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Understanding Successful VDI Implementation.

A Technical Perspective.

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Introduction

As companies continue to push strategies that provide more business speed, flexibility and control, bringing order to the chaos that often exists in end user computing can be a top priority. Layer in the changes occurring in devices utilized by end-users, Forrester predicting the growth of wearable devices for example, and the complexity grows. Huge efforts are often required to achieve only moderate security, manageability and control. Many companies are looking at implanting a Virtual Desktop Infrastructure (VDI) as one approach to help achieve those goals as well as to improve business speed and flexibility. Historically, many VDI projects have not been successful at making it past the pilot phase, typically due to scalability, cost and performance issues. While a new generation of VDI technologies is helping to overcome many of these historical challenges, projects that do not have the right level of both initial planning and back-end management can still end up in trouble.

More than just understanding when and how to get started, you have to get insight into the entire VDI framework, and be ready to meet the challenges and issues that may crop up along the way.

Before committing to any VDI initiative, you need to make sure you know the answers to the following questions.

1. What are the key elements of my VDI infrastructure?
2. What are the key factors that affect the size, capacity and performance of this infrastructure?
3. How do I monitor, manage this infrastructure to ensure reliability and performance?
4. How do I optimize storage for VDI?

This paper will help you understand the answers to all these key questions so you have a thorough understanding of not just your VDI infrastructure, but also the problems that it may pose along with effective tactics for monitoring and resolving them.

Key Elements of a Virtualized Desktop Infrastructure

When you think about VDI, you have three key consistent components – Servers, Storage and Network. It is how you work with your VDI vendor to design, size, and manage the infrastructure that can make the difference between success and ongoing headaches.

Servers

The servers required for VDI are industry standard x86-architecture servers, with local disk storage recommended. However, you can use any physical form factor including blade servers. VDI works best when multiple servers are clustered together to meet the capacity needs of thousands of desktops. In addition, clustering buys you load balancing and high availability. You want the servers to be stateless so there is no loss of critical data if the server goes down. In addition, it is ideal if the servers themselves scale horizontally much like a web server farm. As your capacity needs grow, you simply add more servers to the cluster, since the same software component runs on every server, and you can attach local storage via standard IDE or iSCSI interfaces. You will get the best results with dual, 1-Gig-E network cards on the servers. You can treat network ports individually for different types of traffic, or team or bond them together.

Storage

In a VDI implementation, the cluster of servers connects to shared storage, which is the persistent repository of all data. The storage is NAS-based and the servers rely on file-based access to the shared storage. You will have support for both NFS and CIFS file protocols.

Storage can be a considerable capacity and performance bottleneck with VDI and can lead to significant frustrations. Shared storage using Storage Optimizer technology can alleviate this and reduce the performance requirements. The key to this technology is the ability to leverage the local disks on the servers for almost all real-time operations. The IOPS on the shared storage is reduced 4-5 per VDI session even for persistent desktops.

Network

The network connects client devices to the VDI sessions running on the servers. Typically, this part of the network is a WAN. Most VDI implementations worry about optimizing WAN bandwidth and latency. Make sure to consider the reliability of the network and remember that VDI requires a persistent network connection.

Factors in the Performance and Capacity of Your Infrastructure

Maintaining the health and performance of your environment is critical to a successful VDI deployment. Virtual Desktop loads have more peaks and are more transient than virtualized servers, so administrators have to be more vigilant monitoring their environment, and even more proactive in anticipating growth before it happens.

Before moving to VDI, you need to understand and measure the OS and applications you want to run for various desktops throughout your organization. Once you understand the loads and add in room for growth and redundancy, you can effectively size the servers, network and storage you need. After you start moving users to their new virtual desktops, our carefully laid out infrastructure and plan will encounter variables you did not consider or could not emulate. You will need to make adjustments quickly by measuring performance, determining the current core issues and anticipating changes and growth of the business. Specifically, you should focus two key areas – managing performance today while anticipating the capacity requirements of tomorrow.

Performance Management

Managing VDI virtual machine performance focuses on the issues you are having right now. Successfully squeezing all your desktops into shared resources requires deep visibility into the infrastructure so you can see where bottlenecks and latency exist. For example, a common issue is boot storms, when users all "turn on" their virtual desktop in the morning, overwhelming the virtual infrastructure as the OS and applications are loaded for the first time, causing users to wait. The "contention" for resources can become a self-reinforcing feedback loop, causing high latency and slowing everything to a crawl.

In general, you will encounter contention in the following areas:

- **Hosts (CPU and Memory):** Sharing CPU means that some processes will have to wait until others finish. Sharing memory can force OS to swap space, effectively writing it to disk until memory becomes available.
- **Storage I/O:** The slowest part of delivering data to a virtual infrastructure is storage; and the load from VMs compound this problem by randomizing the I/O (the hardest type of I/O to handle). When you add more load from memory swapping, your storage becomes your biggest bottleneck.
- **Network:** The packets from all your virtual desktops squeeze down into fewer wires and ports, and often have to go through additional protocol layers to work in a virtualized environment.

Overall, contention will be one of the biggest issues in a virtual infrastructure, and being able to measure and monitor it and have a plan to respond rapidly to alleviate bottlenecks will be crucial to having a well running environment.

Capacity Management

Capacity management for hypervisors such as VMware, Hyper-V, KVM or Xen focuses on how you can optimize your current environment, how current resource consumption is trending, and evaluating what-if scenarios to understand what happens when your environment changes.

Optimizing your environment can occur in several areas, but you will both reclaim and adjust resources according to their historical need. You can reassign resources from over-allocated virtual desktops to other VMs. This benefits under-allocated VMs that struggle to get the resources they need and cause various types of bottlenecks. With virtual capacity monitoring tools, you will have reports that will identify these VDI problems and offer corrective actions to fix the issue.

Once your environment is optimized, you need to be able to trend and forecast resource depletion. First, this forecast should define which resource you will run out of first based on your current growth, telling you where you will need to budget dollars to increase resources. Second, this forecast should show you how many more VMs you can add to your current environment, enabling you to understand both your expandability and redundancy. For example, in order to budget properly, you can justify host purchases by understanding that CPU is your current constraint as you are at 50% utilization today and will hit 70% utilization in 6 months, which means you will not have the necessary redundancy to migrate additional desktops for future projects.

Finally, you should evaluate "what-if" scenarios in your environment to prepare for future needs and disaster recovery. Some of these scenarios would include:

- How many hosts could I lose and still function reasonably well?
- For the next project, can I add "N" virtual machines with current hardware, or do I need to buy more?
- Can my environment survive an increase in peak load?

Managing performance and latency in a virtual environment is a demanding job due to the transient, spiky nature of the loads. Administrators must carefully measure and plan their infrastructure, but also monitor loads for proper balancing.

Considerations to Get your Virtualized Desktop Infrastructure Right

These tips will prime your VDI project for success.

End user analysis is essential

Evaluate not just how many users will be on the system, but more importantly, how many desktops each user needs and what type of activities they will be doing. For example, an admin or knowledge worker typically only needs a single desktop, but developers often need multiple desktops. Likewise, some users will be doing low bandwidth office style work, whereas others will engage in multimedia viewing. Consider how many different locations exist and how spread out they are as well. Together, these considerations will allow you to properly size your infrastructure, understand user experience implications, and establish reasonable SLAs.

"Where" matters as much as "Who"

When you look at access clients and protocols, make sure to consider where the users will be located, how often will they be remote and accessing their VDI session from across a WAN, and how much multimedia will be used in the environment.

Take a holistic approach with your storage considerations.

Start with a comprehensive understanding of your users (including types of users) and move through the entire implementation, carefully considering the design for both scaling and cost. Evaluate your storage needs independent of vendor. And then consider using monitoring software to keep the storage vendor honest. Remember to keep in mind that you will more than likely be working with different types of users in your environment: task, knowledge and/or power users. Ensure use cases are set up accordingly.

Cluster to improve reliability.

Clusters of host /server machines can improve both scaling and reliability. From a VDI scalability standpoint, the cluster allows you to more effectively load balance virtual desktops for better performance. When we look at reliability, clustering eliminates the concerns of having a single point of failure, while also leaving spare capacity in case of failure.

Guest OSs can replace a desktop.

VDI done right eases the migration burden on both end users and IT staff associated with such upgrades. In fact, this has been so successful that many enterprises are turning to VDI to streamline the time-sensitive upgrade from Windows XP to Windows 7 (and for some, the planning stages of the anticipated move to Windows 10). In this case, the guest OS is the actual desktop OS that the users are interacting with in their VDI session, essentially replacing their desktop.

Applications drive user productivity.

An assessment of the application landscape is critical to the success of any VDI implementation. Applications drive user productivity and typically include a mix of commercial and in-house apps. Most of the typical commercial apps will become part of the Gold Master image, a common set of operating system and base application configurations shared among a group of users, and centrally managed, while the specialized, in-house apps may be packaged and associated with particular user's desktops (e.g. a factory floor worker). If custom in-house applications are widely deployed, they can live in the Gold Master as well. Applications typically included with the Gold Master are: MS Office, Adobe Reader, Flash and custom browsers (e.g. Chrome or Firefox).

The most up-to-date USB devices work best.

It's important to review the peripherals that will be used in the VDI sessions. Most up-to-date USB devices work well in the VDI environment as the USB is redirected from the physical client to the VDI session. Typical devices utilized in VDI environments might include printers, scanners and thumb drives. Special case or niche devices may need special consideration. Keep in mind, USB devices work best over a LAN connection.

Client devices offer flexibility and mobility.

Thin clients are typical replacements for the legacy PCs in use and offer a number of advantages including excellent power efficiencies (often enough to offset their costs over a 3-5 year payback period), superior security and much longer life. Other physical clients may include thick clients, iPads and other tablets used in BYOD scenarios. The same virtual desktop can be accessed from multiple clients and allows the end-user to be mobile without having to be tethered to a specific client device.

Make sure it scales.

Infrastructure choices, including servers, storage and networking, should be scalable up to a maximum theoretical deployment. While you may start with a small, initial roll-out, you should plan with the maximum intended size in mind. At the same time, ensure you can migrate with minimal downtime in the case that you do outgrow your current availability.

Keep cost in perspective.

You should think of storage and other VDI costs as marginal cost per user, not overall cost. For example, if you are planning a 6,000-user deployment and looking at a $230,000 NAS setup to support it, the number that matters is $38/user, not $230,000.

Storage Optimization for Your Virtualized Desktop Infrastructure

Storage is the biggest performance bottleneck in a virtual infrastructure, and VDI can compound that with its spiky, transient nature. But capacity can be a problem, too, with VMs taking up space, as do the files, logs, snapshots, etc.

The first thing with storage in a VDI environment is to make sure you properly evaluate your storage needs. Starting with storage too slow to meet the demands of your environment will start you down the wrong path.

The challenge of storage inefficiencies is widely acknowledged. Traditional VDI requires excess amounts of top-tier storage, which is costly to purchase and complex to manage, often making large-scale VDI deployments too expensive and slow to be practical. Some vendors offer third-party solutions to address storage issues, but they add expense and integration headaches and can fail to solve the problem. However, other integrated storage optimization solutions (such as *NComputing*'s VERDE VDI Storage Optimizer) can help address the storage cost issue. By approaching caching at the local level on VDI nodes, this type of solution can reduce traffic over the storage area network by 90 percent or more often resulting in a dramatic reduction in traffic and Tier 1 spindle counts. Regardless of how you address your storage needs, it's very important to have the baseline performance you need for your environment.

When monitoring storage performance, the first key is to understand that this is a shared resource split across dozens or hundreds of VMs and the disks in the array are trying to read and write data fast enough to meet the requests coming from the hosts. The requests are like an I/O blender when compared to traditional physical environments, and can cause contention on both the virtualization and storage side. Without visibility into both domains, you are running your environment with one eye shut.

When you have a performance problem, it's critical for you to be able to drill down and immediately find the source of the issue. Sometimes, it will be on the host side, and sometimes on the storage side. For example, high memory utilization on VM1 can lead to swapping, which puts a load on the shared storage, which slows down VM2.

Looking at VM2, nothing appears to be wrong – it's just slow, and hard to diagnose. A good storage performance management tool will give you a single view to both sides of the story, allowing you to pinpoint VM1 as the source of the issue, not the storage.

A second problem in virtual environments is storage capacity monitoring and management. Storage presented to a virtual infrastructure is then thin-provisioned, sliced and diced into many pieces, snapshotted, cloned, etc., and can move on its own in some cases. Often, storage usage grows at a rapid clip as VMs are easy to create. In general, without virtual and server tools, there is no visibility into end-to-end capacity, how fast is it growing and when you will run out. If you do use thin provisioning, you will need to pay special attention to how much you are over provisioned – the more you are, the more risk you incur.

An ancillary to the capacity is the optimization story, sometimes called right-sizing. Knowing where you have capacity that you can reclaim, whether a VM with too much disk capacity, an orphaned VM file, or an unmapped or unformatted LUN, there is almost always storage to be reclaimed and repurposed before you consider buying additional disks from your vendor.

Storage is the biggest challenge in virtual server and desktop environments and requires good tools to understand how storage is being used, where there are performance issues, and when you should buy more.

Conclusion

VDI can be a powerful technology but it can also operate on a model that data centers are not used to. Careful execution at the planning, implementation and operational phases is critical to the overall success of the project. With the appropriate architecture and capacity plan, technical implementation, and operational monitoring and management tools and approach many of the most common problems can be easily eliminated. It's ultimately the balance between operational cost and end user satisfaction that determine if a VDI implementation succeeds or fails. As a result, it pays to make sure that your upfront planning for all phases of the project is as effective as possible.

Need more info?
We'd love to talk to you about your project. Click here.

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