

The Essential Guide to Storage for Virtual Desktops



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In Brief

Organizations of all types and sizes are turning to virtual desktop infrastructure (VDI) to replace physical desktop systems and deliver greater mobility, flexibility, and security.

Individuals move frequently from location to location, organizations embrace bring your own device (BYOD) policies, and desktop environments need accessibility from an increasing variety of devices.

VDI simplifies desktop management in dispersed environments and ensures that sensitive data remains in the data center.

Despite the many advantages of VDI, its unique IO (Input/Output) characteristics can be difficult for many storage systems to handle. Under normal steady-state conditions, the VDI workload has a high percentage of writes. Other events, such as many users logging in nearly simultaneously (a typical occurrence on most mornings), create big spikes in read IO.

Traditional storage systems often must be over-provisioned to accommodate these IO patterns, driving up storage costs. This is one reason why storage is the single largest capital expense for VDI.

But don't despair. Over the past several years, a number of innovations have emerged that simplify VDI. By paying attention to a few selection criteria, you can identify storage that will not only meet your needs and budget, but deliver a superior desktop experience for users.

This guide includes performance, scaling, management, data protection, and other guidelines to put you on a path to VDI success.

Is VDI Right for You? Before you dive into the details of storage for VDI, consider some of the reasons why companies do—and don't—choose VDI.



Why VDI?

IMPROVED MOBILITY AND PRODUCTIVITY

Today's workforce is increasingly mobile. With properly configured VDI, a user can access the same desktop environment from almost any location and be instantly productive.

BRING YOUR OWN DEVICE

Today's users want to use their own devices. With VDI, users can have the device of their choice, while administrators maintain control and governance over business applications.

BETTER DATA PROTECTION AND SECURITY

Because data remains inside the data center, VDI—when properly configured—can be far more secure than dispersed desktops and laptops with locally stored data.



Why Not VDI?

ELUSIVE COST SAVINGS

If your primary reason to implement VDI is saving money, you may be disappointed. Operational savings may outweigh capital savings, and it may take longer than expected to reach a point where you are saving money.

POTENTIAL IMPACT OF FAILURES

When a desktop fails, a single user is affected. A VDI failure could impact hundreds or thousands of users simultaneously.

ORGANIZATIONAL RESISTANCE

Sometimes initial attempts at VDI have mixed results, or users and management are unwilling to give up the perceived level of control they get from a physical desktop or laptop. If your company culture is resistant to VDI, you may be swimming upstream.

In the end, only you can decide whether VDI will solve—or add to—your company's technology challenges.

When Storage Selection Goes Wrong... The wrong storage can derail VDI performance, create negative user perceptions, and put projects in jeopardy.

VDI Fails at Business School on Two Different Storage Options

After the business college at a major state university implemented a successful server virtualization project, it launched a VMware Horizon View VDI deployment using the same conventional storage.

Unfortunately, the platform didn't have the "muscle" to meet the mixed demands of 400 virtual desktops and 100 server virtual machines.

The IT team tried to fix the deficiency by purchasing a different conventional storage system dedicated to VDI. That helped initially but failed to eliminate performance degradation.

Existing Storage Can't Satisfy VDI Needs of Healthcare Organization

Like many companies testing out VDI, a UK-based healthcare organization did its initial VDI rollout using existing storage.

The IT team quickly found that, while the storage worked okay during steady-state operations, it simply couldn't handle the spikes in IO demand that came with VDI: login and boot storms, virus scans, and other activities left employees in the field waiting.

The small IT team didn't have time to constantly configure, tweak, and fix things to keep VDI up and running.

Financial Management Firm Has Unexpectedly High IOPS Needs

This global firm's IT staff often received user complaints, such as "I can't work" or "My machine's not working," due to VDI. Complexity made issues difficult to troubleshoot.

Consultants had predicted a requirement of 20 to 50 IOPS per desktop, but the firm's demanding financial applications frequently consumed over 200 IOPS per desktop.

During moderate periods, desktops in aggregate generated 5,000 to 6,000 IOPS. During peak periods, demand spiked to 22,000 IOPS, exceeding the number of IOPS the storage could deliver.



MISTAKE:

Selected storage was not designed to support mixed, concurrent workloads.



MISTAKE:

Storage could not accommodate VDI's spikes in read IO. Constant tuning and firefighting was a drain on limited resources.



MISTAKE:

Initial assessment of requirements missed the mark. Storage failed to scale to accommodate growth.

What matters?

Storage is a critical element of VDI. When it comes to selecting storage, keep the following criteria in mind:



Performance

Fast logins and good user experience are a must



Efficiency

The right data reduction capabilities dramatically decrease capacity needs



Management

Ease of use, end-to-end visibility, and operational simplicity are critical



Integration

Storage must interoperate with hypervisors, VDI software and more



Scaling

Avoid “surprises” as the number of VDI seats grows



Support

Your storage vendor should help you succeed



Availability

A VDI outage could leave thousands of workers idle

These points are explored in more detail on the pages that follow.



Performance Because every user who transitions to a virtual desktop has performance expectations based on physical hardware, fast login time and good user experience are critical to VDI success.

VDI's unique IO requirements aren't easily addressed by every storage system.

WRITE-HEAVY WORKLOADS

VDI workloads are frequently write-heavy—as high as 80%. It's important to assess your expected workload as accurately as possible and choose storage that will accommodate that IO pattern.

IO BLENDER EFFECT

The mixed IO from 100s to 1,000s of VDI seats can create an “IO blender” effect that can be difficult for some storage systems to handle. Noisy neighbors may affect the performance of other virtual desktops.

BOOT, LOGIN, AND ANTIVIRUS STORMS

A variety of events in a VDI environment can cause read IO to spike—and VDI performance to suffer. Numerous applications booting, users logging in, or antivirus scans at the same time can bring performance to its knees.

Choosing Storage for VDI Performance

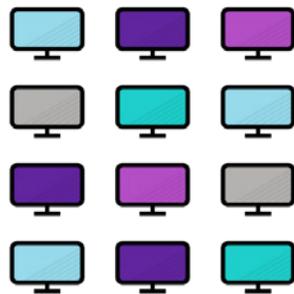
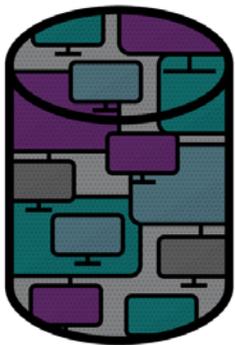
- Assess your environment to understand your expected VDI workload: numbers and types of users, IOPS/user, GB/user, IO size, etc. Get help with your VDI assessment if you need it.
- Don't assume the storage you're using for server virtualization will “just work” for VDI—especially if the VDI workload is in addition to your existing server workload.
- Choose storage that is capable of exceeding assessed performance needs and that can scale to accommodate growth.
- Features such as quality of service (QoS) on an application level can eliminate IO blender and noisy neighbor effects.
- Choose storage that is “application aware” if possible. LUN-based storage architectures that predate virtualization may have been designed for physical infrastructure.



Management The people tasked with managing VDI may not have much storage expertise. Ease of use is critical.

Storage architectures that predate the era of virtualization can be more complicated and time-consuming to manage. The intricacies of RAID, RAID groups, LUNs, and volumes may require the expertise of a storage administrator, making it a challenge if a person is tasked to oversee the entire VDI environment.

The storage you choose for VDI should be easy for a non-expert to configure, monitor, manage, protect, and scale. This frees up administrators to focus on more than just storage.



Choose the Right Management Features to Reduce Complexity

At a minimum, look for storage that includes management tools that make it easy to use the full set of capabilities offered by the storage platform. Consider the value of storage that offers the following features:

- A single, centralized management console rather than fragmented management tools.
- Predictive analytics to help you anticipate when you'll need more capacity and performance.
- Performance monitoring capabilities to avoid exceeding resource limits and to aid in troubleshooting.
- Policy-based management and APIs to facilitate automation.

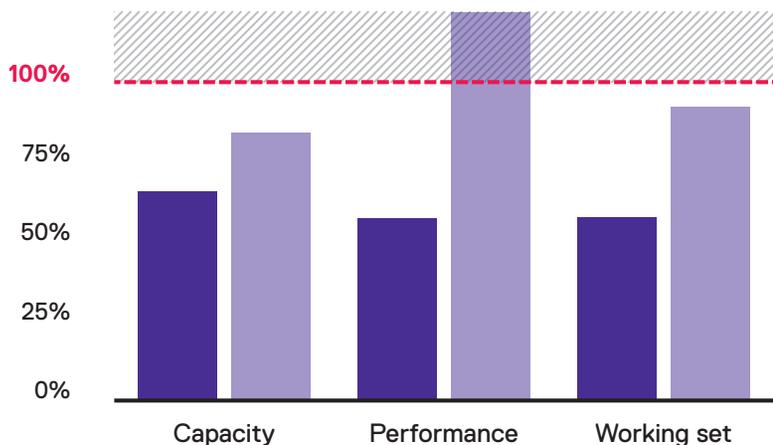


Scaling Most VDI deployments start with a small number of users and grow over time. Storage that works well initially may not scale in a predictable fashion as users are added, creating disruption and unanticipated expense.

While it's relatively simple to tell if a storage system has the available capacity to support a given number of additional VDI seats, it is much more difficult to predict when a system will run out of IO performance.

IO performance depends on a number of fixed or finite resources such as CPU, cache memory, SSD capacity, and number of HDDs. Exhausting just one of these can cause noticeable increases in IO latency, leading to user complaints.

When IO performance is exhausted before capacity, in many cases the only solution is to add a second storage system or replace your existing storage with something more powerful. Many VDI deployments resort to over-provisioning storage upfront so they don't run out of performance or capacity too quickly.



Avoiding Scaling Problems

- Many successful VDI deployments use a pod approach with a fixed ratio of servers to storage. Pods are easy to deploy, but lock you into a predetermined approach to scaling—an important consideration for fast-growing organizations.
- Consider scale-out technology that allows you to optimize the placement of VDI workloads across storage resources as you scale.
- Choose storage that offers good monitoring and analytics tools to help you avoid exhausting resources unexpectedly and tanking performance.



Backup and Availability Because a failure can leave thousands of users unable to do their jobs, protecting a VDI environment from failure and loss of user data is critical.

Backup

Companies moving to VDI tend to provide the same level of data protection as was previously provided for physical desktops. However, methods that worked for physical machines may need to be adapted or replaced to support the VDI environment.

It's important to ensure that in the VDI environment, important databases, master images, any other bookkeeping files, and user data are backed up regularly. (The specifics will depend on the VDI software you choose.)

Availability

Backup is only the first step in protecting the availability of a VDI environment. You will need to take steps to ensure that your VDI infrastructure—especially storage—is resilient to failure.

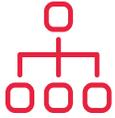
Some companies deploy VDI in two separate data centers in an active/active configuration.

If VDI in one data center goes down, affected desktops can be restarted in the other data center quickly, allowing work to resume. Providing this level of availability is not trivial.

Choosing Storage to Help Protect Your VDI Environment

Look for storage that provides a high level of reliability and features that will aid in data protection tasks.

- **Resilience to drive failure.** Choose storage that provides some means of resilience (RAID or other) as a first line of defense against drive failure and data loss.
- **Controller resilience.** Choose storage with dual controllers and/or scale-out architectures that avoid placing an excessive performance burden on just a few controllers.
- **Snapshot.** A space-efficient snapshot capability can be a simple and fast form of data protection for VDI.
- **Replication.** Built-in replication (asynchronous and synchronous) can allow you to replicate your VDI environment regularly to protect against disaster.



Data Efficiency VDI environments sometimes contain a large amount of duplicate data. Choosing storage with advanced data efficiency technologies reduces the total amount of storage capacity you'll need, with additional savings in space, power, cooling, and ongoing management.

There are two methods of provisioning virtual machines for VDI. "Full clones" are byte-for-byte copies of a master image. Full clones result in many copies of each guest OS, as well as application files and other duplicate files in your VDI environment. "Linked clones" allow you to provision multiple virtual machines that share a single baseline image, saving storage space and accelerating provisioning.

Which provisioning method you choose depends on the particular needs of your environment. Choosing storage with advanced data efficiency features levels the playing field in terms of capacity consumption, giving you greater flexibility to architect a VDI environment that best meets your needs. These technologies will also reduce the space needed for any user data stored in your VDI environment for further savings.

More Bang for Your Storage Buck

A variety of efficiency technologies are available. Whether you intend to use full clones, linked clones, or some combination, choosing storage with the following capabilities will ensure you achieve maximum efficiency and minimize the amount of storage you need:

- **Thin provisioning.** Just like disks on physical desktops, the virtual disks used for VDI initially have a lot of empty space. Thin provisioning saves you from having to allocate that space until it's actually needed.
- **Deduplication.** Deduplication removes copies of identical blocks. With full clones, it can reduce the storage needed many fold. It can also eliminate redundancy across user files stored on virtual disks.
- **Compression.** Efficient compression algorithms further reduce space requirements without affecting performance.
- **Inline or post-process?** Particularly if you are opting for all-flash storage, look for solutions that offer inline deduplication and compression. This will prevent data from being written unnecessarily, reducing write cycles on flash SSDs.



Integration and Support Because storage is such a critical part of VDI success, it needs to work with all the elements of your solution. Choose a solution with wide integration from a company that understands VDI and can support your efforts.

Integration

Make sure the storage you choose integrates with the other elements of your VDI solution:

- **Hypervisors**
 - VMware vSphere, including VAAI and VASA support
 - Microsoft Hyper-V, including ODX support
- **VDI platforms**
 - VMware Horizon View
 - Citrix XenDesktop and XenApp
- **Third-party software**

A variety of third party options exist to support functions such as security and authentication, profile management, application management, and many others. Many products target the needs of specific vertical markets such as healthcare or education. Make sure the products you need work together with your chosen storage.

Some storage vendors offer plugins for greater integration.

Support

While you hope that careful upfront planning will eliminate problems down the road, your planning process needs to take post-sales support into consideration. Choose a storage vendor that has proven support expertise and a lot of experience with VDI. Look for storage vendors that can provide support for their products when used in conjunction with the other products you've chosen. Predictive analytics can make the support you receive more proactive.

What about VVOLs?

VMware introduced virtual volumes or VVOLs in vSphere 6 to help make storage more friendly for virtualized environments. When evaluating storage for use with VMware, pay particular attention to the number of VVOLs supported.

You typically need 3-5 VVOLs for a single application. Because many storage arrays only support a few hundred or a few thousand VVOLs, this constrains the number of applications (and therefore the number of virtual desktops) that can be supported by an array.

The Right Storage Can Turn a VDI Disaster Into a Success. By making more informed storage choices, the organizations described on page 5 fixed their VDI problems.

Third Time's a Charm for Business School

After VDI failed on two storage platforms, this business school chose storage that was built to support mixed virtualized workloads.

Each desktop received its own IO "lane", isolating it from noisy neighbors. And the storage supports the performance of 2,000+ desktops concurrently with existing server virtualization.

The team had the new storage up and running in just 15 minutes, and the time spent managing storage has shrunk from hours a day to minutes per week.

A centralized console lets them track application performance and latency statistics across compute, network, and storage.



SUCCESS FACTORS

Concurrent workload support, ease of management.

Healthcare Organization Unlocks VDI Scaling

To solve its problems, this healthcare organization chose a storage platform built to withstand the spikes common to VDI. It also gained the ability to grow to several thousand users over time.

Two VDI environments were deployed in two different data centers in an active/active configuration for availability.

In addition to VDI, zero clients, single sign-on, and proximity readers for remote access were also deployed.

Staff can walk up to any device, swipe their ID cards, and login in less than 13 seconds. As they change locations, it takes just 3.8 seconds to switch the session to a new device.



SUCCESS FACTORS

Scaling with consistent performance in the face of IO spikes, benefits of mobility.

Modern Storage Solves Financial Firm VDI Woes

After re-evaluating performance needs, this global financial firm chose storage that would support necessary scale, including mixed workloads.

The same storage platform now supports virtualized desktops, servers and a busy database.

Virus scans take less than an hour, versus 11+ hours previously—a more than 90% increase in performance. Overall management has been greatly simplified.

Most importantly, user complaints and trouble tickets have been almost entirely eliminated.

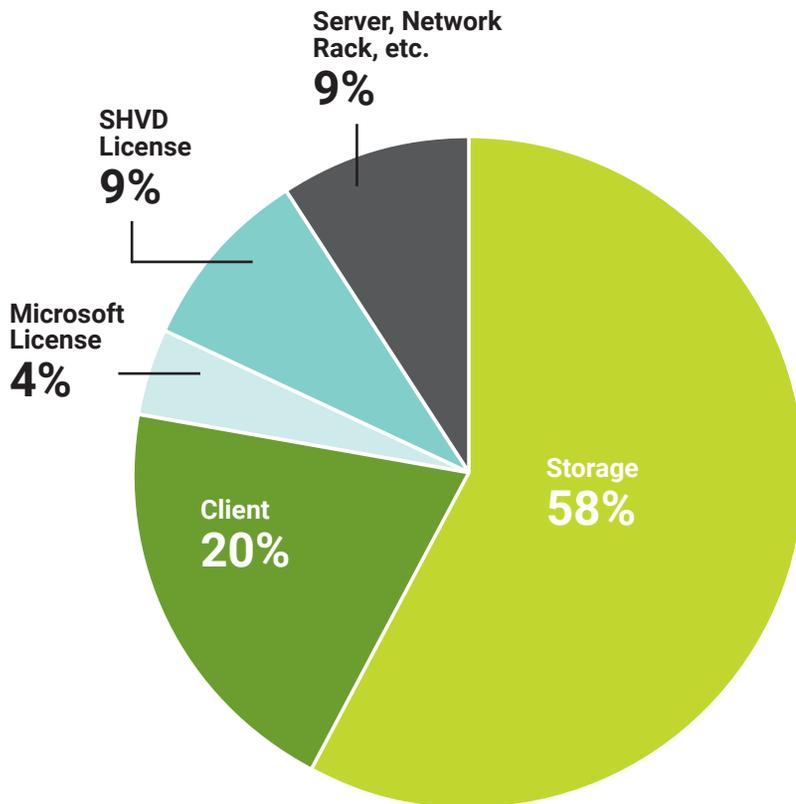


SUCCESS FACTORS

Superior performance, room to grow.

Control Costs Storage has the highest capital cost in a typical VDI installation, but it also presents the biggest opportunity for cost reduction. Keep these guidelines in mind to reduce both the capital expense and the ongoing operational expenses associated with storage:

CAPITAL COSTS PER DESKTOP



Get It Right The First Time.

As the examples in this book suggest, many organizations deploying VDI fail to get storage right on the first try. Carefully consider your performance and scaling needs up front to avoid expensive surprises later.

Drive Down Operating Costs.

Choosing storage that's easy to deploy, monitor, manage, and scale will save you admin time—and money down the road.

Be Efficient.

Choose storage with a full set of efficiency and data reduction features. Use them to decrease the total storage capacity you must purchase and reduce space, power, and cooling needs.

Create a Successful VDI Strategy The advice in this book should help you narrow the field of potential storage vendors. As you compare the options in terms of functionality and cost, keep the following guidelines in mind:



Performance

Profile your current and future IO requirements as carefully as possible. (Get help with the assessment if you need it.) Choose hybrid or all-flash storage that addresses projected requirements.



Backup and Availability

Profile your current and future IO requirements as carefully as possible. (Get help with the assessment if you need it.) Choose hybrid or all-flash storage that addresses projected requirements.



Management

Ease of use is essential. Your team should be focused on high impact projects, not constantly tuning and troubleshooting storage.



Data Efficiency

Thin provisioning, deduplication, and compression capabilities that reduce the amount of storage you need should be considered table stakes. Look for storage that can densely pack applications.



Scaling

Plan ahead for how you will scale storage as your VDI project rolls out and expands over time. Choose storage that will scale flexibly as your needs change and grow.



Integration and Support

You'll get more value from storage that integrates with your hypervisor, VDI platform, and related elements. Look for a vendor that understands VDI, values support, and has strong relationships with other companies doing VDI.

Thanks for reading!



We hope The Essential Guide to Storage for VDI got you thinking. Now it's time to make those wheels turn even faster—get hands-on with storage built specifically for virtualized desktops. We've created a mock-up of the Tintri UI, so you can see how easy it is to guarantee performance, scale-out, replicate and more. Just visit:

Explore.tintri.com

Tintri maximizes performance for your applications and the people who manage them. With all-flash storage and software for virtualized workloads, Tintri automatically manages each application, so you don't have to. That means you're free from decades-old storage constraints, so you can spend your time on high-impact projects.



For more information, visit www.tintri.com and follow us on Twitter @Tintri