



- **Cut desktop provisioning times by up to 75%**
- **Improve Hyper-V storage performance by 3x – 9x**
- **Reduce storage capacity consumption by up to 90%**
- **Double the desktop density your existing storage can support**
- **Enable easy “self-service” with granular storage management at the VHD level**

Unexpectedly high storage costs delay or derail many virtual desktop infrastructure (VDI) projects. Because of I/O patterns unique to VDI environments, storage is sorely underutilized, driving the need for 30% - 50% more storage to meet desktop performance requirements. Since storage is by far the biggest cost component to the overall cost/virtual desktop, existing budgets can be quickly over-run. Server hypervisor technology solved similar utilization issues with physical servers to improve flexibility and lower costs, but so far a “storage hypervisor” that brings these same benefits to storage has been missing.

#### STORAGE ISSUES IN VDI ENVIRONMENTS

If you’ve worked with virtual servers before, you have probably already experienced the very random I/O patterns that slow storage performance and drive up storage costs. Desktop workloads tend to be even more write-intensive than most server workloads, and because so many more VMs are hosted on each Hyper-V R2 Host, the I/O patterns are significantly more random. As bad as legacy storage performs in virtual server environments, it’s even worse in VDI environments.

On top of that, due to phenomena like boot, login, application, and logout storms, the difference between average and peak I/O requirements in VDI is much greater. Administrators are often forced to over-provision storage or invest in expensive solid state disk (SSD) to address these issues.

Provisioning speed greatly impacts administrative time requirements. After initial deployment, most VDI environments need to be refreshed between 8 and 16 times per year due to upgrades, patches, and new application rollouts. Administrators are often forced to trade off storage performance against provisioning speeds and storage capacity consumption when choosing Microsoft virtual hard disk (VHD) types for VDI deployments.

#### VIRSTO: CHANGING THE ECONOMICS OF VDI DEPLOYMENT

Virsto is a software-based storage hypervisor that installs in the parent partition of each Hyper-V Host and significantly improves the utilization of your *existing* storage to achieve phenomenal gains in the areas of provisioning speed, performance, capacity consumption and management. The bottom line with Virsto is it will cut the storage costs to meet your performance requirements by at least half, saving on storage infrastructure costs and administrative overhead.

Designed to work with any heterogeneous, block-based storage, Virsto can almost instantly provision storage that outperforms Microsoft fixed disks but is also thin provisioned and cluster-aware to support live migration and failover. This allows

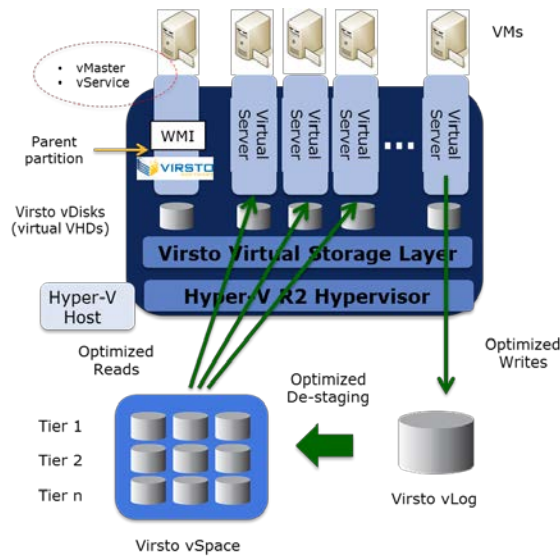
*“Virsto helped us unlock the true value of Hyper-V, and we’ve put that to work to meet our business needs.*

*Eddie Diaz*

*Senior Systems Administrator*

*MAKO Surgical Corporation*





Virsto works transparently in Hyper-V environments while providing significant provisioning, performance and management advantages.

enterprises to enable HA for executive desktops, set up automatic recovery from host failures, and pre-emptively migrate desktops to another host to minimize maintenance impacts.

Virsto enhances Hyper-V to cut storage provisioning times by up to 75%, meet desktop performance requirements with up to 50% less hardware, reduce storage capacity consumption by up to 90%, and allow block-based storage to be managed at the VHD instead of the storage LUN level. Virsto fundamentally changes how Hyper-V handles storage I/O to increase its utilization, improving flexibility and reducing storage costs. With Virsto installed, most Hyper-V customers can at least double the virtual desktop density their storage configuration can support without having to purchase any additional storage.

When installed, Virsto creates a virtual storage layer that presents Virsto vDisks, storage objects that look exactly like a Microsoft fixed VHD. Managed through a Microsoft Management Console (MMC) snap-in, Virsto preserves Microsoft's familiar management semantics and can be used with all the major Microsoft Hyper-V products and tools, including Windows Server 2008 R2, Windows VSS, Windows Server Failover Clusters, PowerShell, WMI and other relevant System Center technology including Hyper-V Manager, Virtual Machine Manager, Self Service Portal, Data Protection Manager, Operations Manager, and Orchestrator. In use, Virsto is completely transparent to Hyper-V and any applications and supports any guest operating systems and devices supported by Hyper-V R2.

## VIRSTO ARCHITECTURE

Virsto employs a logging architecture, proven through decades

of use in enterprise databases, that is implemented at the storage layer to improve the utilization of the disks. The Virsto vLog effectively sequentializes all writes, delivering write acknowledgements to the desktops as soon as the writes hit the log. All writes hit the vLog all the time so the performance that the desktops perceive is the sequential write performance of whatever device is used in the log. Writes are then asynchronously de-staged to a shared primary storage area called the Virsto vSpace. Virsto optimizes how data is written to vSpace, avoiding fragmentation and maximizing read performance. Note that this architecture splits writes and reads across separate dedicated spindles to further improve performance.

All Virsto vDisks, which reside in vSpace, are thin provisioned all the time. From the point of view of the virtual desktops, their write performance is entirely determined by the performance of the logs. The vSpace supports up to 4 storage tiers, allowing the use of any kind of block-based storage (spinning disk or SSD) in the tiers. This enables the creation of very high performance tiers where "golden masters" may be placed and lower cost tiers where desktop private data may be placed.

Each Hyper-V Host gets a dedicated vLog, which resides in the same external, shared storage pool that the vSpace does to ensure recoverability in the event of failures. The logs absorb very high peak I/O loads without performance degradation, smoothing out the workload while providing very predictable storage performance without requiring storage overprovisioning. Virsto provides the option to use either spinning disk or SSD in the logs, and will improve the performance of either.

Virsto's ability to almost instantly provision high performance storage cuts desktop provisioning times by up to 75%, saving significantly on administrative time. With Virsto installed, Hyper-V can support tens of thousands of clones without any performance degradation, increasing its scalability.

Because it allows storage to be managed at the VHD level, Virsto enables reliable "self-service" provisioning and deprovisioning for end users and Hyper-V administrators that will not require storage administrators to get involved. Virsto transparently manages all storage allocation and reclamation.

## INCREASING THE UTILIZATION OF EXISTING STORAGE

Virsto virtualizes storage resources to increase utilization, allowing enterprises to get the maximum in provisioning speed, performance, capacity, and management from their existing storage. These efficiency improvements benefit both SSD and spinning disk, allowing storage of whatever type to be used most efficiently to lower overall VDI costs.

If you'd like to get more out of your Hyper-V environment, let's talk.