



# Introduction to Virtual Desktop Infrastructure

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From the Experts at  
Scale Computing

Technical Whitepaper  
**VDI with Scale Computing HC3®**

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## Introduction

End user computing support and management can be one of the most time and resource intensive IT responsibilities in the modern digital age. As the world becomes more and more reliant on technology for innovation and productivity, information workers in all fields and industries find themselves using desktop, laptop, or other types of handheld computing systems to accomplish many of their tasks, often from remote locations or while mobile.

Providing each worker with their own high-performing computing system can be costly and complex to manage. Virtual desktop infrastructure provides an alternative that can be easier to manage, more secure, easier to protect from disaster, and more affordable. As with server virtualization, desktop virtualization can consolidate both the hardware and software into a single computing system for greater efficiency.

Virtual desktop infrastructure (VDI) is generally composed of three primary components: a virtualization platform consisting of computing hardware and a hypervisor, a connection broker that connects users to virtual desktops, and a profile management solution that allows users to have their unique information persist in a virtual desktop environment.

In this paper, we will discuss how Scale Computing HC3 virtualization works as part of a VDI solution and what is required from other solution vendors. This paper will also discuss alternative solutions such as remote desktop sessions and application delivery.

## HC3 Virtualization

The primary component of VDI is the virtualization layer and that is where the HC3 platform does the heavy lifting. Nothing happens without efficient computing resources to power the desktops. There are many virtualization hypervisor options to choose from for VDI but there are three primary reasons why HC3 is ideal for VDI.



### Storage Management

On an HC3 system, storage resources are pooled automatically across the entire cluster. Unlike other hypervisors where storage resources must be manually configured into “data stores” or “storage groups”, with HC3 there is a single storage pool across the cluster and all storage is added and configured automatically. When a new node is added to the cluster to expand storage and compute resources, that storage is added to the storage pool automatically and is made available immediately.

Whether an HC3 system is composed of all spinning disks, all flash, or a hybrid of flash and spinning disk, the storage is configured automatically. With tiered flash and spinning disk storage, machine intelligence automatically optimizes blocks of data across the tiers for maximum performance. This automation greatly simplifies infrastructure management and allows a VDI solution to be deployed in far less time and with less future storage management needs.



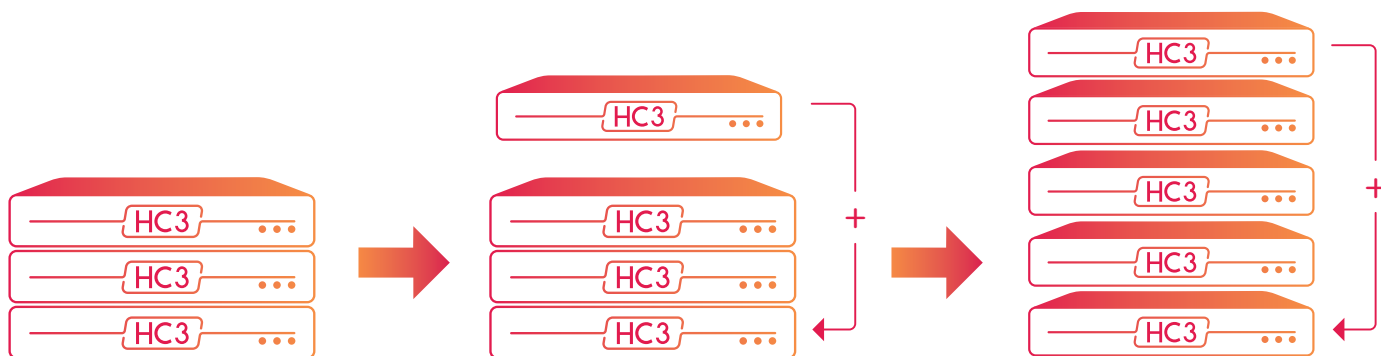
## Resource Efficiency

The HC3 platform is very resource efficient when it comes to system overhead compared to other hypervisor options. The primary reason is because of the storage architecture. HC3 uses a hypervisor-embedded storage architecture that, unlike most virtual storage systems, does not require a virtual storage appliance (VSA). These VSAs are required to run as a virtual machine on each host server or cluster node in other virtualization solutions and consume from 24 to 150 GB of RAM per node as well as multiple compute cores.

With HC3, there is no VSA and the HyperCore hypervisor only reserves about 4GB of RAM and a fraction of a single core per node, freeing up RAM and cores to run more virtual desktops. The storage architecture has an additional advantage of handling the storage as direct attached to the VMs rather than as virtual SAN attached storage that VSA architectures provide. This greatly reduces the number of I/O hops between the VMs and the physical storage, improving efficiency. This increased I/O efficiency is why HC3 does not need to use flash storage as a dedicated cache (vs. a true storage capacity tier) to overcome bottlenecks and can efficiently provide storage on all spinning disk systems or hybrid tiered storage systems.

## Scalability

With the HC3 platform, scaling out is simple. A new node can be added to a cluster within minutes and the resources are automatically made available to the entire cluster, including storage. Adding a new node is done seamlessly, without taking any other nodes or VMs offline. The hardest and more time-consuming part of adding the new node is physically adding it to the rack and attaching the cables.

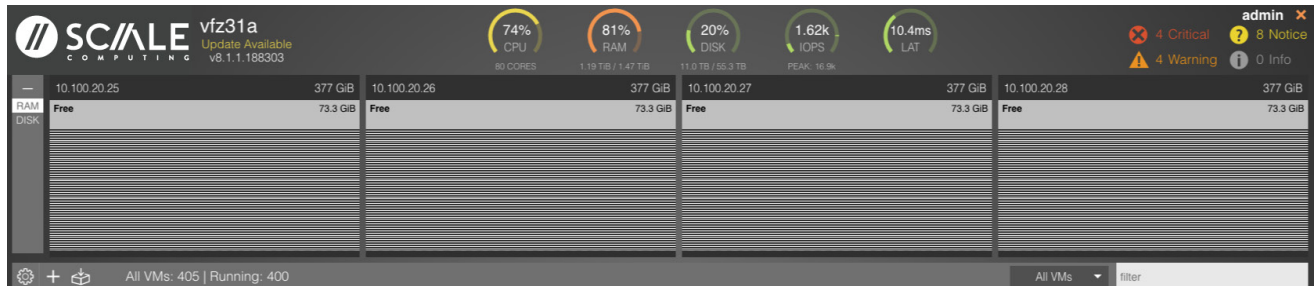


Not only is it easy to add a new node, but the new node does not have to match the resource configuration of the existing cluster nodes. It can have more or less of storage, RAM, or CPU as needed. This makes HC3 incredibly flexible for using only the resources needed and adding more resources as needed and only when they are needed.

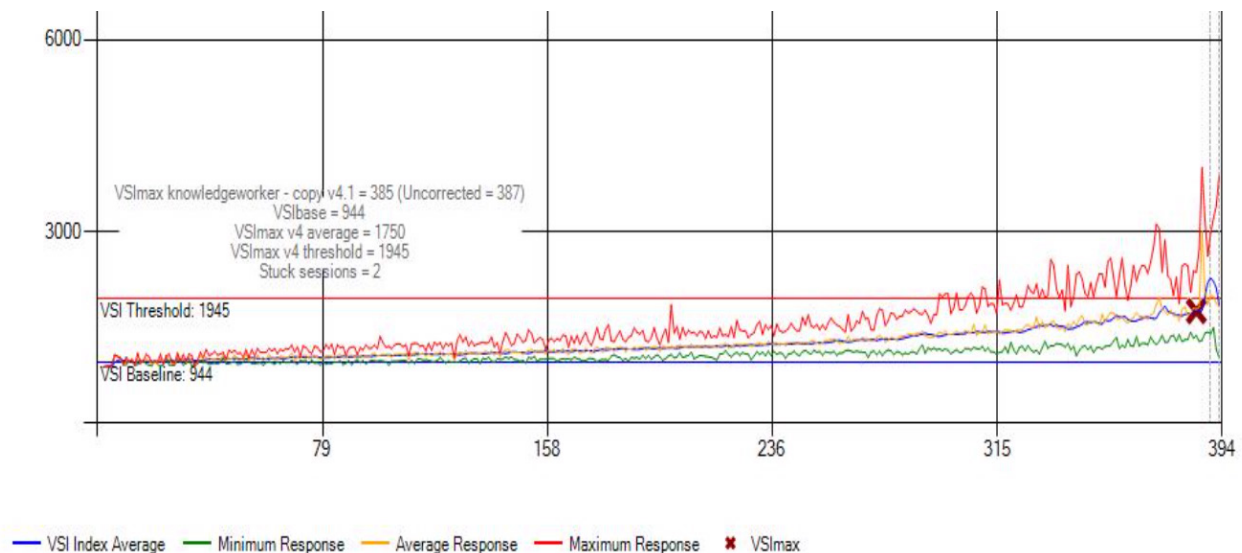
## VDI Density

Scale Computing performs LoginVSI testing against selected HC3 clusters to verify VM density for VDI. Recent testing of a four node HC1250D cluster resulted in a VSImax rating of 400 VMs.

Each node featured dual Intel(R) Xeon(R) Silver 4114 CPUs @ 2.20GHz and hybrid storage with both SSD and HDD storage.



*A four node HC1250D cluster with 8 CPUs and 1.47TB RAM running 400 virtual desktops during LoginVSI testing. VMs are running Windows 10 and Office 2016 Pro Plus with 2 virtual CPUs and 3GB RAM each.*



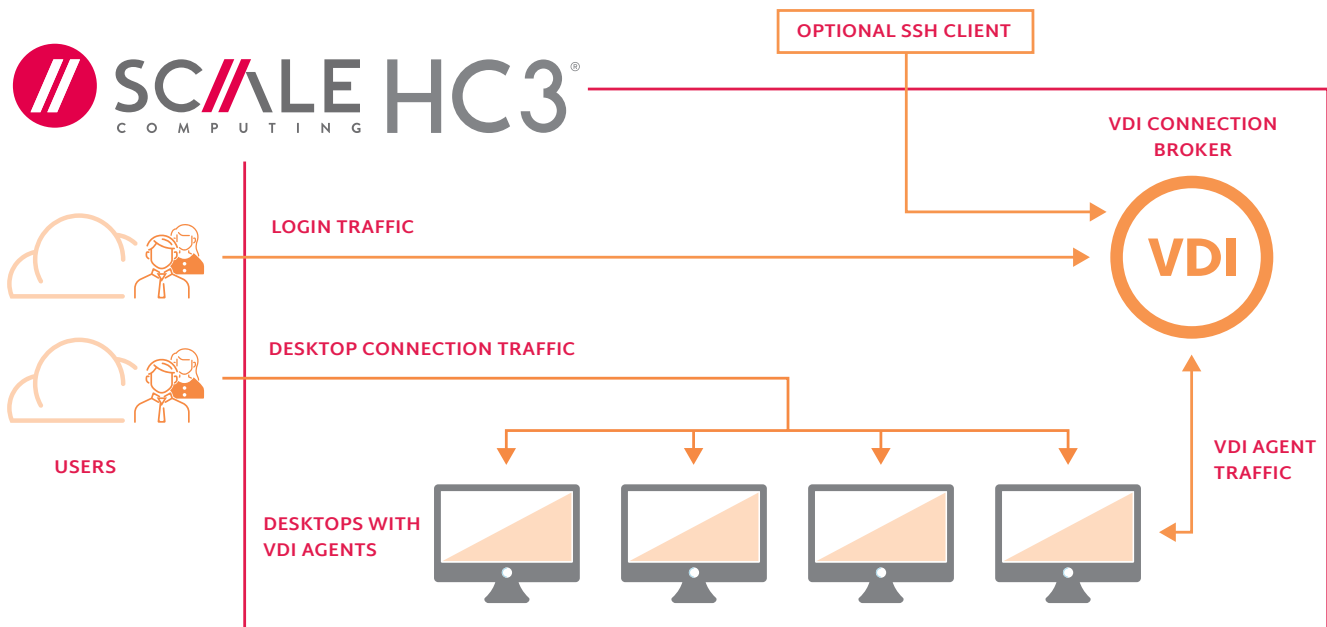
*In the LoginVSI testing, VSImax was reached at 400 VMs on the four node cluster.*

Scale Computing HC3 really is an ideal platform for virtual desktops because it further reduces the complexity of desktop management by providing an easy-to-use and efficient architecture. VDI is often where organizations see the need to scale out the most as the organizations and their user base grows. With VDI on HC3, that growth can come without changing how it is managed.

## The Connection Broker

Although VDI cannot exist without the virtual infrastructure, the connection broker is equally important. The job of the connection broker is to make sure that a user anywhere in the organization can log in and get connected to the right virtual desktop resources every time. But just making the connection is only the beginning of what a connection broker typically does. Their role usually includes managing the virtual desktop lifecycle to make the most efficient use of the virtual infrastructure. There are a number of different tasks that connection brokers perform.

### A VISUAL REPRESENTATION OF THE CONNECTION BROKER MANAGING LOGIN TRAFFIC TO VDI VMS.



Arrows indicate direction in which communication is established. Responses return on same port.

## Desktop Image Management

Connection brokers also have the responsibility of connecting each user to the desktop resources that they need. Not every user has the same responsibilities. Someone from the finance department needs a different desktop experience than someone in R&D or shipping and receiving. Connection brokers make sure specific users are connected to virtual desktops with specific desktop images with the applications and resources they need to perform their tasks.

These master images, often referred to as “golden” images, have the applications pre-installed or alternately use application delivery solutions (discussed later in this document.) Generally, a VM is created and all of the applications are installed and the VM is configured to the appropriate state before being stored as nothing more than an image from which other VMs are created. Sometimes the VM is stored as is, sometimes is “sysprepped” and converted to a template, and it simply varies by hypervisor and VDI software but the concept remains the same.

The connection broker does not define the images; it only tracks which user is assigned to what image so that the user always gets the correct image then they log in. An organization may have only a handful or dozens or hundreds of images depending on the number of users and departments.





## Desktop Mobility

Connection brokers also make it possible for a user to access their specific desktop from multiple locations which could be throughout an office, at home, at a remote location like a hotel, or on a mobile device. The organization can decide where users can access virtual desktops, but a connection broker has the responsibility of connecting their users to the correct virtual desktop resources from wherever they are logging in.

## Virtual Desktop Lifecycle

In an ideal VDI solution, virtual desktops are not running 24 hours a day because individual users are not using them 24 hours a day. Not only are they not running 24 hours a day, but the virtual desktops also don't even need to exist 24 hours a day consuming any computing resources. Instead, the connection brokers are able to manage virtual machines from every stage of the VM lifecycle from creation, powering on, powering off, and even deleting VMs as needed. For some VDI users, lifecycle management is an important security measure, "refreshing" virtual desktops from their base images to eliminate undesirable changes that may have occurred including malicious code (malware).

Lifecycle management helps control the number of running VMs and conserve system resources. This is particularly important for organizations with multiple shifts of users occupying the same computing infrastructure but at different times of the day, or organizations like universities with computer labs that may have hundreds or thousands of different users throughout the day.

With virtual desktops being created and deleted routinely, it is challenging to keep a persistent state of data and other settings on a desktop that users prefer. That is why connection brokers are typically paired with profile management solutions to keep user desktop experiences persistent across virtual desktop sessions.

## Profile Management

As users access virtual desktops, they desire a similar experience to a physical desktop where they can customize the desktop to their own preferences and of course they need to be able to save and access their own data files. With virtual desktop lifecycles being so short-lived, persistence for user settings and data can be accomplished by user profile management tools.

In a nutshell, a profile manager stores the "profile" data of each individual user separately. This profile data could consist of basic items like desktop wallpaper images or it could involve more crucial desktop settings like enabling accessibility features or security settings. The profile manager stores all of the necessary data to carry over the desktop experience of a user from one virtual desktop session to another and incorporating changes made by the user as they go even though they will be running on different virtual machines.

How much of the unique desktop that a profile manager can carry over varies by the profile management solution. Many of unique parts of a user desktop experience can also be made persistent through the applications they connect to remotely or storing data on user-specific remote storage on file servers or in the cloud. Profile managers can't provide 100% of the experience of having a dedicated desktop computer but they can get pretty close.

## Application Delivery

Not directly part of VDI, but related, are application delivery solutions. These solutions, sometimes referred to as application streaming, application layering, or application publishing, connect users to desktop applications without those applications being installed on their desktops. Application delivery can be used with VDI or with physical desktop machines and has benefits to both.

With VDI, virtual desktops are created from golden images that already have the appropriate applications installed for the appropriate users. With application delivery solutions, those desktops no longer need the applications actually installed, saving storage space on each desktop that is created. The applications are instead run as remote sessions from an application delivery server somewhere in the network.

Application delivery is commonly combined with VDI to create further efficiency for storage and management purposes. Application delivery is often used with VDI solutions on HC3 or as an alternative to using a VDI solution.

## Remote Desktop Session Host

Remote desktop sessions have been used since before VDI even existed. The basic architecture is that someone connects remotely to their own session of the desktop running on the physical or virtual machine acting as a remote desktop session host (RDSH). Unlike VDI, where each user has their own virtual machine, with RDSH, multiple users are logged into the same machine each with their own unique desktop experience.

RDSH can be used with virtual servers but is usually an alternative to VDI. RDSH is a native feature of the Windows Server operating system and can be used with the use of Windows Roaming Profiles or other profile management solutions. It is a lower-cost alternative to VDI because you can generally support more users on the same number of compute resources.

For more information on Windows Server Remote Desktop Services which includes RDSH and application publishing capabilities, please refer to the links below.

### **Windows Remote Desktop Services:**

[docs.microsoft.com/en-us/windows-server/remote/remote-desktop-services/welcome-to-rds](https://docs.microsoft.com/en-us/windows-server/remote/remote-desktop-services/welcome-to-rds)

### **Quickstart Guide for using RDHS with HC3:**

[www.scalecomputing.com/documents/support/EXT\\_Microsoft\\_RDSH\\_App\\_Note.pdf](http://www.scalecomputing.com/documents/support/EXT_Microsoft_RDSH_App_Note.pdf)

## Desktop Clients / Endpoints

Most modern VDI solutions support a bring your own device (BYOD) model for connecting to virtual desktops. This could be a personal device of the user such as a laptop, desktop, or tablet computer. This approach is very well suited to remote users and users whose work hours extend beyond their office hours. In the office, however, because there is no longer a need for a high-performance desktop machine, most organizations choose to replace traditional desktop/laptop machines with thin clients.

These are small computing devices intended only to operate the keyboard, mouse, display, and make the connection to the remote virtual desktop (or remote desktop session). The benefit is that these are far less expensive than full desktop machines and far easier to manage for IT. There are many different types of thin clients available for use with VDI and any of these should work with VDI on HC3.



## Preferred VDI Solutions for HC3

There are several VDI, application delivery, and profile management solutions that are preferred for use on HC3



### Leostream

Leostream is a vendor-independent connection management platform that connects users to virtual desktops or remote desktop sessions. Leostream has integrated with HC3 to provide full virtual desktop lifecycle management. Leostream specializes in providing secure connections for users with an intuitive, web-based interface. Leostream supports Windows and Linux remote desktops.

Scale Computing and Leostream provide a complete VDI solution to satisfy a wide range of use cases and maximize the utility of desktops and applications on HC3. With the combination of Leostream and Scale Computing, you can:

- **Provide desktops on-demand** – Leostream quickly provisions virtual machines preconfigured from customized template VMs created in HC3.
- **Improve security** – keep data off of the end user's client device, to ensure that sensitive data never leaves your data center.
- **Lower costs** – avoid licensing fees associated with full VDI stack solutions.

**Leostream Quickstart with Scale Computing HC3:**

[www.leostream.com/wp-content/uploads/2019/03/quick\\_start\\_Leostream\\_with\\_Scale\\_Computing\\_HC3.pdf](http://www.leostream.com/wp-content/uploads/2019/03/quick_start_Leostream_with_Scale_Computing_HC3.pdf)

### Parallels

Parallels is a connection broker and application delivery system that is integrated with HC3 to provide full virtual desktop lifecycle management. Parallels works with both VDI and remote desktop sessions for connection management and is integrated with RDSH for application publishing. Parallels offers remote BYOD connectivity to desktops and applications on nearly any operating system.

Scale Computing and Parallels work together to focus on architectural simplicity and low-cost solutions to enable organizations to achieve their VDI goals efficiently and within budget.

**Parallels Remote Access Server**

[www.parallels.com/products/ras/remote-application-server](http://www.parallels.com/products/ras/remote-application-server)

### Liquidware Labs

Liquidware Labs provides solutions for profile management and application delivery. Liquidware Labs ProfileUnity a preferred profile management solution for use with both Leostream and Parallels. ProfileUnity provided secure policy management, application rights management, and support user migration across different environments. ProfileUnity makes it easier to manage user profiles and provide unique user desktop experiences with VDI solutions.

**Liquidware Labs ProfileUnity:**

[www.liquidware.com/products/profileunity](http://www.liquidware.com/products/profileunity)

## Citrix

Citrix provides solutions as a connection broker for VDI, remote desktop sessions, and application delivery. HC3 is Citrix Ready certified. HC3 supports both Citrix XenDesktop for VDI and Citrix XenApp for application delivery.

Scale Computing and Citrix provide the following benefits:

- Lower infrastructure costs by consolidating desktop computing to a hyper-efficient storage, compute, and virtualization platform.
- Increase productivity by eliminating downtime with integrated virtual desktop high availability and disaster recovery
- Increase performance of desktops with an SSD storage tier along with efficient wide striping of data across the cluster.
- Scale out effortlessly by adding new cluster nodes in minutes without downtime.

### Citrix Ready Marketplace:

[citrixready.citrix.com/scale-computing-inc/hc3-hypercore-v6.html](https://citrixready.citrix.com/scale-computing-inc/hc3-hypercore-v6.html)

## Summary

For organizations looking to implement VDI, HC3 is an ideal virtualization platform that offers efficiency, ease of use, and scalability that eliminate complexity from VDI. Whether an organization ultimately decides to use VDI, remote desktop sessions, or application delivery solutions, HC3 supports all of these technologies and partners with a number of vendors who provide these. Paired with connection broker and profile management solutions, organizations can build modern, robust VDI solutions that meet the needs of all of their users while focusing on simplicity and saving on cost with HC3.

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