As virtualization becomes the new normal, every aspect of IT is adapting. However, general-purpose shared storage, designed 20 ago, is poorly adapted to flash and virtualization, impacting costs and inhibiting business agility. Tintrí’s VM-aware storage operating environment—with intelligent flash and VMs and virtual disk management entities—can overcome cost, performance and complexity challenges of traditional shared-storage systems in virtual environments.

Tintrí OS uses VMs and vDisks as primary management abstractions; there are no LUNs, volumes or other storage objects to manage. It’s easy for both VM and storage admins to get immediate insight into the virtual environment.

**Instantly Diagnose VM Performance Issues**

Performance bottleneck troubleshooting is a tedious management task. It is difficult to pinpoint where in the infrastructure—host, network, storage or something else—the problem lies. With Tintrí OS, administrators have instant visibility, from the guest OS layer to the storage layer. They can see per-VM or per-vDisk latency in real-time at any infrastructure layer, identify the source of performance issues and take immediate action. Tintrí OS also maintains historical data to give a graphical view of performance trends.

**Performance Isolation and QoS for VMs**

Since Tintrí OS uses VM abstractions internally, the Tintrí file system monitors and controls IO for each vDisk, to provide performance isolation and QoS at VM and vDisk level. Tintrí file system maps each IO request—read, write and metadata operation—directly to a virtual disk. Tintrí OS does automatic VM alignment and provides performance gains of from 10 percent to 30 percent.

**Highlights**

**Radically simplified VM-level management**
- Diagnoses VM performance issues instantly with bottleneck visualization.
- Performance isolation and QoS at the VM and vDisk level.
- Simplified management with advanced per-VM snapshots and clones.
- Plug-and-play configuration and support.

**Intelligent performance and scalability**
- 99 percent of IO from flash for hundreds of VMs on a single appliance.
- Efficient flash use with inline deduplication and compression, and working-set analysis.
- Scalable storage for thousands of VMs.

**Simple, flexible and high-performance per-VM replication**
- Protect and restore individual VMs with RPOs as low as 15 minutes.
- Dedupe and compression reduces WAN utilization by up to 95 percent.
- Efficiently create remote clones on demand.

**Unparalleled data integrity**
- Continuous operation even with two failed drives.
- Real-time correction and continuous verification for data integrity.

The Tintrí OS is the industry’s first and only hypervisor agnostic VM-aware storage OS. It was purpose-built for flash and virtualization. It provides performance isolation for each VM’s working set by prioritizing the active data, and does all monitoring and management at the VM and vDisk level.
Advanced Per-VM Snapshots and Clones
Tintri OS provides per-VM data protection with space-efficient snapshots with no performance impact. Default snapshot schedules protect every VM automatically; custom schedules allow users to meet specific data protection needs. Tintri OS uses space-efficient clones at VM level so clones are immediately visible to the hypervisor management console. Advanced cloning can create hundreds of clones to support VDI, instant provisioning and test and development environments.

Plug-and-Play Configuration and Support
VMstore appliances running Tintri OS can be set up in minutes. Tintri OS includes non-intrusive data collection capabilities for automated and user-initiated notification of complete system status to Tintri support, enabling proactive support and service without administrator intervention, simplifying ongoing management.

Intelligent Performance and Scalability
Ninety-Nine Percent of IO from Flash
Tintri OS integrates flash into its architecture as a first-class storage medium rather than as bolt-on cache. Tintri’s unique working-set analysis intelligently assigns flash where it provides the most benefit — to VMs that need it. Technologies like inline deduplication, compression, garbage collection and hardware monitoring of flash drives maximize the performance and durability of MLC flash.

Scale to Thousands of VMs
Tintri OS scales to support thousands of VMs, leveraging inline data reduction and automatic data placement to deliver 99 percent of IO from flash. Expanding storage is simple. For example, each VMstore appliance appears as a single datastore in VMware vCenter, making it easy to scale and manage each node as part of a VMware Storage DRS cluster.

Simple, Flexible and High-Performance Per-VM Replication
Protect and Restore Individual VMs
Tintri OS’ VM-aware replication provides data protection at a VM level. Enabling replication for a VM is as simple as checking a box. Restoring from replicated copies takes just a few mouse clicks and is as easy as restoring from a local copy. Per-VM, customizable data protection policies allow RPOs as low as 15 minutes and simplifies planning, monitoring and data protection policy changes.

Dramatic WAN and Storage Efficiency
Tintri OS’ per-VM replication only replicates incremental block-level changes between VM snapshots after dedupe and compression, providing up to 95 percent reduction in WAN utilization. Multiple systems replicating to a single system provide additional WAN efficiency because of global deduplication.

Efficient Creation of Remote Clone VMs
Leveraging per-VM cloning and per-VM replication, Tintri OS enables administrators to create fully functional clone VMs on-demand on remote VMstore systems. Remote-clone VM provisioning is bandwidth efficient and reduces resource consumption on hosts. Ability to efficiently create VMs on any datastore increases VM agility and significantly simplifies managing large-scale virtual environments.

Unparalleled Data Integrity
Double Drive-Failure Protection and Real-Time Correction and Continuous Verification
RAID 6 on SSD and HDD provides continuous system operation even when two drives fail simultaneously, with minimal impact on application performance. Tintri OS RAID 6 software detects and self-heals errors in real-time on every read from disk. Ongoing background processes periodically verify data to ensure integrity.