



# The VMware Reference Architecture for Stateless Virtual Desktops with VMware View 4.5

REFERENCE ARCHITECTURE BRIEF

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## Overview

This document provides a high level summary of a reference architecture for stateless virtual desktops with VMware View™ 4.5. A stateless desktop architecture is ideally suited for “task worker” environments where the desktop image is consistent from user to user. By leveraging the tiered storage capability in VMware View 4.5, a per desktop hardware infrastructure cost of about \$500 (approximately \$250 datacenter and \$250 client) can be achieved. Because VMware View 4.5 allows specific placement of different types of disks to be re-directed, even to local storage, the I/O requirements on shared storage can be drastically reduced.

The VMware View 4.5 Reference Architecture for Stateless Virtual Desktops involves high performing solid-state drives within a physical host to offload the majority of desktop virtualization IOPS needed, while providing a stateless desktop virtualization design for planned and unplanned downtime.

This use of local solid-state drives (SSDs) is a completely new approach to desktop virtualization storage. SSDs are critical to achieving a low per-desktop cost because they remove the need for operating system and application storage requirements on the SAN. By decentralizing these storage needs, the desktop environment for CPU and memory resources scales linearly, with extremely low latency.

The simplicity of the architecture that is enabled by View 4.5’s tiered storage capability allows for a new era in the evolution of desktop virtualization cost modeling.

This brief provides an introduction to the full reference architecture document. The full reference architecture, to be published in the near future, will provide full descriptions of the test environment as well as performance metrics captured during test validation.

## Business Challenges

Increasingly, organizations are turning to virtual desktop technologies to address the operational and strategic issues related to traditional corporate desktop environments. VMware View 4.5 provides not only a virtual desktop environment that is secure, cost effective, and easy to deploy; but now can also provide comprehensive storage flexibility.

VMware View 4.5 modernizes the desktop experience to deliver private cloud capabilities to users for a consistent experience across the global enterprise. This Desktop-as-a-Service model is possible with unmatched scalability.

The challenges of traditional desktop administration, especially at scale, range from lost laptops with corporate data, security issues related to viruses or hackers, or simply ensuring that IT resources can maintain a service level agreement (SLA) appropriate for specific end-users. In addition to the challenges of operational management, IT must also consider the implication of broader system wide issues such as compliance, corporate governance, and business continuity strategies.

## VMware View 4.5

VMware View 4.5 is the leading desktop virtualization solution, built for delivering desktops as a managed service - from the platform to the protocol. This solution unlocks the desktop components, operating system, applications, and persona (user data and settings); enabling IT to manage these components independently

of each other for extreme business agility. VMware View 4.5 dynamically assembles these components on-demand, giving users a single, personalized, unified desktop with all applications and information immediately available.

VMware View 4.5 simplifies desktop management, reduces operational costs, and increases control for IT with flexible access and a superior experience for users, over any network or while offline.

New in VMware View 4.5:

- Full Microsoft Windows 7 support
- A new administrative console with support for role-based authentication, a dashboard for a quick view of the virtual desktop environment, and troubleshooting capabilities
- Application assignment for deploying ThinApp™ applications to VMware View desktop pools
- Tiered-storage support in View Composer for increased storage flexibility and reduced storage costs
- Local mode, which enables a virtual desktop to download locally onto physical PCs or laptops and execute locally; security policies remain intact and only changes are checked back into the datacenter
- Kiosk mode which enables multiple users to share a published virtual desktop from a kiosk

Typical VMware View 4.5 deployments consist of several common components, illustrated below, which represent a typical architecture. It includes VMware View components as well as other components commonly integrated with VMware View.

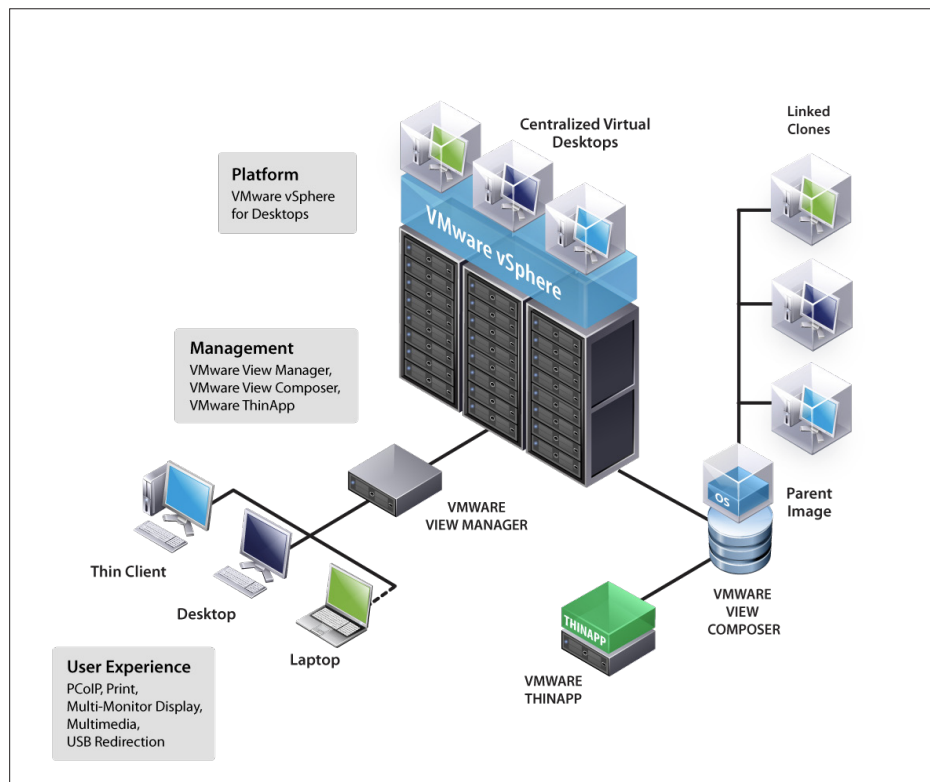


Figure 1: VMware View 4.5 Architecture

## Solution Overview

Because VMware View 4.5 enables the centralization of the virtual desktop environment with flexible storage architecture, an extremely low per-user cost can be achieved. This reference architecture leverages VMware vSphere™ 4.1, VMware View 4.5, compute and storage that optimizes performance, scalability, and drastically reduces storage costs.

This flexible storage architecture can be deployed in a highly modular and cost-effective fashion. A stateless desktop virtualization environment designed with VMware View 4.5 with tiered storage can scale from a few hosts, to hundreds of hosts, while providing the lowest cost per desktop in the industry. This design provides linear scalability across both compute and storage regardless of scale.

The high level compute infrastructure consists of:

- Intel Nehalem Quad-Core 2.93Ghz CPUs
- 96GB RAM
- Intel Solid State Drives
- 10Gbit Converged Networking
- Windows 7 32-bit Virtual Desktop Image

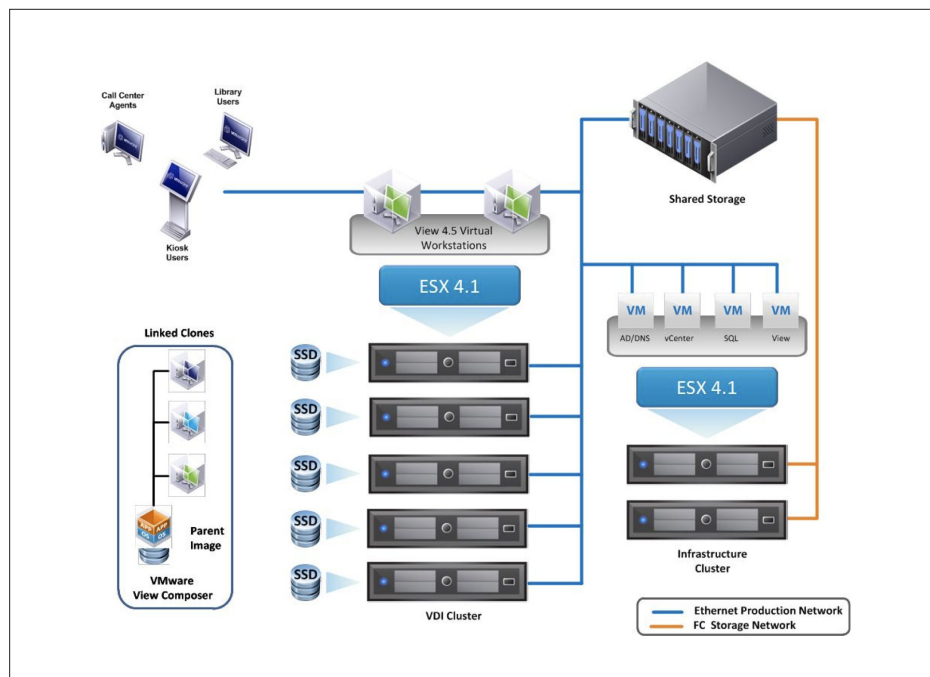
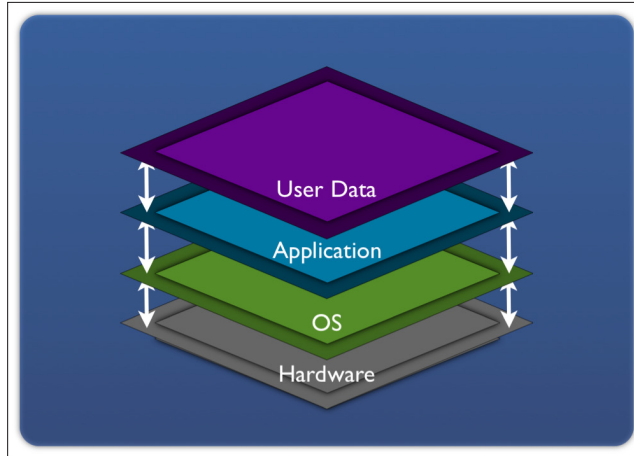


Figure 2: VMware View 4.5 Architecture for Stateless Virtual Desktops

### Design Flexibility

When building a highly scalable, flexible, and cost effective architecture, it is important to view each area of a virtual desktop separately. User data, applications, and desktop operating systems must be thought of as dynamic, flexible entities. Each entity must independent of another entity if the environment is to have the highest level of scalability and cost effectiveness.

User data, in particular, is extremely important to be separated for the cost effectiveness of virtualized desktops, as it is the lynchpin to allow non-persistent desktop pools as well as the ability to leverage this architecture.



## Storage Flexibility

VMware View 4.5 provides two critical storage capabilities for desktop virtualization:

- Reduction of storage capacity usage with VMware View Composer, which creates a master desktop image to deploy across the environment. The master image ensures consistency across the infrastructure and simplifies management with ease of patching, updates, and deployment. VMware View Composer allows storage reduction of 50 to 90 percent.
- The ability to direct various needs of the desktop image storage to different tiers of storage, including the usage of local host-based storage, for caching and I/O offload.

## Storage I/O Contention

The ability to reduce storage was first introduced with VMware View 3.0. Similarly, VMware View 4.5 reduces storage by leveraging a base disk, and using linked clone technology to direct individual desktops to that base image.

This reduction of storage creates intense density within shared storage, particularly during intensive I/O activities; including the boot up process, log-on process, anti-virus scans, or similar actions that are not optimized for a consolidated desktop environment.

There are multiple approaches that are being offered in the marketplace today to address this issue. The goal is to reduce the volume of I/O traffic generated by the desktop environment's operating system and applications. These approaches have yet to show any significant cost improvements over traditional SAN based desktop virtualization architectures.

This reference architecture, however, is unique as the design takes full advantage of key features enabled by VMware View 4.5 tiered storage capability. Instead of centralized caching, this architecture uses solid-state drives as a local per-host "cache" to offload desktop virtualization storage traffic. This provides an increased amount of local inexpensive IOPS capability, but still provides a stateless design for a non-persistent desktop pool. A stateless desktop enabled by a non-persistent image is ideally suited in a "task worker" environment.

## Storage I/O Flexibility

Because of the separation and flexibility of VMware View 4.5 tiered storage components, VMware View 4.5 now has the capability to profoundly affect the physical storage I/O usage that is associated with a typical virtual desktop. This is performed by directing specific types of desktop storage to different virtual disks, residing in various physical storage locations including local host drives.

Because of this flexibility of the VMware View 4.5 architecture, it can now utilize non-traditional means to reduce the IOPS requirements of a particular desktop.

Specifically, it is possible to provide a desktop using local storage as “cache” for the desktops, reducing the needs for SAN-based storage and IOPS within that shared storage architecture.

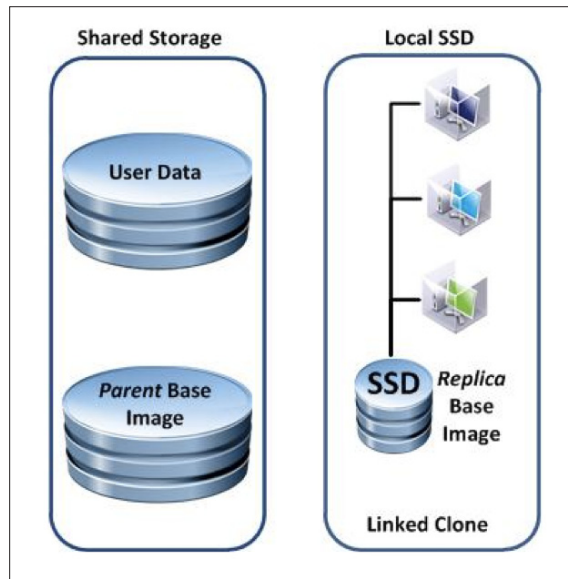


Figure 3: VMware View 4.5 Tiered Storage Components

## Validation Samples

Several examples of data from stateless tiered storage architecture testing of desktop virtualization with VMware View 4.5 are provided here. The validation includes several test iterations to ensure data consistency after the 30 minute ramp up period. The data for per-host CPU usage from a single server in a node, as well as a single host disk usage graph, are below.

A maximum of 70% CPU was allowed to ensure N + 1 capability in the cluster, detailed in figure 4.

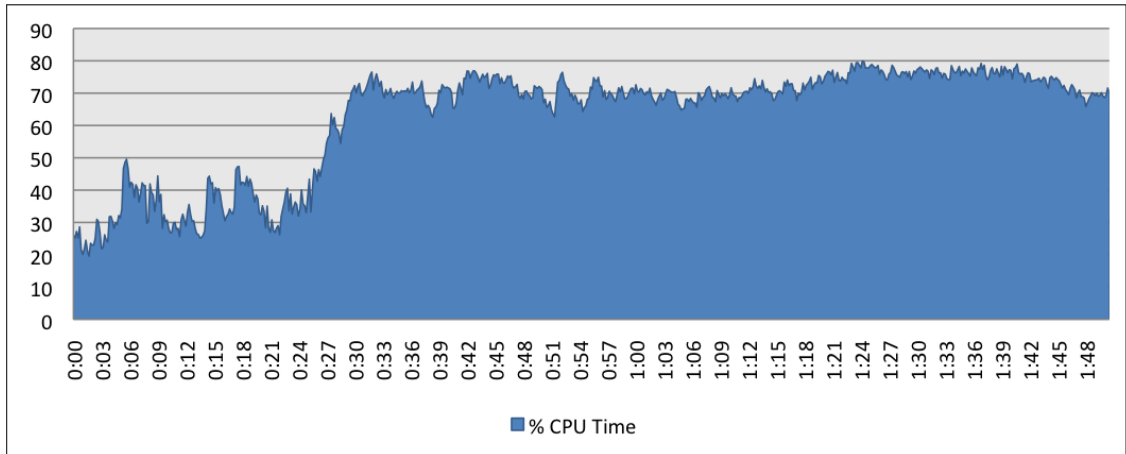


Figure 4: Host CPU Usage

The per host virtual machine disk usage is detailed in figure 5, comprised of local solid state drives. Even a single local solid state disk is capable of several orders of magnitude higher IOPS (tens of thousands) than seen below, however more than one was used to provide the capacity necessary.

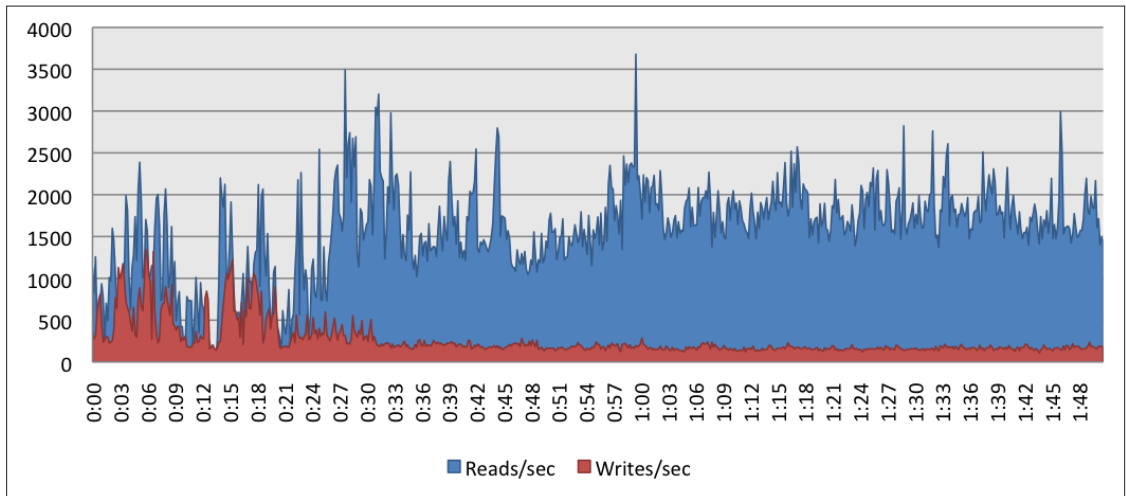


Figure 5: Host Disk Usage

## Conclusion

The VMware View 4.5 architecture for stateless desktops discussed in this brief significantly reduces the hardware infrastructure costs of desktop virtualization environments. The architecture provides a stateless desktop virtualization environment designed with VMware View 4.5 tiered storage that can scale from a few hosts to hundreds of hosts, while providing the lowest cost per desktop in the industry. In summary, this design provides linear scalability across both compute and storage regardless of scale.

## Acknowledgements

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VMware, Inc.: Mac Binesh, Matt Eccleston and Mason Uyeda

## References

VMware View

<http://www.vmware.com/products/view/>

VMware vSphere 4.1

<http://www.vmware.com/products/vsphere/>

