The Essential Guide to Intelligent Storage for Virtual Desktops

Tintrı

Intelligent Infrastructure

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IN BRIEF

Organizations of all types and sizes are turning to virtual desktop infrastructure (VDI) and the latest in end-user computing (EUC) to replace physical desktop systems and deliver greater mobility, manageability, and security for their anytime, anywhere workforces.

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

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

Despite the many advantages of VDI, its unique I/O (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 write I/O operations. Other events however, such as near-simultaneous logons by a large volume of users (which typically occurs most mornings), create big spikes in read I/O.

Conventional storage systems, AKA standard infrastructure, often must be over-provisioned to accommodate these varying I/O 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 and the evolution of EUC. In particular, the availability of Intelligent Infrastructure that natively understands virtualization and virtual machines has fundamentally reduced the administrative effort, and improved both the performance and cost structure of VDI. By paying attention to a few selection criteria, you can identify storage that will not only match your needs and budget, but deliver the ultimate experience for end-users.

This document includes guidelines around performance, scaling, management, data protection, and AI-driven ways to automate and optimize each of these areas to put you on a path to VDI and EUC success.

IS VDI RIGHT FOR YOU?

Before you dive into the details of storage for VDI and EUC, 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 and dispersed. With properly configured VDI, a user can access the same desktop environment from almost any location, at any time, and be productive instantly.

BRING YOUR OWN DEVICE

Today's end-users want the freedom to use their own devices, including desktops, laptops, tablets and phones. 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 for implementing VDI is to save money, you may be disappointed. Both capital and operating expenses can continue to rise due to the overprovisioning and administrative complexity of standard infrastructure, so it may take longer than expected to get beyond your break-even point.

POTENTIAL IMPACT OF FAILURES

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

ORGANIZATIONAL RESISTANCE

Initial attempts at VDI sometimes have mixed results. End-users and management may be 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, your EUC technology choices will determine whether VDI will solve—or add to—your company's business challenges.

WHEN STORAGE SELECTION GOES WRONG...

The wrong storage can derail VDI and EUC performance, create negative end-user experiences, 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 VDI deployment, but continued to use the same conventional storage.

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

The IT team tried to fix the deficiency by purchasing a different conventional storage system, still based upon standard infrastructure, dedicated to VDI. That helped initially but failed to eliminate performance degradation as the EUC environment continued to grow.

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 discovered that standard infrastructure worked reasonably well during steady-state operations, but simply couldn't handle the spikes in I/O demand that came with VDI: login and boot storms, virus scans, and other activities left employees in the field waiting for timely access to their devices.

The small IT team didn't have time to constantly configure, adjust, and fix things to keep VDI up and running. Managing standard infrastructure in support of VDI can be very time-consuming.

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. Standard infrastructure complexity and poor visibility 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 workload periods, desktops in aggregate generated 5,000 to 6,000 IOPS. However demand spiked to 22,000 IOPS during peak periods, exceeding the number of IOPS the storage could deliver.

MISTAKE

Standard infrastructure is not designed to support mixed, concurrent workloads.

MISTAKE

Standard infrastructure could not accommodate EUC spikes in read I/O. Constant tuning and firefighting was a drain on limited IT resources.

MISTAKE

Initial assessment of requirements missed the mark. Standard infrastructure could not scale to accommodate peak loads.

WHAT MATTERS?

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

User Experience

Consistent, predictable QoS and self-service capabilities are necessary for a superior experience

Management

Operational simplicity, automation, end-to-end visibility, and intelligent desktop-level analytics reduce IT burden
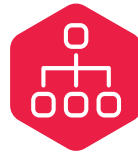
Availability

Risks around data protection and desktop access are magnified because a VDI outage could leave thousands of workers idle

Scaling

Avoid surprises with extreme, dynamic scaling and intelligent desktop placement as the number of VDI seats grows

Data Efficiency

Precise provisioning and mixed workload consolidation dramatically decrease capacity needs

Integration

Storage must interoperate with hypervisors, VDI software and existing infrastructure to optimize EUC

Support

Your storage vendor should help you succeed by anticipating your needs before "real-time" events.

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

USER EXPERIENCE

Employees who transition to a virtual desktop expect the same performance and access that they get from physical devices, so an excellent user experience is critical to VDI success.

VDI's unique I/O requirements aren't easily addressed by standard storage infrastructure.

Write-Heavy Workloads

VDI workloads are frequently write-heavy—with as high as 80% write operations. It's important to assess your expected workload as accurately as possible and choose storage that will intelligently accommodate the QoS needs of that I/O pattern.

I/O Blender Effect

The mixed I/O from 100s to 1,000s of VDI seats can create an "I/O blender" effect that makes it difficult for storage systems to match the performance needs of individual desktops. "Noisy neighbors" – other virtual desktops or workloads – may affect the performance of virtual desktops.

Boot, Login, and Antivirus Storms

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

Choosing Storage for VDI Performance and QoS

- Assess your environment to understand your expected VDI workload: number and types of users, IOPS/user, GB/user, I/O 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 added to your existing server workload.

- Choose storage that is capable of exceeding assessed performance needs and can scale to accommodate non-linear growth.

- Features such as dedicated quality of service (QoS) at an application and virtual desktop level can eliminate the I/O blender effect and noisy neighbors.

- Intelligent Infrastructure that has a native understanding of virtual machines and operates at that level is uniquely qualified to support VDI.

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, AKA standard infrastructure, 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 management challenge if the individual is tasked with overseeing the entire VDI environment in addition to other responsibilities.

The storage you choose for VDI should be easy for a non-expert to configure, monitor, manage, protect, and scale. This empowers generalists to manage their own VDI storage footprints and frees up administrators to focus on more than just storage. Intelligent Infrastructure designed to support virtualization can greatly simplify administration for specialists and generalists alike.
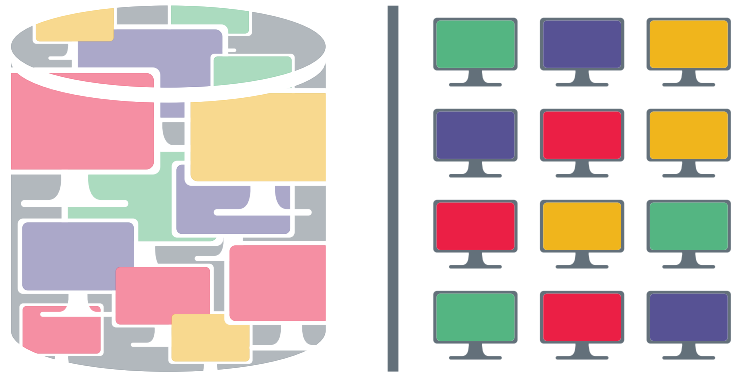
Choose the Right Management Features to Reduce Complexity

At a minimum, look for storage that includes autonomous operations and intelligent 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.
- Real-time insights to quickly troubleshoot and resolve performance bottlenecks.
- Predictive, AI-driven analytics to help you anticipate when you'll need more capacity and performance.
- Performance and capacity monitoring capabilities to avoid exceeding resource limits.
- Self-optimizing capabilities and automated QoS to minimize time-consuming configuration and tuning.
- Policy-based management and APIs to facilitate automation.
- Native understanding of virtual machines and their performance profiles.

BACKUP AND DISASTER PROTECTION

Because a failure can leave thousands of users unable to do their jobs, it is critical to protect VDI environments from failure and loss of user data.

Backup

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

It's important to not only ensure that critical databases, master images, bookkeeping files, and desktop user data are backed up regularly, but that they can be quickly and complete restored. (The specifics will depend on the VDI software you choose.)

Disaster Protection

Backup is only the first step in protecting a VDI environment. You need to take steps to ensure that your VDI infrastructure—especially storage—is resilient to failure. This means that data is protected and desktops stay up and running in the event of ANY failure, whether it's a disk, a server or a complete site that goes down.

Some companies deploy VDI in two separate data centers with a highly available active/active configuration.

If VDI in one data center goes down, affected desktops can be restarted in the other data center quickly, enabling work to resume with little to no disruption. Providing this level of data protection and desktop 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 enhanced data protection and simplify its processes.

- **Resilience to drive failure.** Choose storage that provides some means of resilience (RAID or other) as a first line of defense against disk 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 copy-management capability such as point-in-time copies or snapshots can be a simple, space-efficient and fast means of data protection for VDI.

- **Replication.** Built-in replication (asynchronous and synchronous) enables you to continuously replicate your EUC data to a secondary site to protect against disaster or planned downtime events such as maintenance or upgrades.

- **Granular Protection.** Look for storage that provides the flexibility to set up data protection policies that enable backup, replication and restore for a set of VMs or individual VMs (desktops).

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.
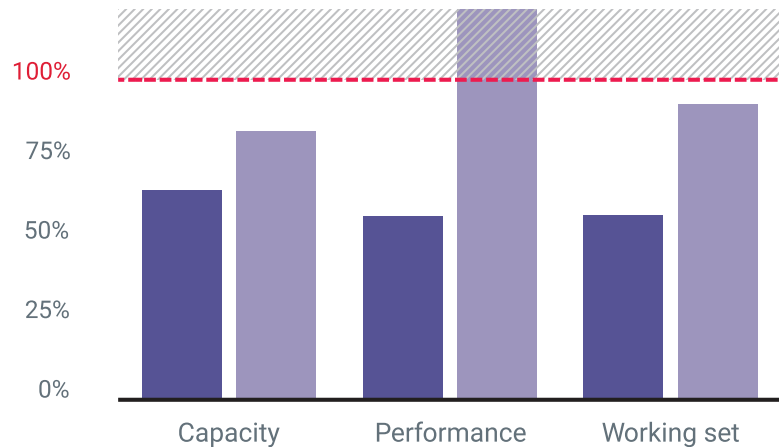
Avoiding Scaling Problems

Many successful VDI deployments use a pod or hyperconverged infrastructure (HCI) approach with pre-integrated server, storage and network resources and usually 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 technology that enables you to flexibly scale compute and storage independently and optimizes the placement of VDI workloads and individual desktops across storage resources as you scale.

It's relatively simple to determine whether a storage system has the capacity to support a given number of additional VDI seats, but it is much more difficult to predict when a system will run out of I/O performance.

I/O 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 resources can cause a noticeable increase in I/O latency, leading to user complaints.

When I/O performance is exhausted before capacity, the only solution in many cases is to add a second storage system or replace your existing storage system with something more powerful. Many VDI teams resort to over-provisioning storage upfront so they don't run out of performance or capacity too quickly. Unfortunately this headroom represents idle wasted resources and unnecessary expense.

Choose storage that offers good monitoring and analytics tools to help you avoid exhausting resources unexpectedly and tanking performance.

Look for technology that lets you know exactly when you'll need to provision resources, so you can avoid costly overprovisioning when you scale. Flexible scale-out solutions enable you to add storage nodes within a single pool for a combination of extreme capacity and simplified management.

Intelligent Infrastructure that natively understands virtualized machines and operates at that level can address over-provisioning through capacity pooling and predictive analytics.

COST-EFFICIENCY (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, which can easily grow to hundreds or thousands of seats.

1. Full clones are byte-for-byte copies of a master image. Full clones result in many copies of each guest OS, as well as copies of application files and other files in your EUC environment.

2. Linked clones enable you to provision multiple virtual machines using a single, shared baseline image, saving storage space and accelerating provisioning.

The provisioning method you choose depends on the particular needs of your EUC environment. Full clones provide better performance and don't require a persistent connection to the master VM image. But they also don't provide the space-efficiency of linked clones.

Choosing storage with advanced data efficiency features enables you to reduce capacity consumption and gives you greater flexibility to architect a VDI environment that best meets your needs, especially if you wish to trade off some capacity for better performance.

More Bang for Your Storage Buck

Whether you intend to use full clones, linked clones, or some combination, choosing storage with the following data efficiency capabilities will help you further 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 so you don't have to provision as much headroom.

- **Deduplication.** Deduplication removes copies of identical blocks. When full clones are used, deduplication can reduce your required storage capacity by many fold. It can also eliminate redundancy across desktop user files stored on virtual disks.

- **Compression.** Efficient data compression algorithms further reduce space requirements without affecting performance.

- **Real-time or post-process?** Look for solutions that offer real-time deduplication and compression, particularly if you are opting for all-flash storage, This will prevent data from being written unnecessarily, reducing write cycles on 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 and interoperability from a company whose storage natively understands VDI and operates at the virtual machine level so as to best support your efforts.

Integration

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

Hypervisors

- VMware vSphere, including VAAI, VCAI and VASA support
- Microsoft Hyper-V, including ODX support

VDI platforms

- VMware Horizon
- 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 other operations. 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 with VDI solutions.

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 extensive 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 or are considering. Predictive analytics and remote, real-time monitoring and communication 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 a storage system.

THE RIGHT STORAGE CAN TURN A VDI DISASTER INTO A SUCCESS

By making more informed storage choices, the organizations described on page five fixed their VDI problems.

Third Time's a Charm for Business School

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

Each desktop received its own dedicated resources, isolating it from other desktops and workloads. And the storage supports the performance needed for 2,000+ desktops running concurrently with an existing server virtualization workload.

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

A centralized console lets the team track individual desktop performance and latency statistics across compute, network, and storage.

Healthcare Organization Unlocks VDI Scaling

To solve its problems, this healthcare organization chose an Intelligent Infrastructure platform built to withstand the I/O spikes common with VDI. It also gained the ability to grow to several thousand users over time.

Two VDI environments were deployed in different data centers in an active/active configuration for high availability and disaster protection.

In addition to VDI, the enterprise also deployed zero (ultra-thin) clients, single sign-on authentication, and proximity readers for remote access.

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

Modern Storage Solves Financial Firm VDI Woes

After re-evaluating its performance needs, this global financial firm chose Intelligent Infrastructure that would deliver the necessary scale, including support for 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 important, user complaints and trouble tickets have been almost entirely eliminated.

SUCCESS FACTORS

Concurrent workload support, and ease of management.

SUCCESS FACTORS

Scaling with consistent performance in the face of I/O spikes and the flexibility of transparent end-user mobility.


SUCCESS FACTORS

Superior performance with room to grow EUC and other workloads.

CONTROL COSTS

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

Server, Network Rack, etc.
9%

SHVD License
9%

Microsoft License
4%

Client
20%
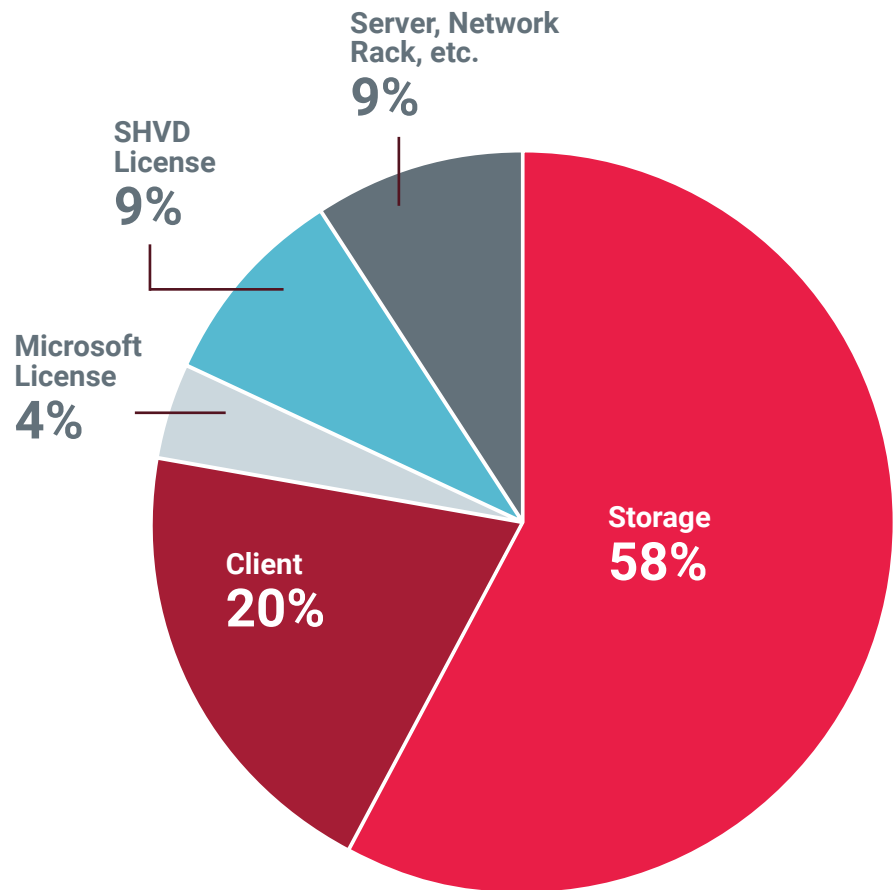
Storage
58%

CAPITAL COSTS PER DESKTOP

Get It Right The First Time.

As the examples in this E-book suggest, many organizations deploying VDI fail to get storage right on the first try. Carefully consider your performance and scalability needs upfront to avoid expensive surprises later. Also, weigh the advantages of storage that has a native understanding of virtualization and VDI.

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. Consider solutions that leverage AI and ML to simplify, automate or eliminate time-consuming VDI storage tasks so staff can focus on strategic priorities and innovation.

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 E-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 I/O requirements as carefully as possible. (Get help with the assessment if you need it.) Choose all-flash storage that addresses projected requirements.

Data Efficiency

Mixed workload support, 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.

Backup and Disaster Protection

Consider your recovery time and recovery point objectives (RTO and RPO) to determine how much downtime and data loss your business can tolerate. Look for solutions that leverage space-saving snapshots and real-time replication technologies to minimize both.

Scaling

Plan ahead for how you will scale storage as your VDI project rolls out and expands over time. Choose storage that will scale cost-effectively, with minimal disruption as your needs change and grow.

Management

Ease-of-use, including ML and autonomous operations are increasingly essential. Your team should be focused on high impact projects, not constantly tuning and troubleshooting storage.

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 and validated solutions with other companies doing VDI.

Tintri Intelligent Infrastructure maximizes performance for your applications and the people who manage them. With all-flash storage and software for virtualized workloads, Tintri VMstore automatically manages resources for each VM, each application, each desktop, 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.

Experience Different! To learn more about how Tintri VMstore can turbo-charge your VDI and business success through a simplified, Intelligent Infrastructure, visit tintri.com/vmstore

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