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## Business Value Highlights

**413%**

Five-year ROI

**9 months**

To pay back

**76%**

Less employee time on device application log-ins

**71%**

Lower cost of operations per device per year

**81%**

Less time for IT support per device

**80%**

Less downtime per device

**56%**

Lower cost per device

# The Business Value of VMware Horizon

## EXECUTIVE SUMMARY

While the rapid influx of smart devices, including tablets and phones, and mobility workforce trends is adding significant complexity to IT operations, the increase in employee productivity, collaboration, and satisfaction that mobile technologies offer is not lost on business leaders.

Business leaders are increasingly looking to IT to deliver a mobile workspace that allows employees to access corporate data, applications, and communication resources on their devices of choice. But making the most of the opportunity while minimizing risks can be complex and overwhelming for many IT teams. Therefore, it makes more sense than ever for IT leaders to consider virtual client computing (VCC) solutions.

The benefits of VCC include centralized desktop and application management, “any device” access to corporate IT resources, an increased ability to protect corporate intellectual property, and demonstrated compliance with industry and governmental regulations.

However, when IT cannot optimize performance and effectively support the environment, this has a direct impact on the end-user experience, adoption, and ultimately the success of the implementation. It’s not just about saving money or improving efficiency. For VCC to be successful, the technology must provide an end-user experience that is as good as, if not better than, the end-user experience on local operating systems and applications.

IDC interviewed eight organizations that have virtualized desktops and applications on the VMware Horizon platform to understand the impact on their costs, operations, and

businesses. IDC's research shows that these organizations are achieving substantial value with VMware Horizon, and IDC projects that the solution will yield an average five-year return on investment of 413% by:

- » Supporting business operations through employee mobility and access to applications and saving time associated with device and application log-ins
- » Requiring less IT staff time to support and manage device environments
- » Reducing the impact of device-related problems on users and the business
- » Costing less than traditional PCs and other non-virtualized devices

## Situation Overview

The entry of diverse untrusted devices, multiple operating systems, and consumer-oriented applications into what used to be a controlled IT environment is creating more demanding business users, increasing security issues, and reducing the ability of IT to govern users to ensure compliance with corporate policy. As the lines continue to blur between corporate-owned and personally owned devices and between work offices and home offices, a mobile and global workforce now expects to have access to corporate data on multiple devices anywhere at any time.

This shift and the persistent consumerization are driving the need for IT executives to constantly address their organizations' changing technology needs. Failure to do so often results in employees circumventing an IT department's procurement policies and procedures, commonly referred to as "shadow IT," which is an unfortunate but growing trend. The long-term effects of shadow IT can be detrimental to both the business and the IT organization, often resulting in higher technology costs, increased risk of data compromises, less information continuity across the organization, and the diminished ability of IT to comply with industry and/or governmental mandates such as HIPAA, SOX, PCI, and FISMA.

Even when IT organizations had the benefit of supporting relatively homogeneous environments, managing corporate-owned desktop PCs and laptops remained an uphill battle, with many IT administrators relying on manual processes and disparate endpoint management solutions for provisioning, configuring, securing, and maintaining client devices. Furthermore, traditional desktop management tools and processes often require business users to hand over their devices to IT for undetermined and often extended periods of time.

The inability of IT to truly manage devices effectively leads to increased end-user downtime. This loss of productivity can multiply significantly in scenarios where there is limited or no onsite IT staff, and thus equipment must be shipped to and from the IT department located in the corporate home office. This long-standing approach to endpoint management is becoming increasingly inefficient, especially as globalization and mobility trends cause organizations to become ever more dispersed.

A distinct advantage of VCC is that it enables an IT organization to centralize business users' desktops in a corporate datacenter, where the IT organization is usually located. As a result, IT staff can more efficiently provision new client instances, centralize desktop management, and provide endpoint security — even for systems residing well outside of the corporate firewall. What's more, virtual desktops and applications can provide IT organizations with increased consistency across system settings and policies. This is largely due to the fact that in a virtual desktop delivery model, system configuration attributes are far less reliant on the underlying hardware. As a result, VCC can aid IT organizations in streamlining and reducing their image inventory to a few gold images or perhaps even a single image.

With VCC, IT is enabled to provide a more consistent and seamless desktop experience to the rapidly expanding population of employees who seek to use multiple devices to conduct business transactions. For example, in most VCC implementations, business users can access the same desktop instance in each new session, as well as securely access corporate data and applications anytime and anywhere, through one set of policies and log-ins. Moreover, this takes place regardless of the hardware or operating system or location being used to access the instance.

What's more, with advanced virtual GPU and pass-through technologies, such as NVIDIA GRID, IT can deliver great user experiences for even the most demanding graphic-intensive workloads. Many applications leveraged by designers, architects, and engineers that require large and costly workstations can now be virtualized and accessed across many devices including smartphones, tablets, and thin clients, fostering new VCC use cases.

## VMware Horizon for On-Premises Implementations

- » **VMware Horizon.** VMware Horizon 7 is a family of desktop and application virtualization solutions designed to deliver Windows and Linux virtual desktops and published applications on-premises. With Horizon 7, VMware extends the value of

virtualization — from datacenters to devices — and delivers an optimized desktop and application virtualization user experience, closed-loop manageability, and tight integration with VMware's software-defined datacenter (SDDC) solutions.

VMware Horizon 7 is available in three editions: Standard, Advanced, and Enterprise. The three editions include all components needed for an end-to-end virtual desktop deployment:

- **Horizon View Standard Edition.** Delivers full VDI capability targeted at providing an optimal end-user experience
- **Horizon Advanced Edition.** Cost-effective delivery of desktops and applications through a unified workspace
- **Horizon Enterprise Edition.** Desktop and application delivery with advanced management and automation capabilities available out of the box

Together with vRealize Operations for Horizon, App Volumes, and User Environment Manager, VMware Horizon includes more than just the desktop and application virtualization software; it also includes the components necessary to deploy and manage virtual desktops and virtual applications across a plethora of device types. For instance, Instant Clone technology, App Volumes, and User Environment Manager capabilities allow IT practitioners to not only deliver applications to business users in real time but also provision them in a manner in which they're able to maintain proper governance and control through settings and personas based on predefined IT policies.

In addition, VMware Horizon 7 includes several enhancements such as Blast Extreme, a protocol designed to provide better user experience and longer battery life across more devices and network conditions; application and just-in-time management support of apps and users; high-performance graphics via support for NVIDIA GRID; and smart policies that provide end users with single sign-on into their desktops and apps.

- » **App Volumes.** VMware App Volumes technology enables customers to streamline the delivery of applications to virtualized environments in real time. The combination of App Volumes and VMware Horizon allows customers to build an application delivery system that enables all applications to be centrally managed, delivered, updated, and maintained to virtualized environments on demand.
- » **Instant Clones technology.** Instant Clones technology and App Volumes allow IT to deliver brand-new personalized desktop and application services to end users

every time they log in. Instant Clones for Horizon does for application and desktop virtualization what vMotion did for vSphere, ensuring organizations can deliver truly stateless desktops to end users at scale. Instant Clones technology coupled with App Volumes ensures that organizations can reduce infrastructure requirements while enhancing security for end-user computing environments.

- » **User Environment Manager.** VMware User Environment Manager provides customers with capabilities that allow for the provisioning of user settings and personas based on a set of predefined IT policies. With User Environment Manager, IT can deliver a consistent and personalized user experience for end users to maximize productivity. What's more, IT can use User Environment Manager to manage virtual, physical, and cloud-hosted environments.
- » **Mirage.** VMware Mirage is a layered image management solution that categorizes the PC into logical layers and simplifies image management and OS migrations for physical PCs. A complete copy of the image is stored in the datacenter, allowing IT staff to update the IT managed layer while protecting the integrity of the user data. The Mirage client allows the PC to continuously synchronize with the datacenter image in order to receive any updates and changes that have been made to the IT-managed layers.
- » **vRealize Operations for Horizon.** VMware vRealize Operations for Horizon is a monitoring and reporting tool used to proactively manage Horizon and Citrix virtual desktop and application environments. vRealize Operations for Horizon allows organizations to monitor the health and performance of their infrastructure, desktops, and applications to help ensure that end users have the best possible experience at all times.
- » **VMware Identity Manager.** VMware Identity Manager is a single workspace for end users to securely access corporate assets on nearly any device. IT departments can allocate applications or desktops based on the needs of users or groups as opposed to strictly targeting devices. Business users have the ability to self-provision corporate applications and services, reducing the IT staff's workload. VMware Identity Manager also enables IT organizations to easily add new devices, users, or applications without having to reconfigure the devices or endpoints. In addition, VMware Identity Manager supports centralized management to simplify the enforcement of user policies, enabling enhanced security and compliance across device platforms. It enables the following:
  - Streamlined application provisioning, self-service catalog, conditional access

controls, and single sign-on capabilities for SaaS, Web, and cloud applications

- Ability to efficiently make changes to workspaces by adding, deleting, and updating user accounts; managing storage quotas; and determining policies as well as the ability to control external sharing and other policies that can help implement the security and control that IT requires
- Access to both full virtual desktops and applications (Likewise, VMware is now making many of its virtual client computing technologies [e.g., User Environment Manager, vRealize Operations for Horizon, VMware Identity Manager] available in a new standalone published apps offer. This new offer is designed to help customers streamline and simplify how they manage and deliver Windows and custom apps)
  - Horizon Apps Standard: Low-cost, streamlined way to publish Windows and custom-built apps on vSphere
  - Horizon Apps Advanced: Application publishing with just-in-time management capabilities

## VMware Horizon Air for Cloud/Hybrid Implementations

### Horizon Cloud

VMware Horizon Cloud enables companies to deliver virtual workspaces to their end users — including full Windows Client desktops as well as shared desktops and applications — as a subscription service. Built and delivered by VMware, Horizon Cloud allows customers to spin up desktops and applications, using a single cloud control plane to greatly simplify desktop management. Horizon Cloud is available in two models:

- » **Horizon Cloud with On-Premises Infrastructure.** Customers can pair their cloud-based subscription service with certified on-premises hyper-converged infrastructure appliances.
- » **Horizon Cloud with Hosted Infrastructure.** Customers can leverage a complete cloud-hosted solution with infrastructure that is managed by VMware.

VMware Horizon Cloud delivers the reliability, security, and performance that IT expects, with VMware business essential support and a seamless experience for end users across devices and locations.

With VMware Horizon Cloud, customers get:

- » **Hybrid deployments.** This offers the ability to support simple and flexible desktop and application delivery with a service that lets customers deliver desktops and application on-premises, off-premises, or in between through a cloud control plane.
- » **Customizable desktop experience.** Users can have their own virtual desktop with a look and feel that mirrors that of their physical desktop or laptop. End users can also enjoy a great experience across a variety of devices, locations, and network conditions.
- » **Simplified management.** IT can easily manage desktop images, virtual machines (VMs), user assignments, applications, and multiple desktop models — that is, 1:1 persistent virtual desktops and shared, non-persistent desktops — from a single console. Optionally, IT can manage cloud-hosted desktops and apps with existing enterprise tools. Horizon Cloud customers can additionally take advantage of Just-in-Time Management Platform (JMP) technologies — including App Volumes, Instant Clones, and User Environment Manager — to simplify how desktops are provisioned and managed.
- » **Integrated security.** With built-in security capabilities such as secure point-to-point network connectivity, dedicated compute, and network isolation, IT can better ensure that corporate data and applications are secure.
- » **Enterprise-class service.** With VMware Horizon Cloud, IT has access to the expertise of specialists who are skilled at running cloud-hosted desktops at scale. Furthermore, IT can effectively offload the service, support, and SLAs associated with the management of the underlying infrastructure.

VMware's vast end-user computing portfolio and adjacent product lines enable a holistic approach to the delivery, management, and security of applications and/or desktops regardless of device form factor.

## The Business Value of VMware Horizon

### Study Demographics

IDC interviewed eight VMware end-user computing customers to understand the impact of desktop and application virtualization initiatives on the VMware Horizon platform on their costs, operations, and businesses. IDC conducted interviews with VMware customers of varying sizes, ranging from 80 employees to 175,000 employees, with an average employee base of 24,800 and a median of 2,700. Interviews reflected the experience of a number of industries, as shown in Table 1.

TABLE 1

## Demographics of Interviewed Organizations: VMware Horizon

	Average	Range
Number of employees	24,800	80 to 175,000
Number of IT staff	477	1 to 3,000
Number of employees using IT services (IT users)	22,100	80 to 157,500
Number of VMware Horizon users	2,600	80 to 7,300
Number of devices on which VMware Horizon is accessed	1,885	80 to 5,500
Number of applications on VMware Horizon	143	8 to 500
Industries	Natural resources, healthcare, financial services, education, public services, retail	

*n = 8 interviewed organizations*

*Source: IDC, 2017*

These organizations are supporting 2,600 users on average with virtualized desktops and applications through VMware Horizon with 1,885 virtual desktops. Six of these organizations are using VMware Horizon on-premises, with two organizations using VMware's Horizon Cloud. Three of the organizations reported using Horizon Standard, three reported using Horizon Enterprise, and two reported using Horizon Advanced and Horizon Enterprise. Organizations reported that they are supporting a number of use cases, including: :

- » **Productivity applications.** Several organizations have made applications including CRM and Microsoft Office available through virtualized desktops.
- » **Call center operations.** Two organizations are supporting their call center operations on the VMware Horizon platform.
- » **Healthcare applications.** Two healthcare organizations are providing industry-specific applications such as Epic to their nurses and physicians on the VMware Horizon platform.
- » **Industry-specific applications.** A financial services organization is providing access to loan origination documents to its employees and customers through virtualized desktops.



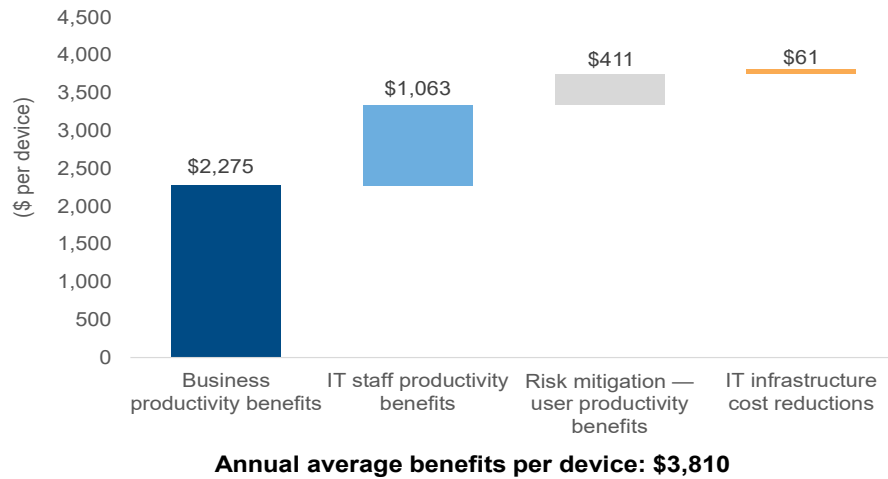
## Business Value Analysis

Interviewed organizations reported enabling their business operations and making their desktop environments more cost effective and efficient on the VMware Horizon platform. IDC calculates that these organizations will achieve average business benefits worth \$7.18 million per year over five years (\$3,810 per device) in the following areas (see Figure 1):

- » **Business productivity benefits.** Desktop and application virtualization supports user mobility and improves access to business applications, in addition to saving time on device and application log-ins. These efficiencies enable better customer service, reduced operational costs, and the capturing of more revenue. IDC puts the value of higher user productivity and revenue gains at an average of \$4.29 million per year over five years (\$2,275 per device).
- » **IT staff productivity gains.** Virtualized desktop environments require much less IT staff time to deploy, manage, and maintain than traditional PC environments. IDC calculates that interviewed organizations will benefit from IT staff time savings and efficiencies worth an average of \$2.00 million over five years (\$1,063 per device).
- » **Risk mitigation — user productivity benefits.** Virtualized devices experience fewer outages and security breaches, and problems are resolved in less time. As a result, problems exact a lower toll on user productivity and business operations. IDC projects the value of higher productivity and avoided revenue loss at \$770,000 on average over five years (\$411 per device).
- » **Device-related cost reductions.** Virtualized desktops cost less than traditional PCs, have longer replacement cycles, and require less power to operate. As a result, IDC calculates average savings of \$120,000 per year over five years (\$61 per device).

**FIGURE 1**

**Average Annual Benefits per VMware Horizon Device**



Source: IDC, 2017

**Business Productivity Benefits**

Desktop and application virtualization on the VMware Horizon platform has made the interviewed organizations more operationally agile and increased productivity levels. With VMware Horizon, they are able to deliver consistent experiences with key business applications to their users regardless of location and device. This improves mobility and business agility, which is translating into more productive employees, better ability to support customers, and higher revenue.

**The Benefit of Greater Mobility and Access to Applications**

Desktop and application virtualization on the VMware Horizon platform has driven employee mobility deeper into these organizations. IT managers at these organizations explained that they needed to break away from the constraints of traditional PC environments and disentangle employee productivity from legacy infrastructure and processes. With virtualized desktops and applications, employees can work at a time and location convenient to them, with consistent and timely access to the applications and services they need to do their jobs. One organization explained that this has transformed how its employees work: *“We put [a group of users] on VDI and now they can work from their iPads in their cars and we can just put information right into the system or collaborate with others online .... So their productivity is way up, and the department is loving it because it’s helping them save in overtime.”*

The impact of desktop and application virtualization with VMware Horizon has been especially significant on employees who are mobile within a workplace, work in branch or remote office environments, or require frequent but interrupted access to applications. Examples include:

- » **Enhanced mobility.** A healthcare organization has made its caregivers more productive by giving them mobile and timely access to applications instead of needing to find workstations each time they want to use these applications: *“We are confident that a physician saves about a half hour per day and an average nurse saves about 50 minutes a day.”*
- » **Virtualizing key applications.** Another organization in the healthcare industry has enabled substantial time savings for employees across its organization using medical applications. It explained: *“VMware Horizon is a big time saver for anyone using our medical application, which includes all of our clinical users .... They’re able to use the system anywhere they want — I think they’re saving 10% of the time they spend using that application.”*

Desktop and application virtualization has also contributed to making organizations more operationally agile. With the VMware Horizon platform, they are more flexible and faster to deliver devices and applications to users. Less time is required to prepare devices for new users, and new applications as well as updates and patches can be delivered without needing to access endpoint devices. These factors reduce the friction associated with provisioning and supporting devices that users rely on to do their jobs and make the physical location of a device less important. Examples of increased operational agility with desktop and application virtualization include:

- » **More distributed workforces.** A healthcare provider can support distributed call center operations, allowing it to locate call center agents where they can best serve customers: *“We have opportunities to support our solutions in new and interesting ways. For example, call center agents can now work from home, which enables us to do a call center offshore.”*
- » **Speed of onboarding.** An organization in the financial services industry gets new hires working at full productivity in substantially less time with virtualized desktops: *“We’ve sped up the onboarding of projects. To get a new employee up and running now takes half an hour, compared to two to three hours. We probably have ten new hires per month.”*

Greater agility enables these organizations to better serve their customers. IDC projects that they will realize an average of almost \$1.5 million per year in additional revenue

through the agility, flexibility, and reliability of virtualized desktops and applications on the VMware Horizon platform.

### Time Savings and Efficiencies with VMware Horizon

In addition to mobility and agility, interviewed organizations benefit from discrete employee time savings and efficiencies. In particular, employees spend less time on repetitive tasks such as logging into devices and applications and benefit from having near-real-time access to devices and applications with thin- and zero-client devices. These time savings can ensure a more positive experience, especially when users are serving customers, patients, and constituents (see Table 2).

TABLE 2

#### User Time Savings: VMware Horizon

	Before VMware Horizon	With VMware Horizon	Difference	Benefit (%)
<b>Device log-ins</b>				
Number of device log-ins per day	3.3	3.3		
Time per device log-in (minutes)	3.8	0.9	2.9	77.5
Hours spent logging into devices per user per year	50.2	11.3	38.9	77.5
<b>Application log-ins</b>				
Number of application log-ins per day	11.0	11.0		
Time per application log-in (seconds)	17.0	5.3	11.7	68.6
Hours spent logging into applications per user per year	12.5	3.9	8.6	68.6
<b>Total hours spent logging into devices and applications per user per year</b>	<b>62.6</b>	<b>15.2</b>	<b>47.5</b>	<b>75.8</b>

Source: IDC, 2017

### Lower Total Cost of Operations

In addition to enabling productivity and operational agility, virtualized desktops and applications on the VMware platform cost substantially less to deploy, maintain, support, and use than traditional PCs. Historically, organizations have sought as much as possible to minimize device-related costs and staff time costs associated with device support

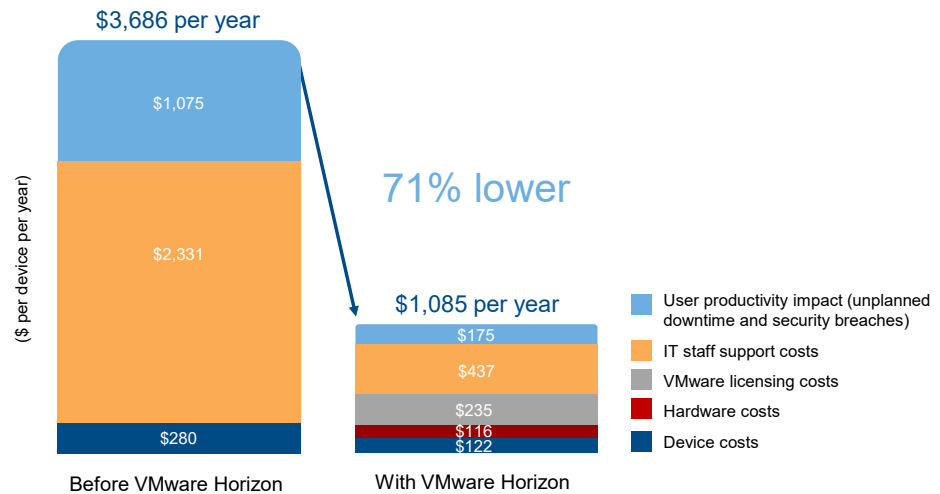
and performance, including IT staff time and user productivity. IDC's research shows that desktop and application virtualization on the VMware Horizon platform continues to provide clear cost benefits for interviewed organizations; IDC calculates that virtualized desktops cost an average of 71% less to buy, deploy, support, maintain, and use over five years on a per-device basis because of:

- » **IT staff efficiencies.** Virtualized desktops require much less IT staff time to deploy, support, and maintain than traditional PCs.
- » **Reduction in lost user productivity.** Virtualized desktops deliver higher uptime, meaning that less productive employee time is lost and there are fewer operational disruptions.
- » **Device cost savings.** Virtualized desktops cost less, have longer device life cycles, and require less power to run than traditional PCs.

Figure 2 shows the annual cost of operations with VMware Horizon.

FIGURE 2

### Annual Cost of Operations: VMware Horizon



*Note: Initial hardware and VMware licensing costs are annualized based on a three-year life-cycle assumption; VMware licensing costs include both initial annualized and annual costs; IT staff support costs include time costs for help desk support, desk-side support, device management, back-end support, and security management.*

Source: IDC, 2017

#### IT Staff Efficiencies

Virtualized desktops on the VMware Horizon platform require much less IT staff time for maintenance and support than traditional PCs. These efficiencies stem from

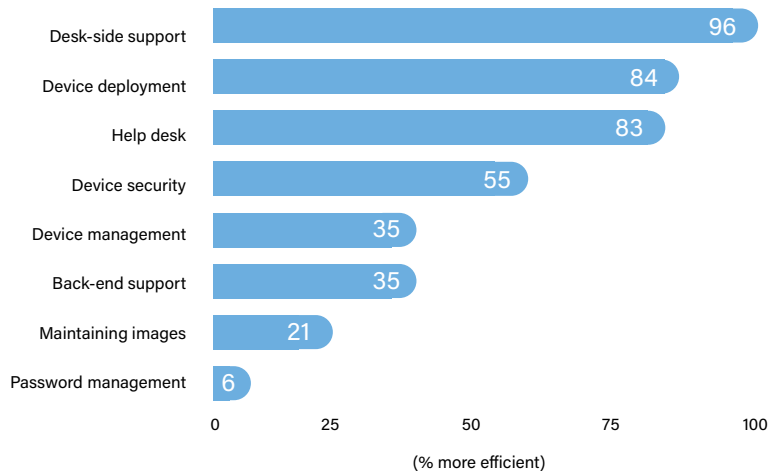
characteristics of virtualized desktops such as their reliability, centralized management, and ease of ensuring security. As a result, interviewed organizations require 81% less IT staff time across the device life cycle on a per-device basis. For IT organizations seeking to become business partners and enablers, the efficiencies from minimizing the burden associated with supporting users can free up resources to pursue IT innovation and other business-enabling initiatives or support expanding device bases without commensurate staffing increases. A healthcare provider explained: *“We’ve increased our endpoint distribution by one-third with VMware Horizon, and the interesting thing is our service desk call volume dropped. As a result, we’ve avoided hiring — we probably would have needed to hire two service desk staff and one desktop support staff the old way.”*

Interviewed organizations attributed substantial IT staff time savings and efficiencies to their move to virtualized desktops in a number of areas, as shown in Figure 3:

- » **Device deployment.** Virtualized devices require less time to deploy than traditional PCs because they typically run fewer applications and have more standardized setup processes.
- » **Device support.** Virtualized devices experience fewer hardware-related problems, and centralized patching, updates, and application deployment reduce the amount of staff time required for ongoing and desk-side support.
- » **Device security.** Virtualized devices can more easily be locked down and wiped, making it less time consuming to ensure device security.
- » **Device management.** Virtualized devices and applications are managed centrally, which means that less staff time must be spent supporting users at the endpoint level.
- » **Device back-end support.** The VMware Horizon platform requires less datacenter staff time to support due to its serving as a single platform for devices and its reliability.
- » **Other device-related tasks.** Issues related to images and passwords occur less frequently with virtualized devices.

FIGURE 3

## IT Staff Efficiencies: VMware Horizon



Note: Figure 3 compares these IT staff responsibilities in the VMware Horizon environment with those before VMware Horizon deployment, rather than on a per-device basis.

Source: IDC, 2017

### Risk Mitigation and Availability

Virtualized desktops and applications provide the uptime and availability that the interviewed organizations need to support their users and businesses. Virtualized desktops can be managed and locked down centrally, which better enables IT teams to limit outages and security-related problems. In addition, centralized management provides visibility when problems occur, which helps IT teams resolve problems in less time. Furthermore, virtualized desktops can be isolated, swapped out, and wiped with relative ease, which mitigates the impact of viruses and other security breaches.

IDC calculates that interviewed organizations are reducing the impact of device-related issues such as unplanned downtime and security breaches by an average of 84% per device on the VMware Horizon platform (see Table 3).

Improved device reliability can also translate into better business outcomes for interviewed organizations. For example, a retailer explained that it is able to better serve its large customer base with virtualized desktops supporting its call center operations: *“We can serve customers better with VMware Horizon because of high availability and less downtime for our end users . . . . This means call agents are available more quickly, and this translates into more revenue.”*

TABLE 3

## Unplanned Downtime and Security Breaches: VMware Horizon

	Before VMware Horizon	With VMware Horizon	Difference	Benefit (%)
<b>Unplanned downtime</b>				
Number of instances per year	15.8	13.9	1.9	12.1
MTTR (hours)	1.4	1.0	0.4	27.2
Hours of unplanned downtime per device per year	16.4	3.2	13.2	80.2
Equivalent FTEs	11.2	3.3	7.9	71.0
<b>Security breaches</b>				
Number of security breaches per year	17.0	12.4	4.6	26.9
MTTR (hours)	11.7	5.7	6.0	50.9
Hours of security breach impact per device per year	8.1	0.2	7.8	97.0
Equivalent FTEs	5.5	0.2	5.3	95.6

Source: IDC, 2017

### IT Infrastructure Cost Reductions

Interviewed organizations have reduced device-related costs by an average of 56% by moving to the VMware Horizon platform. These cost reductions are the result of three factors:

- » **Virtualized devices cost less.** Replacing traditional PCs or desktops for thin- or zero-client devices means lower up-front device costs.
- » **Virtualized front-end devices last longer.** Virtualized front-end devices such as thin- and zero-client devices last longer — 62% longer on average according to interviewed organizations (6.6 years versus 4.1 years), meaning that devices must be replaced less often.
- » **Virtualized devices have lower ongoing costs.** Several interviewed organizations credited moving to centralized virtual desktops with VMware Horizon with enabling substantial power savings. For organizations supporting an average of 1,885 virtualized devices, ongoing cost savings in areas such as power can quickly add up.



## ROI Analysis

IDC interviewed eight organizations using VMware Horizon as their platform for virtualized desktops and applications in 2015 and 2016 and recorded their results to inform this study's analysis. IDC used the following three-step method for conducting the ROI analysis:

- 1. Gathered quantitative benefit information during the interviews using a before-and-after assessment.** In this study, the benefits included employee productivity gains and time savings, increased revenue, reduced IT staff time needed to support end-user devices, and device-related cost reductions.
- 2. Created a complete investment (five-year total cost analysis) profile based on the interviews.** Investments go beyond the annual costs of using VMware Horizon and can include additional costs related to the solution, including migrations, planning, consulting, configuration or maintenance, and staff or user training.
- 3. Calculated the ROI and payback period.** IDC conducted a depreciated cash flow analysis of the benefits and investments for the organizations' use of VMware Horizon over a five-year period. ROI is the ratio of the net present value and the discounted investment. The payback period is the point at which cumulative benefits equal the initial investment.

Table 4 presents IDC's analysis of the average discounted benefits, discounted investment, and return on investment for the VMware customers interviewed for this study. IDC projects that over five years, these organizations will make an average discounted investment of \$4.94 million in VMware Horizon, including licensing, server, device, consulting, training, and device and back-end infrastructure staff support costs (\$2,620 per device), and achieve discounted business benefits worth \$25.34 million (\$13,444 per device). This results in a five-year average ROI of 413% and a break-even period of 9.3 months on their investment in VMware Horizon.

TABLE 4

## Five-Year ROI Analysis

	Per Organization	Per VMware Horizon Device
Benefit (discounted)	\$25.34 million	\$13,444
Investment (discounted)	\$4.94 million	\$2,620
Net present value (NPV)	\$20.40 million	\$10,824
Return on investment (ROI)	413%	413%
Payback period	9.3 months	9.3 months
Discount rate	12%	12%

Source: IDC, 2017

## Challenges and Opportunities

### Challenges

Organizations looking to virtualize their client environments should carefully analyze their own unique organizational needs, develop a specific client virtualization strategy, and then adopt the types of client virtualization technologies that fit their needs. However, that is not to say that organizations are limited to one specific client virtualization technology; more often than not, better results can be realized through combining technologies, as depicted in this white paper.

While the promise of client virtualization has long been compelling, IT departments are often challenged by implementation roadblocks related to the complexity of designing, scaling, and managing a high-availability VCC deployment. Therefore, it behooves IT to take into account potential performance optimization roadblocks, which can be easy to miss unless the proofs of concept take into consideration all of the variables that exist in the production environment. For instance, inadequate storage, network, and server capacities can severely limit the effectiveness of a VCC implementation. In addition, organizations should bear in mind issues that wouldn't be apparent until a scaled deployment is under way, such as VM density, VM boot storm, network load, and storage I/O blending.

Thus, to help maximize ROI on VCC projects, organizations should complete a comprehensive testing phase in order to mitigate the risk of performance degradation when the technology is put into production. Understanding the requirements for client virtualization optimization and the cost of deployment as long-term investments can

create the right mindset and expectations when exploring this technology. The effort to deploy and manage VCC technology involves both technical and organizational dimensions. If the end-user experience is poor, business users will simply go back to their pre-existing local desktop experience.

To that end, while VCC technologies offer capabilities associated with improving the overall desktop management paradigm, more importantly, the inherent benefits of VCC are results of an improved long-term business productivity strategy in which employees are empowered to securely access corporate data and applications anytime and anywhere across their devices of choice.

## Opportunities

Enterprises have quickly discovered that the use of virtualization to support desktop workloads creates significant benefits, including improved IT management efficiency, improved price efficiencies, and improved capabilities. IDC categorizes these benefits as follows:

- » **Quantifiable.** Virtual desktops can drive benefits that are directly measurable, as showcased in this white paper. Virtual machines rely less on the horsepower of the endpoint devices themselves, thus creating an opportunity for IT to significantly drive down the cost of endpoint hardware either by extending the life span of existing PCs by repurposing them as virtual endpoints or by replacing PCs with a thin-client device. The simplified management model of VCC can further drive down the total IT costs by enabling IT to work more efficiently. In addition, VCC can make users more productive by improving desktop reliability, lessening the need to contact support.
- » **Functional.** Certain key functions of desktop management can be improved with VCC. The ability to move data from the edge of the IT environment into the datacenter inherently reduces the security risks to an IT organization. Data backup is improved because virtualized desktops reside entirely within the datacenter. These security and backup improvements make it easier to ensure full compliance. Disaster recovery is significantly simplified because central IT staff can effortlessly revert virtual desktops back to their last known good states.
- » **Organizational.** Traditional tension between IT and the rest of the organization can be lessened with VCC. Because virtual desktops are easier to manage and secure than traditional desktops, IT can provide end users more freedom and promote goodwill. VCC can also improve the user experience, especially compared with aging physical PCs. In addition, VCC can allow users ubiquitous access to their virtual desktops and applications on any device, which can improve overall user satisfaction.

For many organizations, however, resources and expertise aren't available to effectively implement and/or operate client-side virtualization. As a result, IT often faces significant roadblocks associated with the complexity of designing and implementing the underlining infrastructure (e.g., storage, networking, and compute) required to run a high-availability virtualized client environment.

However, with the advent of hosted or managed virtual client computing, many of these long-standing challenges can now be fully addressed. This is where virtual desktops hosted by managed service providers or cloud providers become a viable solution. Virtual desktops are commonly referred to as desktop-as-a-service (DaaS) or hybrid offerings with cloud managed desktops that are paired with on-premises infrastructure.

DaaS or hybrid cloud computing can reduce the initial investment by requiring little, if any, onsite datacenter capacity. At the same time, these options can be deployed quickly, and end-user management can be outsourced to the hoster too. The user experience with DaaS, however, may not be as good as the user experience with onsite VCC solutions because of WAN bandwidth limitations. And this is where hybrid cloud computing options can help because they simplify management while ensuring that compute resources and infrastructure sit locally to provide the best possible user experience.

Moving desktop provisioning and management to a service provider-hosted environment or hybrid deployment model can help IT organizations avoid large capital outlays and failed implementations. Other benefits of going with a cloud service for virtual desktops include:

- » On-demand workspace — full desktops or just applications
- » Ability to try before you buy
- » Scale by user or by group
- » Fast time to value
- » Simplified rollout and deployment

That said, regardless of the VCC deployment model (on-premises, hybrid, and/or hosted), IT organizations must take into account the unique needs of their business users and leverage solutions that allow them to optimize both the performance and the manageability of an ever more dispersed and disparate endpoint device landscape.

## Summary and Conclusion

On-demand access to corporate applications and data is no longer a “nice to have” in today’s demanding environment; it is an outright necessity. Likewise, BYOD, mobility, and cloud technologies are adding significant complexity to device and application management. And these trends show no signs of slowing. As a result, more and more IT executives struggle when attempting to empower users with modern technologies while still maintaining proper governance and control over their organizations’ increasingly diverse and burgeoning IT assets.

Therefore, IT organizations must find innovative ways to optimize user experience across varying device types in order to curb potentially damaging rogue IT trends. It’s also imperative that IT streamline and simplify its service and support processes to remain relevant and efficient and reduce unnecessary costs to the business. By leveraging a client virtualization offering, organizations can enable a mobile and global workforce while also freeing up valuable IT staff and resources as well as optimizing support for business expansions, mergers, and acquisitions.

However, IT organizations looking to quickly deliver desktops, applications, and data need to determine if they have the skill set and expertise to rapidly deploy, manage, and scale virtual desktops. In addition, IT staff must plan for properly patching and deploying applications and software as well as user policies to a heterogeneous mix of virtual, physical, and mobile devices. Historically, this has been accomplished with a siloed/point product approach. Thus we’re seeing the need for continued growth in unified device management.

Therefore, vendors that can offer holistic device management solutions are well positioned for growth. With a wide range of end-user computing products and services that include Horizon and Horizon Cloud, VMware has an advanced ability to focus on both the delivery and the management of virtualized desktops and applications.

IDC’s study of organizations adopting a VCC environment with the VMware Horizon platform shows that investment in the technology can result in significant business value and high ROI. IT organizations with high densities of users uniformly accessing business applications can benefit.

To the extent that they undertake VCC deployment as a long-term investment in both technology and organizational processes, they can expect to obtain positive business value benefits and to be able to manage user and desktop use cases that had proved difficult to control before the advent of VCC.

## Appendix

IDC's standard ROI methodology was utilized for this project. This methodology is based on gathering data from current users of VMware Horizon as the foundation for the model. Based on these interviews, IDC performs a three-step process to calculate the ROI and payback period:

- » Measure the savings from reduced IT costs (staff, hardware, software, maintenance, and IT support), increased user productivity, and improved revenue over the term of the deployment.
- » Ascertain the investment made in deploying the solution and the associated migration, training, and support costs.
- » Project the costs and savings over a five-year period and calculate the ROI and payback for the deployed solution.

IDC bases the payback period and ROI calculations on a number of assumptions, which are summarized as follows:

- » Time values are multiplied by burdened salary (salary + 28% for benefits and overhead) to quantify efficiency and manager productivity savings.
- » Downtime values are a product of the number of hours of downtime multiplied by the number of users affected.
- » The impact of unplanned downtime is quantified in terms of impaired end-user productivity and lost revenue.
- » Lost productivity is a product of downtime multiplied by burdened salary.
- » Lost revenue is a product of downtime multiplied by the average revenue generated per hour.
- » The net present value of the five-year savings is calculated by subtracting the amount that would have been realized by investing the original sum in an instrument yielding a 12% return to allow for the missed opportunity cost. This accounts for both the assumed cost of money and the assumed rate of return.

Because every hour of downtime does not equate to a lost hour of productivity or revenue generation, IDC attributes only a fraction of the result to savings. As part of our assessment, we asked each company what fraction of downtime hours to use in

calculating productivity savings and the reduction in lost revenue. IDC then taxes the revenue at that rate.

Further, because IT solutions require a deployment period, the full benefits of the solution are not available during deployment. To capture this reality, IDC prorates the benefits on a monthly basis and then subtracts the deployment time from the first-year savings.

*Note: All numbers in this document may not be exact due to rounding.*

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