White Paper

Best Practice Virtual Desktops: Four Factors That Make a Difference in Public Sector

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Abstract

Advances in desktop virtualization technology make it possible for mobile and remote workers to access critical information and applications with improved security, manageability, and flexibility. However, successful virtual desktop configurations must be able to scale to hundreds or thousands of desktops and deliver the performance demanded by users. NetApp delivers storage solutions that enable organizations to provide mobile users with secure access to services and applications with predictable performance and costs across virtualized desktop infrastructures.

TABLE OF CONTENTS

LIST OF FIGURES

1 Why the Public Sector Needs Virtual Desktops

The desktop as we know it is changing. With today's advances in technology, employees can now perform their job from virtually anywhere using mobile devices such as smart phones and tablets with access to applications, information, and services in cloud infrastructures. And with the rapid advancement of new technologies like the virtual desktop, IT organizations can now provide a more flexible, secure work environment at a lower cost.

U.S. Federal Government

The U.S. Federal Government has long been a leader in establishing flexible work arrangements for employees. Initial teleworking laws were designed to reduce traffic congestion around Washington, D.C. But additional benefits quickly surfaced, including increased employee productivity, job satisfaction, and hiring flexibility, and cost savings resulting from reduced office space requirements. Virtual desktops enable flexible work arrangements by giving employees secure, cost-effective access to their desktops and applications from anywhere on any device.

State and Local Government

Growing fiscal challenges continue to impact state and local governments. Requests for new services with a reduced workforce make it imperative to find more efficient ways to provide citizens with access to critical information. The operational efficiencies achieved through the use of virtual desktop technology, rather than traditional desktop systems, can provide significant cost savings for agencies.

K–12 Education

Public schools today must deal with ongoing state budget cuts and limited resources, which require them to do more with less. Additionally, they need to take advantage of the explosive growth in mobile device and personal laptop usage by students and faculty. Desktop virtualization serves as a great equalizer in realizing the promise of a democratic education. Schools can now provide quick and responsive access to information and applications regardless of the age of the laptop or device the student uses. Since all of the heavy processing is handled by back-end servers in a virtualized desktop environment, students with older laptops get the same experience as students with new tablets.

Higher Education

Higher-education institutions continue to invest in ways to improve the learning experience through analytics and personalized learning environments. With the increasing use of tablets for e-learning, virtualized desktops enable broader student access to applications and resources. And by centralizing applications, expensive software licensing (such as for analytics, biotech, and other sophisticated modeling tools) can be reduced, resulting in cost efficiencies for the university.

The Move to "Work Anywhere" Accelerates
According to the Telework Exchange, 65% of federal agencies are telework IT ready and expect mobile-device use to increase by 20% by 2013.[1]

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[1] www.teleworkexchange.com

1.1　Top Four Drivers in the Shift to Virtual Desktops

#1: Work Efficiency / Ease of Use

Many organizations have adopted desktop virtualization to improve IT efficiencies and streamline the way people work. With virtual desktop technology, IT organizations are able to reign in operational costs by centralizing desktop administration from the data center.

- Cut operational costs for patching and maintaining desktops.
- Reduce administration expense while increasing the number of virtual desktops deployed.
- Eliminate downtime so that users have access to information when needed.

Figure 1) Address broad range of users with virtual desktops.

Task Workers	Knowledge Workers	Power Users	Mobile Users
▪ Well defined desktop ▪ Predictable tasks ▪ Controlled environment	▪ Personalized desktop ▪ Variety of tasks ▪ Variety of apps ▪ Multimedia content	▪ High-end apps ▪ Maximum performance ▪ Personalized desktop ▪ Multimedia content	▪ Device flexibility ▪ Disconnected access ▪ Remote access ▪ Personalized desktop
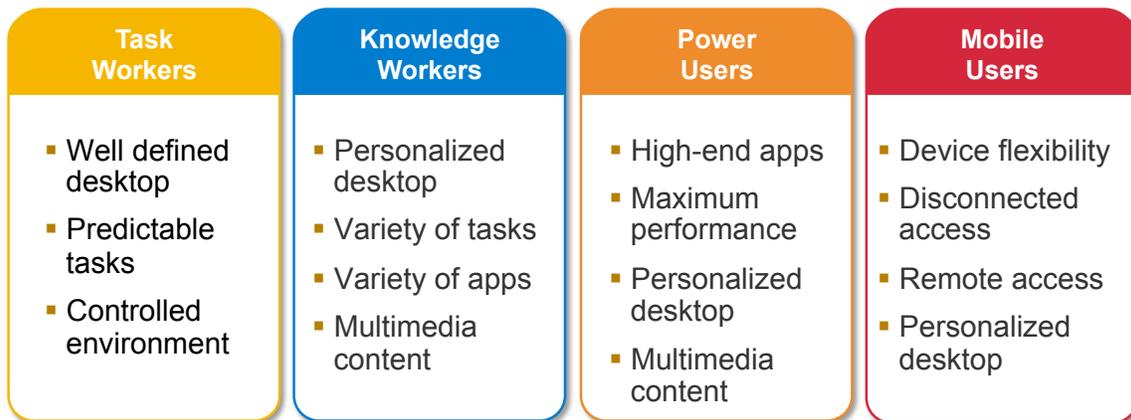
#2: Achieve Greater Security

It is critical for organizations with teleworkers to implement strong security policies and practices. This is particularly important for agencies with highly secure environments, such as the DoD and Intelligence. National security, employee safety, and diplomatic relations are all at risk if the wrong information gets into the wrong hands. The publication of hundreds of thousands of classified documents and cables on WikiLeaks in 2010 is a perfect example. In addition, the recent security breach within the Utah Department of Health highlights the urgency of protecting confidential personal information. According to Utah Governor Herbert's office, there are nearly a million attempts each day to infiltrate the state's IT network.[2]

Virtual desktops reduce many of the risks that are characteristic of typical user environments. Since the desktop image is hosted in the data center, agencies can protect sensitive information within the organization's data center—not on the end-user's device, which can be lost, stolen, or even destroyed.

#3: Deliver a Seamless User Experience

Desktop virtualization enables employees to benefit from increased flexibility and productivity with a "work-anywhere" desktop environment. And users can follow a "bring your own device" (BYOD) approach to maintain their personal desktops while sharing applications and resources from a centralized location. Users can buy whatever hardware they want and still have access to the applications they need with the

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[2] http://www.govtech.com/policy-management/Utah-CIO-Steve-Fletcher-Resigns-State-Promises-Security-Reforms.html

familiar desktop they are used to. Employee satisfaction generally increases when there is greater control over the applications and settings employees need to perform their jobs.

#4: Realize Cost Savings

Virtual desktops, when established correctly, can minimize initial capital outlay and deliver tremendous value over traditional PC environments, including the ability to:

- More easily provide ongoing support for corporate machines and assets.
- Easily enable all desktops to be compliant with corporate and regulatory requirements.
- Provide desktop continuity and data protection in the event of a natural disaster or other unplanned workforce interruption.
- Lower ongoing operational cost.

2 Why Storage Matters in Virtualized Desktop Deployments

2.1 Choosing the Right Storage Is Essential to Successful Deployments

Your storage decision can have a significant impact on the success of your virtual desktop deployment. In order for you to claim victory, you must keep data secure, deliver a positive end-user experience, and keep costs to a minimum. To maximize the benefits of desktop virtualization, you need a complete data management strategy that delivers the flexibility required at a cost that is affordable.

Why? Storage typically takes 23%–50% of data center budgets. Enterprise storage is usually one of the largest expense categories in virtual environments, comprising as much as half of the cost of a virtual desktop deployment. However, with desktop virtualization, you move from local desktop systems to virtual desktops on a shared enterprise storage environment. So choosing the right storage platform is critical to the success of your desktop deployment.

Also, the virtual desktop infrastructure (VDI) can help avoid unique performance challenges that impact the user experience, such as unacceptable delays accessing desktop, applications, or data that are created when everyone tries to boot up or log in to their desktops simultaneously, such as first thing in the morning.

2.2 Features to Look for: the "Must Haves"

Users demand continuous access to their data and applications. From an IT perspective, this means having the right balance between storage capacity and performance so that you can keep costs under control. Storage technologies have matured in the past several years so you can now realize the full potential of a virtual desktop environment with innovative, integrated technologies that remove the impediments to success and make VDI a more viable option.

- Eliminate redundant desktop and user data to minimize storage requirements.
- Minimize time to initialize the virtual desktop environment.
- Provision thousands of virtual desktops in minutes instead of days.
- Reduce data loss via centralized protection of desktops and user data.
- Simplify desktop management by centralizing administrative capabilities to reduce complexity.

3 Addressing Key Concerns with Virtual Desktops

Storage is a critical part of any desktop virtualization solution; however, enterprise storage costs have traditionally been one of the inhibitors of virtual desktop adoption. When evaluating any desktop virtualization solution, the ability to reduce total storage requirements (that is, drive down costs) should be a top priority, and NetApp can help you achieve this. With our storage solutions, you can realize the full potential of your virtual desktop infrastructure with storage that's flexible, available, and cost effective.

3.1   Deploy Faster

Desktop virtualization built on NetApp® lets you easily provision thousands of desktop at a time, house all home directories in the same place, back up all data at once, and manage thousands of desktops in a unified, highly simplified manner—all from one storage platform.

With NetApp, you can deploy and manage desktop environments and applications centrally. Users access their virtual desktop over a standard network infrastructure without affecting the level of control over their desktop environments. With NetApp storage, IT can:

- Provision thousands of virtual desktops in minutes with nearly instantaneous low-overhead storage cloning.
- Accelerate performance to address desktop boot or log-in storms and provide faster user access to desktops and apps.
- Reduce virtualized desktop storage costs by deduplicating redundant data stored across virtual desktops, user directories, and backup and DR copies.

Figure 2) Unified storage for desktop and data.
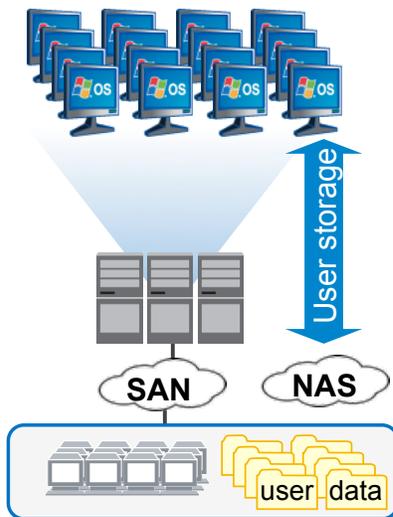
Unified storage for virtual desktops
- Any protocols
- Desktop, user and profile data
- Individual and pooled desktops

Scale capacity in real-time
- Thousands of desktops per system
- No trade-offs in desktop performance

3.2   Virtual Desktop Security

A key feature of any desktop virtualization approach is the unique ability to allow users to access secure data only while logged in and to keep data from being transferred outside the session. In highly secure environments, this provides a level of security that is difficult to achieve on a traditional PC. In addition, the virtual storage environment can provide further security enhancements and safeguards.

Data Protection and Disaster Recovery

Data protection and recovery are requisites for most virtual desktop deployments. NetApp has solutions that automate backup, provide cost-effective data retention, and enable compliance in virtual desktop environments. NetApp advanced storage features let users recover and restore their desktop data and files on their own—without having to open a help desk ticket and involve the storage administrator.

- Our Snapshot™ (point-in-time copy) functionality provides instantaneous copies of desktop data that are used for fast, space-saving backups. There is no performance impact associated

with Snapshot-based backups so you can use them much more broadly than traditional snapshots.

- Because backups are very space efficient you can maintain them very cost effectively for months or years.

- You can store backups to comply with corporate policies or to meet regulatory requirements and audits by safeguarding user data archives. NetApp technology prevents historical data from being tampered with or deleted and can be enabled on the storage system without requiring additional devices.

NetApp has solutions and features that minimize downtime from any type of failure or outage. Desktop users stay connected and keep on working. In addition to protecting and securing data we've included built-in availability features in the storage array that make all our systems very robust.

- Guard against downtime due to a component failure (for example, if a disk, shelf, or controller head fails it's transparent to the user accessing the data).

- If an entire system fails you can set it up to fail over to another system that has access to the mirrored data.

- Integrated replication technology enables you to easily and cost-effectively replicate data to a DR site.

- You can provide users with continuous access to their virtual desktop data in the event of virtually any type of failure or outage with nonstop storage availability, automated backup, and disaster recovery.

Multi-Tenant Security

NetApp, working with our partners, is a pioneer in providing secure multi-tenancy (SMT) in shared IT infrastructures, allowing you to deliver end-to-end secure resource and data isolation for maximum privacy and data security.

NetApp MultiStore® software enables data for multiple tenants to reside on a single NetApp array, and simultaneously provides the ability to establish secure partitions and unique service levels for each tenant. Because each partition is treated as a separate virtual storage system, multi-tenancy can be used to improve both storage utilization and quality of service management for each tenant residing on the array. By extending security, flexibility, and service efficiencies across the server and storage infrastructure, secure multi-tenancy facilitates a dynamic shared environment that serves as a foundation for desktop virtualization.

NetApp contracted with ICSA Labs to test and validate that the SMT infrastructure can be used to successfully prevent unauthorized users from accessing any tenant's data or resources or other underlying components of the SMT infrastructure. The complete findings are available in the ISCA Labs Custom Testing Evaluation Testing Report.

Figure 3) Benefits of secure multi-tenancy.
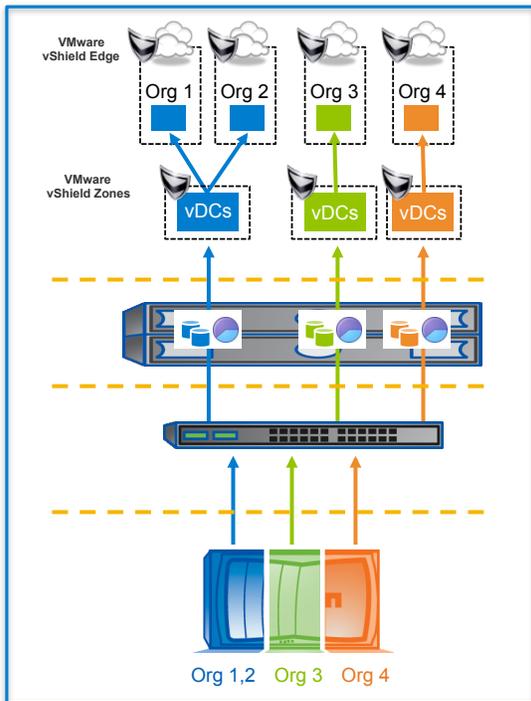
- End-to-end secure resource and data isolation

- vShield Edge provides perimeter security enforcement and isolation for each tenant

- MultiStore provides data isolation for security and QoS

- Automated chargeback for private, public, and hybrid clouds

## 3.3   Performance Drives a Better User Experience

Storage has a significant impact on the end-user experience. In any desktop virtualization environment, you will encounter a mix of read and write I/O activity (typically about 20% reads and 80% writes). One of the most significant challenges is handling peak loads created by the simultaneous action of hundreds of users; for example, at 8:00 a.m. all of your employees log in at once or after a patch all the desktops are rebooted at once. This creates massive amounts of read I/O activity that overburdens the disk, resulting in severe performance degradation or even downtime for users. Likewise, during nonpeak or steady-state periods, the environment tends to be very write I/O intensive.

In a virtual desktop environment, you need to size for capacity (accommodate the number of users, average workload, desktop characteristics, and so on) *and* for performance (types of users and peak workloads in terms of IOPS).

NetApp has technology that addresses both needs.

- NetApp's intelligent Flash Cache eliminates the ramifications associated with boot storms and log-in storms.
- The Data ONTAP® operating system provides "write" I/O optimization for better performance.

Figure 4) Solving the desktop virtualization performance challenge.

	Previous Storage	NetApp Solution
Organization running 1000+ View desktops with major performance issues directly related to storage	**300 Disks**	**56 Disks**
Reboot operations	4 to 5 hour outage	10 minute outage
Boot storms	VDI servers are non-responsive	Non-existent
Login storm	Logins staggered	4 second login
Better Performance AND Lower Cost		
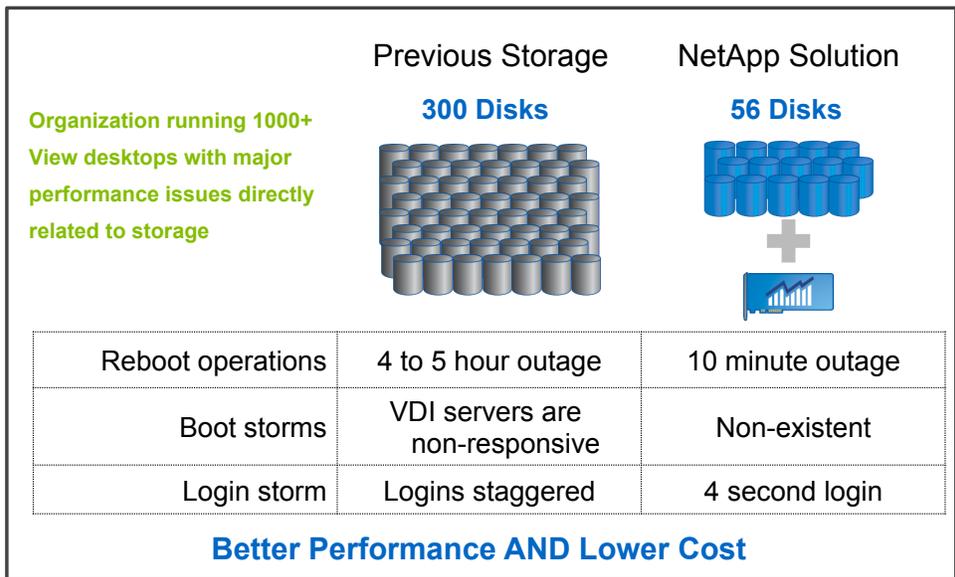
3.4 Cost Savings

NetApp is the essential storage for virtual desktops and can significantly reduce the storage costs of desktop virtualization. With NetApp, you can reduce costs by using storage and servers more efficiently in shared infrastructures.

- Storage efficiency capabilities enable use of 50% less capacity than traditional storage systems.
- Rapid cloning capabilities enable the provisioning of 1,000 desktops in just 10 minutes.
- Integrated backup provides fast, centralized, and automated backup of all end-user data to meet corporate or regulatory requirements.
- Simplified management of the entire ecosystem and risk drive upfront costs down.
- Unburden your staff and manage more disk space with fewer people (customer installations have nearly quadrupled the number of desktops managed by a single administrator; now each administrator can manage up to 4,000 virtualized desktops).
- Reduce maintenance and ongoing operational expenses.
- Deduplication reduces the capacity requirement to further drive down solution costs.

3.5 How Do You Know It Will Work? NetApp Virtualization Guarantee Program

There are two ways to save with NetApp's Virtualization Guarantee Program. We guarantee that you will use 50% less storage with NetApp compared to a baseline of traditional storage. In addition, NetApp can help you gain the full potential of your EMC, HP, or HDS systems with the NetApp Virtualization Guarantee[3] Program. By using NetApp V-Series open storage controllers, you can use deduplication to reduce your existing data by at least 35%.

When you meet the simple program requirements, your virtualization storage requirements will be reduced—guaranteed. Otherwise, a NetApp expert will validate your claim and initiate remediation. If,

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[3] NetApp Virtualization Guarantee Program http://www.netapp.com/us/solutions/infrastructure/virtualization/guarantee.html

after our expert analysis, you don't use 50% less storage with NetApp or reduce your data by 35% on non NetApp storage with NetApp V-Series, then we will provide the additional capacity to meet the shortfall at no additional charge.

Figure 5) NetApp Virtualization Guarantee.

4 Why NetApp?

Storage technologies have matured in the past several years so you can now realize the full potential of a virtual desktop environment with innovative, integrated technologies that remove the impediments to success and make desktop virtualization a more viable option.

NetApp helps organizations successfully design and deploy desktop virtualization to support the growing requirements of their employees (such as mobility; device types; and easy, secure access). With NetApp you can get the flexibility, high availability, and cost effectiveness required to grow your virtual desktop environment. Selecting the right storage platform for virtualizing your desktop systems is a critical component of virtualized desktops. It allows you to enable the scalability demanded by your operations, reduce IT costs, and improve users' performance—without any trade-offs.

Enable Secure Access to Critical Data
- Multiple tenants can reside on a single NetApp array with secure partitions.
- Get secure access to user data stored centrally within the data center.
- Instant backup, recovery, and DR keep data safe.

Deliver a Superior End-User Experience
- Eliminate boot and log-on storms.
- Have user self-service file restore.
- Enable availability of mission-critical services.
- Have anywhere, anytime, any-device access to desktops.

Simplify User, Desktop, and Application Management
- Bring thousands of desktops online in minutes.
- Provision storage as quickly as virtual desktops.

Reduce the Costs of Desktop Virtualization Installations
- Achieve >70% storage utilization.
- Have zero-capacity desktop provisioning.
- Buy 50% less storage, guaranteed.

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