INTRODUCTION

This Server StorageIO® Industry Trends Perspective report looks at industry trend challenges and how to determine Pro-forma, Return on Investment (ROI) cost savings analysis of using a global control plane (Control Plane) for managing cloud-based virtual desktop infrastructures (VDI) environments.

A key driver for this analysis is that VDI has evolved from being a 'second-class citizen' commonly deployed for lower priority use-cases with lower resource requirements to higher performance, more demanding workloads, and users. In some cases, this includes mission-critical applications and their users requiring highly managed data infrastructures[1]. This means that VDI has become an enterprise-class, tier-one workload in many environments that can cause new levels of management headaches and resource demands.

Who This Applies To?

Information Technology (IT) organizations and professionals who have growing cloud-connected VDI environments. This also applies to those looking to respond to the new post Covid 19 workplace requirements including scale, performance, and flexibility. In addition, this applies to those looking to improve:

- Operational and cloud costs expenditures
- Virtualized application service delivery
- Increasingly complex endpoint dynamics

Industry and Trends

A common industry trend is the increase in work-from-home (WFH) is contributing to VDI services demand and affecting new application and user workloads. Another industry trend is the evolution of VDI from being seen as a capital expenditure (CapEx) cost-cutting technique (often applied to "second class" applications use-cases), shifting to focus on optimization and effectiveness. This focus shift includes investing and realizing a return on investment (ROI) applied to traditional "first-class" applications and users' workloads.

Another trend is leveraging VDI to replace traditional VPN access to reduce associated management costs and headaches. We are also seeing increased pressure from finance departments to address exploding OpEx costs. The bottom line, for now, IT teams are being tasked to find ways to reduce cloud, management, and other recurring expenses without compromising application performance or user productivity.

The OpEx Opportunity

The OpEx Opportunity is to gain insight and awareness into your recurring costs, and instead of simply cost cutting that can compromise productivity, find and fix the root issues. For example, knowing your cloud costs and aligning the applicable effective resources to boost productivity vs. simply focusing on efficiency and cost avoidance. Yet another opportunity is to leverage automation and management tools to reduce your recurring OpEx costs, while potentially supporting growth in workload and user productivity.

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[1] Data Infrastructures exist inside physical datacenters (on-prem and cloud) and include servers, storage, networks, hardware, software, security, service, processes and policies. https://storageioblog.com/data-infrastructure-primer-overview/ Learn more about Software Defined and traditional Data Infrastructures via https://storageio.com/book4.html

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Common Customer Challenges

Several potential cost challenges can come about with the increased dependencies upon VDI services and the data infrastructures they rely upon. The expansion of VDI use-cases has moved from hourly, transient, and temporary requirements. VDI now includes business and mission-critical users and their applications and the broader base knowledge workers with their resource-demanding applications (GPU, CPU, memory, I/O, storage).

Shifting from traditional IT applications and on-prem resource-intensive data infrastructure delivery platforms, including desktops and workstations, to cloud-based VDI can potentially eliminate CapEx spending for this workload set. However, it does that by replacing the CapEx with OpEx and brings an alternative set of associated management costs.

Instead of simply moving from CapEx to OpEx spending, compare traditional VDI and associated data infrastructure paradigm with cloud-based software-defined data infrastructures. The key is finding a balance of cost savings while boosting performance and user productivity and reducing management headaches (and spending).

In addition to the financial engineering challenge, there remain concerns around security, privacy, compliance, audit, software license costs, VPN management complexity, all of which add to the increased management workload and resulting costs. Increased complexities include more than just re-hosting Windows or other desktops from on-premises to the cloud.

Current customer challenges and costs about cloud-based VDI environments include:
- Work from home (WFH) driving up the demand and need for VDI services
- Expanding VDI footprint in terms of the number of users (total named and concurrent)
- New VDI workloads including "power" users needing more resources vs. traditional VDI users
- Increased dependencies on VDI services being available and mission-critical
- Managing and contain growing cloud data infrastructure resource costs
- Consolidated management of all VDI hybrid/multi-cloud environments from a single tool

VDI Management Activities and Cost

Today's VDI workloads and users are demanding more robust, complex layers of performance and application data infrastructure services (compute, storage, networking, security) along with on-demand provisioning and access to a broader resource base.

Common VDI management tasks include:
- Initial deployment of the VDI environment, including provisioning of VDI resources (VMs for compute, storage, network, and security resources)
- Provisioning of application stacks (which may vary based upon user profiles)
- Provisioning and alignment of user identity dynamics (i.e., based upon AD group policies) with information and resource access and usage
- Recurring VDI environment management (errors & omission remediation, updates, security)

The ability to support rapid on-demand VDI deployment requires moving from traditional "manual operation" ways of doing things (including writing and managing a library of scripts) to modern management paradigms. Modern VDI management solutions leverage a global control plane, enabling automated resource control and timely insight and situational awareness. NetApp VDS is an example of a modern global control plane-enabled VDI management solution.

Everyday recurring VDI management activity includes, among others:

- Management of the VDI infrastructure stack
  - User session VMs
  - Infrastructure VMs (gateways, brokers, etc.)
  - Storage (shared storage and user storage such as FSLogix containers and roaming profiles)
  - Network connectivity, including security
  - Windows OS layer (versions, updates, patches)
- Management of the user applications (often by user group and AD policy)
- Monitoring of infrastructure resource usage and errors
- Configuring and remediation across the VDI deployment stack
- Provisioning new compute, storage, data protection, security, networking resources on demand
- Addressing user security and profile requirements
  - AD authentication requirements
  - User password and MFA management, enforcement, troubleshooting
- Maintaining service delivery, performance, and cost situational awareness

Reducing VDI Management Cost

Reducing both initial and recurring VDI management costs is an OpEx Opportunity to realize cost savings without adding complexity or compromising user productivity. However, as we discussed in the previous section, this comes with the shift to a different type of OpEx opportunity by reducing management costs and cloud resource subscriptions.

Another OpEx opportunity is changing how cloud-based VDI, resources, and applications are managed. By leveraging a modern global control plane VDI management solution, recurring cloud infrastructure OpEx spend can be reduced while maintaining or enhancing performance, availability, and capacity economics (PACE). In other words, instead of merely cutting costs and reducing VDI service commensurately, there is an opportunity to remove costs while boosting performance, supporting growth, and enhancing availability, including security and data protection.

OpEx savings can be realized for cloud-based VDI deployments using management tools that enable automation and timely insight for situational awareness to make informed decisions. Modern management tools for VDI with a global control plane are integrated with leading cloud providers' data infrastructure resources, operating systems, and associated data infrastructure allowing streamlined management of larger-scale VDI deployments.

In addition to management task automation, insight, and awareness to reduce OpEx costs, modern intelligent, integrated tools can also reduce cost by dynamically adjusting underlying VM and other needed VDI resources. Modern VDI management tools help minimize management and data infrastructure resource OpEx costs (e.g., cloud spend) interacting with LiveScaling and Resource Scheduling Engine technologies.

Modern management tools such as control-plane-based cloud solutions enable dynamic workload event timed scaling (up and down) of VDI resources to meet users' demands as they log on. The result is to streamline deployments via automated management, saving resources and overall IT administrative costs. The OpEx Opportunity is achieved by having the correct number of resources when required instead of having too many resources not being used or not enough to meet demand.

Pro-Forma VDI Management Cost Saving Analysis

Forward-looking Pro-forma predictive models or forecasts compare estimated costs on an economic basis. The methodology described below combines your known costs and configuration information along with prevailing industry standards, industry-recommended general rules of thumb (RUT), and those found via your favorite search tool.

To conduct a Pro-forma cost analysis of VDI management cost savings to support rapid automated provisioning, along with cost-effective resource usage, start by outlining the management tasks. Outline the management tasks you face in providing a VDI infrastructure to your users (both initial setup and recurring management tasks) along with the management cost parameters associated with these tasks. Then you can balance the technology benefit (reduction of work) with the investment required for the technology (OpEx) and make the right decision as to the technology base that's right for you.

Note that admin time is the working hours spent performing the work and not doing other tasks. The admin's working hours also include time from disruptions or resuming duties after shifting focus to another task and then back to VDI management activities.

VDI management Pro-forma analysis cost comparison includes:
- Admin (e.g., man-hours) time for performing initial deployment management tasks
- Admin time for performing recurring management tasks and user provisioning

Let's start by taking a closer look at everyday VDI management activities and subsequent costs.

Table 1 shows additional examples of common initial VDI deployment management tasks that can vary depending on the cloud platform, type of VDI deployment, among other criteria. Understanding the various steps and functions and the amount of time required for performing those items is critical for conducting a Pro-forma ROI management cost analysis.

Table 1 – Common Initial VDI deployment management tasks

Initial VDI setup tasks	General VDI management tasks
• Gather various credentials • Verify cloud subscription • Check admin account and credentials • Get domain tools permissions • Run domain prep tool • Build AD VMs, set up HA • Build RDS gateways and setup DNS • Network and security preparation • Establish VPN/AD connection • Deploy storage file server • Establish drive mappings • Set RDS number, if not WVD • Thinprint server if needed • AD/DC baseline GPOs & MFAs • Create database server and configure	• Install images & apps, image configuration • Set up first VM, build host pool and app group • Set disconnect/logoff policies • Assign users to apps groups • Set folder security permission • Data and user migration • Setup TS/RDS if needed • Setup scripted VM start/stop • Define & validate scaling rules • Activate WVD as needed • Policy settings for teams • Apply initial software updates or patches • Setup, enable HA/replication • Initial backups (master, gold) • Creation of custom scripts and tools

Another critical component for conducting a Pro-forma VDI management cost ROI analysis is understanding the ongoing, recurring monthly activities required to support the environment and the time needed for those tasks. To the outlined tasks, apply your specific labor rates and other financial parameters to determine your cost of providing this type of data infrastructure service.

Table 2 – Common Recurring VDI related management tasks

VDI user management and client support	General VDI management tasks	VDI Software and Platform maintenance tasks
• General VDI user support • Unlock locked user accounts • Reset user account password • Create and set up VDI user • Check and kill processes • Manage VDI user storage • Troubleshoot network access • Maintain user VPN access • Communicate updates	• Ongoing site remediation • Time connecting to VMs • Storage and data protection • Networking, security, VPN • Monitor application usage • Monitor service performance • Monitor cloud usage costs • Add, start, stop, resize VMs • Set up another admin • Give admin rights to a user • Temporary 3rd party access • Maintain automation tools • Run custom scripts as needed • Migrate a user from site A to site B (hybrid or multi-cloud)	• Update VDI VM OS images • Update VDI images • Update VDI applications • Maintain 3rd party tools • Maintain 3rd party apps • Maintain, update, debug custom scripts and tools

Table 2 outlines common examples of recurring VDI management tasks to support a 100 user plus environment. Similar to understanding your initial VDI deployment tasks and the time required to conduct those activities, knowing or determining your recurring management activities and the cost is key to a successful Pro-forma ROI analysis.

Once you have outlined your ongoing VDI management tasks and how much admin time they take for an initial and recurring basis, the next step is assigning cost. Note that admin time is how much time is focused on the given activity and not attending to other tasks. Admin time should also factor in disruptions from changing focus to something else, then back to the task at hand.

Admin cost is your known annual cost per admin for setting up and maintaining your VDI environment. Note that this can be a single admin, part of admin time, or multiple admins, focusing on how many admin hours are needed for the tasks. Then apply cost for the applicable number of admin hours. If you know your annual admin cost, calculate the average hourly rate (adjust for vacation or other non-work time). For example, assuming a yearly admin cost of $144,000 for 52 x 5 x 8 hours per year is $74.80 per hour.

Having your VDI management activity time for initial deployment and recurring activities, you can now calculate your costs. Using your hourly admin cost, multiply that times the number of hours per task for both initial and recurring expenses. For your Pro-forma analysis of time savings, use estimated or other time savings per management activity multiped by hourly admin cost. Note that you will also need to determine how many months to run the analysis.

Initial_Deployment_Time = Sum of time in hours for initial deployment tasks

Initial_Deployment_Cost = Initial_Deployment_Time x Admin_Hourly_Cost

Recurring_Time = Sum of time in hours for recurring tasks

Reccuring_Cost = Recurring_Time x Admin_Hourly_Cost x Number_Months

The next step in the Pro-forma VDI management cost savings analysis is determining time savings using a modern management tool. You can obtain the time required to perform various VDI management tasks from your proof of concept (POC) or working with your vendor. Note that your specific VDI management tasks and those of your vendors may need to be normalized as applicable.

Once you have VDI management task time savings or estimates, calculate your hours and costs.

Initial_Deploy_Time_Enhanced = Sum of time in hours for initial deployment tasks (enhanced)

Initial_Deploy_Cost_Enhanced = Initial_Deploy_Time_Enhanced x Admin_Hourly_Cost

Recurring_Time_Enhanced = Sum of time in hours for recurring tasks (enhanced)

Reccuring_Cost_Enhanced = Recurring_Time_Enhanced x Admin_Hourly_Cost x Number_Months

With the above, you can now conduct your pro-form analysis

Initial_Time_Savings = Initial_Deploy_Time - Initial_Deploy_Time_Enhanced

Initial_Cost_Savings = Initial_Deploy_Cost_Enhanced - Initial_Deploy_Cost_Enhanced

Recurring_Time_Savings = Reccuring_Time - Recurring_Time_Enhanced

Recurring_Cost_Savings = Reccuring_Cost - Reccuring_Cost_Enhanced

The above is a simple Pro-forma VDI management cost savings analysis example; for a more advanced approach, you can factor in different numbers of VDI users, types of VDI users (small or lightweight, medium, large, or heavy resource consumers). Additional Pro-forma model considerations can include which cloud platform, type of underlying storage being used, type of VDI services (e.g., RDS, WVD) among other criteria. Also, note that while the above focuses on VDI management, other OpEx Opportunities can be realized by looking at how underlying cloud data infrastructure resources are used.

Pro-Forma Cost Saving Analysis Example

Two examples are shown below using a fundamental Pro-forma ROI financial analysis comparing traditional managed VDI vs. automated cloud-based global control plane enabled VDI management such as NetApp VDS. Using a model developed by StorageIO™, a Pro-forma analysis and example are shown below. The Pro-forma analysis looks at the costs of deploying cloud-based VDI with traditional management and scripting tools (shown in red) and a modern management solution (shown in green). Note that with any model or forecast, your results will vary based on different assumptions, input data, and options selected, among other considerations.

Figure 1 – 12-month example traditional managed vs. global control plane VDI Pro-forma analysis
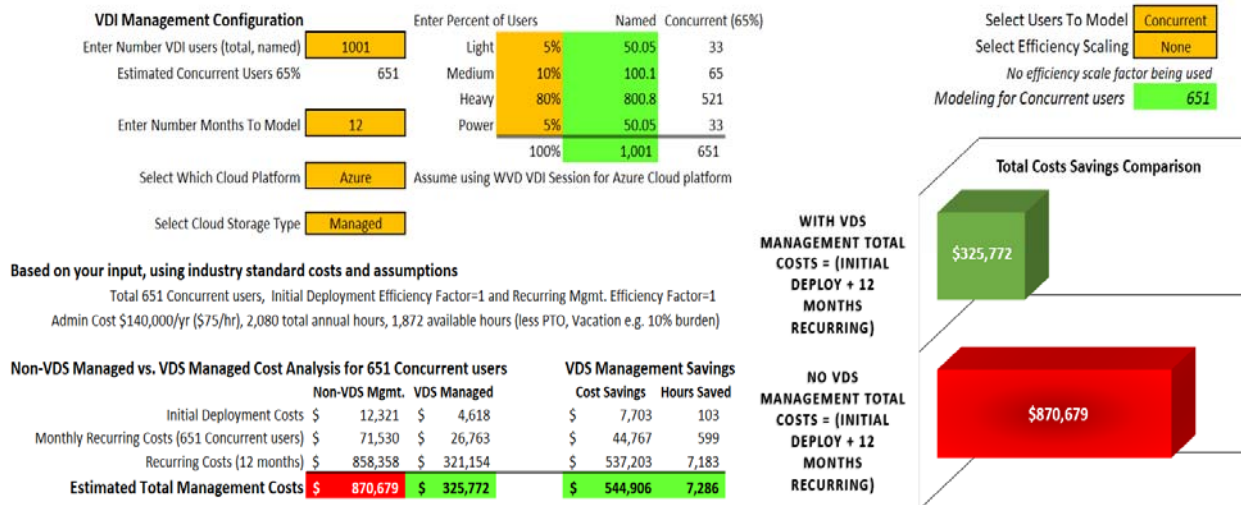
The first example (figure 1) assumes a VDI workload with 1,001 total VDI users with 65% of those (on average) being active at any one time (concurrent users), modeled out over 12 months using Microsoft Azure Cloud Platform and the WVD platform.
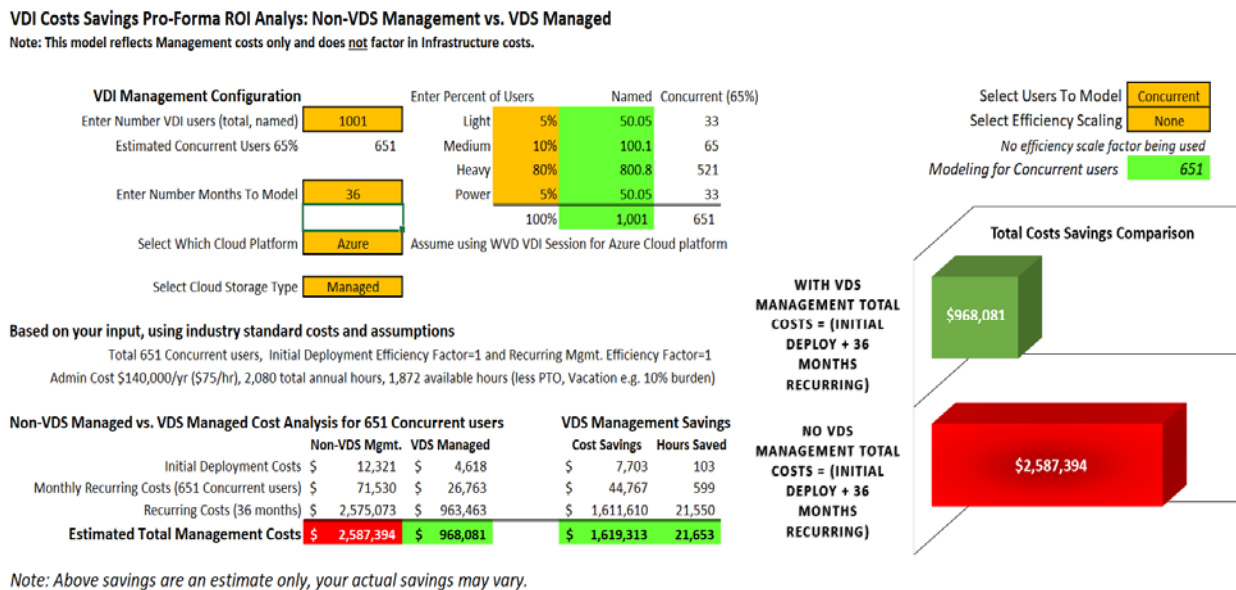
In figure 1, no efficiency factor is used for economies of scale with more users. Figure 1 shows a simple analysis where time and cost per initial and monthly recurring VDI management tasks are the same per user regardless of the number of users (e.g., linear scaling).

Figure 1 assumes that 5% of users are light resource workload, 10% are medium resource users, 80% are heavy resource users, and 5% are power users (normally graphically-intensive client applications). Other assumptions include an average VDI admin salary of $140,000 per year ($74.80 per hour), 2,080 total annual hours (52 x 5 x 8), of which 1,872 are available for work (excluding PTO, vacation).

For the 1,001 total (65% concurrent) users, the traditionally managed example in figure 1 shows that the initial deployment cost is $12,321 vs. $4,618 for the managed cloud-based VDI. Recurring monthly fees in the above example for the traditional managed cloud-based VDI are $71,530 vs. $26,763 with a modern global control plane enabled management solution. Total management costs for one year are $870,679 for traditional managed compared to $325,772 with global control plane managed cloud VDI, representing a savings of $554,906. In terms of hours saved, using a global control plane enabled VDI management solution, initial deployment savings are 103 hours and 599 recurring monthly hours. The result is a total of 7,286 hours saved from management tasks.

Figure 2 shows a Pro-forma analysis of 36 months. Other than the longer duration, the number of users is the same, as shown in figure 1.

Figure 2 – 36-month example traditional managed vs. global control plane VDI Pro-forma analysis

In figure 2, without a global control plane-based management solution, the management cost estimate is $2,587,394. With a global control plane-based VDI management solution, the 36-month management cost is $968,081, a savings of $1,619,313. Keep in mind what makes up the costs are the outlined tasks and the amount of time for them and your management (staff) costs. Also, keep in mind that the above Pro-forma analysis does not factor in efficiency savings from economies of scale (e.g., number of users), nor do they include potential data infrastructure resource savings (cloud storage, networking, compute, software).

The Server StorageIO view: What this all means

This paper, technology, Pro-forma ROI financial model, and analysis discussed are just part of addressing your OpEx Opportunity. Another OpEx Opportunity savings include reducing recurring VDI management costs by leveraging modern intelligent management solutions. Additional benefits include boosting app performance and user productivity while maximizing your investment in admin staffing.

Key Points and Takeaway Items
Key take away points include among others:
✓ Invest some time to realize ROI savings
✓ Leverage intelligent VDI management
✓ Realize OpEx Opportunity benefits
✓ Know your cost, start simple and expand
✓ Economic models should be relevant
✓ How will you use OpEx Opportunity savings?

The methodology and examples used in this paper exclude usage, subscription, or acquisition fees of modern VDI management solutions. Once you have established your VDI management ROI, leverage that knowledge in your discussions with management solutions vendors.

In addition to VDI management benefits, you can realize additional OpEx savings by exploring your cloud resource costs. Keep in mind, the sooner you can conduct a Pro-forma analysis, make a decision and implement a solution, the sooner you will realize ROI savings.

Budgets and economics are also always a concern, which for some applications means enabling more performance per cost. By not understanding your costs for supporting different workloads, you are at a disadvantage of not making informed decisions. Worse, you could perhaps miss out on being able to capitalize on potential economic benefits.

When it comes to making VDI cloud-related data infrastructure and associated resource decisions, avoid flying blind. Have good insight that includes technical, workload, and user productivity performance, and economic situational awareness. Leverage a fundamental Pro-forma financial analysis model for making informed decisions comparing VDI automated Management solutions using a global control plane vs. traditional manual management tools and scripts.

ABOUT THE AUTHOR

Greg Schulz is the Founder and Sr. Consulting Analyst of the independent IT advisory firm Server StorageIO (e.g., StorageIO®). He has worked in IT for electrical utility, financial services, and transportation companies in roles ranging from business applications development to systems management, architecture, strategy, performance, and capacity planning. Greg has also worked for various storage and networking vendors in sales, technical marketing and technologies roles. Mr. Schulz is the author of the books "Data Infrastructure Management: Insights and Strategies" (CRC Press 2019), "Software-Defined Data Infrastructures Essentials" (CRC Press 2017), as well as Intel, Recommended Reading List books "Cloud and Virtual Data Storage Networking" and "The Green and Virtual Data Center" via CRC Press, along with "Resilient Storage Networks" (Elsevier). Greg is a Microsoft MVP (Cloud Data Center Management) and has been a ten-time VMware vExpert. Learn more at storageio.com and storageioblog.com on Twitter @StorageIO