvergence to this untapped market and untangling this complexity.

Since any discussion on KVM could take many more pages than can be covered here, this paper will narrowly focus on the benefits of KVM over other hypervisors and how HC<sup>3</sup> ties it all together, presenting the most advanced commercialized application of KVM on the market today for SMB IT administrators.

### *KVM*



KVM is an open source Linux module designed to be installed within the Linux kernel. KVM was introduced into the open source community in 2007 as a response to commercial virtualization solutions from Citrix, VMware and others. Unlike their commercial counterparts, KVM is not a product easily manipulated by IT generalists. That said, it is widely used along with its commercial counterparts for specific applications in small and large enterprises.

Despite its prominence, KVM had yet to be integrated into a full-functioning commercial-grade, hyperconverged product ripe for mass adoption, until Scale Computing. There are many reasons Scale chose KVM. Those reasons can be segmented into three primary categories: technical, business and strategic.

#### Technical Reasons for KVM

1. Native Support for any Guest OS. As a bare metal, open source hypervisor KVM uses hardware-based virtualization (which eliminates the need to modify guest operating systems) and can support almost any guest OS within Linux.



2. Efficient Code and Better Performance. Unlike VMware, the industry's pervasively looming giant, KVM is not a mass of code (overhead) that creates a fully virtualized environment to the detriment of both guest OS compatibility and performance. Instead, it is a kernel module added to Linux. By adding this module to the kernel itself, every virtual machine becomes a standard Linux process that can operate at near bare metal speeds as para-virtualized instance.

3. Open Source and Flexible: Closed source solutions force manufacturers to write code to the specifications of the solution provider and pay royalties for any use of proprietary code. Specifications can be another word for limitations. With VMware, for instance, a third party can't integrate proprietary storage layers within the code. The only way to "converge" storage and servers with VMware is to virtualize a storage appliance as if it were a Windows or other guest OS and use standard storage protocols for I/O between virtual servers and virtual storage appliances.

SAN and NAS systems, however, need performance. Abstracting them too far from the hardware they are designed to exploit introduces latencies not helpful to IT administration. This faux-convergence is called a VSA (virtual storage appliance) and has such poor performance that most VSA providers turn into high-cost SSDs to overcome latency encumbrances. SSDs naturally drive cost far out of the range of most SMB budgets.

#### Consumer Business Benefit

VMware was first to market with its virtualization technology, changing the IT world forever. One thing it can't easily change however, is its business model. The company depends on license-based revenue which gave birth to a new colloquialism: the "VMware Tax." Citrix (Zen) and Microsoft (Hyper-V) have a broader portfolio of products that extend beyond virtualization and are tied less financially to virtualization revenue than their EMC-owned counterpart.

With the hypervisor becoming a commodity, VMware is forced into a marketing message that highlights management functionality, not just virtualization. Those management features are licensed based on the memory used. For the SMB, it means paying over and over again for virtual management features that weren't needed in their physical architecture.

Because KVM is open source, there are no licensing costs. Manufacturers like Scale Computing can create complete virtual solutions without fretting about the overhead of a complex business model or passing that cost onto consumers.

#### Strategic for the Customer and Scale Computing

Both commercial developers and consumers need to worry about the EMC trap. The company owns VMware and is well-known in the industry for its aggressive business moves. VMware storage partners who are developing converged solutions based on VMware are tying their company's future to their competition. It's quite probable that EMC could create a hyperconverged version of VMware that only runs on EMC storage gear. All other vendors could be locked out, severely limiting choices for vendors, resellers and especially users.



KVM offers many more technical and business benefits than this paper has covered, but the ones discussed lay the foundation for how Scale's HC<sup>3</sup> delivers real benefits to SMB IT managers thanks, in part, to its KVM roots.



HC<sup>3</sup> Delivers:

1. High availability. Using the most advanced file system on the market today, ICOS which is based on the foundations of IBM's GPFS combined with KVM, HC<sup>3</sup> delivers a highly available architecture that stripes and mirrors data across each node in the cluster. If a drive or node fails, the system continues to run.

In a physical server environment, one application is tied to one physical server and the loss of that single server results in application downtime and complicated recovery processes. Consolidating many physical servers into a few virtual hosts can save some money but also consolidates the risk of downtime, putting "all your eggs in one basket." To address this risk, virtualization platforms offer high availability failover features that require multiple virtualization hosts to share a common external storage pool, which must also be highly available.

The architecture of HC<sup>3</sup> ensures disk and compute hardware failures are stress-free events. Virtual machines and their data are redundantly mirrored and striped across all nodes in the cluster ensuring that, in the event of a disk failure, applications running in VMs remain available with full access to their data. In the event an entire HC<sup>3</sup> node is unavailable, all the VMs running on that node are quickly and automatically restarted on another HC<sup>3</sup> node in the cluster, maximizing application availability.

2. Virtual Machine Migration. With some commercial hypervisor providers, this feature is an add-on. Because Scale uses KVM, the company can build this feature into HC<sup>3</sup> for no additional cost. VMs can be live migrated to any server in the cluster based on the memory allocation and performance requirements of each VM.

3. Direct I/O Without Protocols. As mentioned previously, VSAs encumbered by VMware's architecture must use a translation stack to communicate among virtual servers and virtual storage appliances. This isn't true hyperconvergence. With HC<sup>3</sup>, a single pool of compute and storage resources is created, allowing direct I/O – not protocol – communication between a pool of compute resources and a pool of storage resources that actually exist on the same hardware. This reduces latency and allows Scale to use less expensive commodity hard drives rather than expensive SSDs.

4. Single Vendor / Seamless Integration. With Scale Computing, all of your server, storage and virtualization is integrated within one simple, easy-to-use operating system called ICOS. There's only one "throat to choke" if something goes wrong – ours.

Each HC<sup>3</sup> cluster provides an expandable pool of shared compute resources to run applications – integrated and balanced CPU, memory, network access and storage that are easily expanded as you grow. There is no need to stitch together disparate storage systems, servers, and hypervisor software from multiple vendors. The days of multiple management consoles and configuring connectivity, network and storage protocols between systems are over.

5. Ease of Use. Converged infrastructure does not have to mean architectural diagrams, reference documents, new layers of management software and professional services. Scale's HC<sup>3</sup> delivers an integrated IT environment that is simple to understand, simple to deploy and simple to manage. Installation is as simple as connecting each node to power, a LAN, and creating a private cluster inter-node network. Customers can power the nodes, configure IP addresses to form a cluster, and then create their first virtual machine using the shared storage and compute resources of the HC<sup>3</sup> cluster.



6. Low Total Cost of Ownership. Scale's HC<sup>3</sup> is designed to provide substantial cost savings over separately acquiring and managing servers, storage and virtualization software. Scale's HC<sup>3</sup> reduces the additional cabling, switching, and power for separate virtualization and storage systems connected through a SAN. The costs for virtualization software, servers and storage servers are consolidated and the cost of a SAN is avoided. Furthermore, the cost to increase the size and performance of the virtual environment is granular and affordable with Scale's use of scale-out architecture. Bottom line, this represents consumer-class simplicity with enterprise-level features. We estimate this will reduce virtual workload management time and effort by 75 percent versus traditional virtualization.

### *The Future of KVM: Evolution of the Datacenter*



Scale Computing is committed to KVM and developing purpose-built management and orchestration layer technologies that continue to lower the cost of crucial IT infrastructure for the SMB.

Over the next five years, IT managers will benefit from vendors who will choose KVM to bring simple, easy-to-use and affordable virtualization solutions to market. These solutions won't require license fees for basic functionality and will be as easy to use as an iPhone, facilitating access to enterprise software that's as within reach as downloading Angry Birds from an app store. Best of all, IT managers won't have to wait – Scale Computing's HC<sup>3</sup> solution is available now and it's being used to help midmarket IT managers today.

### *More Information*



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